UNITED STATES DEPARTMENT OF AGRICULTURE
MARKETING AND REGULATORY PROGRAMS
AGRICULTURAL MARKETING SERVICE

EQUIPMENT ACCEPTANCE CERTIFICATE

Firm:

BFM Global Limited
P. O. Box 66-087 Beach Haven
Auckland 0749
New Zealand

Model Designation:

Belting Material
Seeflex Natural and Seeflex White

September 1, 2015
Date of Issuance

August 31, 2020
Date of Expiration

U.S. Department of Agriculture
Marketing and Regulatory Programs
Agricultural Marketing Service
Dairy Grading Branch
1400 Independence Ave., SW
Washington, DC 20250-0230

The issuance of this form is based on U.S. Department of Agriculture, Dairy Grading Branch, Equipment Design Review Section, evaluation of the equipment listed above for compliance with:

USDA Dairy Equipment Guidelines, June 2001

This form does not limit USDA's responsibility to take appropriate action in cases in which evidence of non-compliance, improper maintenance, or non-sanitary conditions have been observed.

USDA United States Department of Agriculture

DA-161 (09-04) Destroy previous editions.

BFMfitting

CERTIFICATE OF COMPLIANCE

BFM GLOBAL LTD
P O Box 66-087
Beachhaven,
Auckland 0749
New Zealand

Certificate of Compliance:
Ra for BFM® Spigots

Certificat de rugosité des tubulures
BFM® réalisées en acier inoxydable T304L et T316L

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18 SEP 2017

This document is to certify the BFM® Stainless Steel (SS) Spigots made from T304L & T316L SS has an average roughness (Ra) that is less than 0.8 Ra Micro-meters or 32Ra micro-inches. Tests on BFM® SS spigots had an average 0.2 -0.6 Ra micro-meters. Please see conversion chart below:

Ce document certifie que les tubulures BFM® réalisées en acier inoxydable T304L et T316L ont une rugosité moyenne inférieure à une valeur Ra de 0,8 microns ou Ra de 32 inches. Les tests réalisés sur les tubulures BFM® ont démontrés que la rugosité moyenne se situe entre une valeur Ra de 0.2 à 0.6 microns. Voir la table de conversion ci-dessous :

Ra MICRO-METRES	Ra MICRO-INCHES
0.025	1
0.05	2
0.1	4
0.2	8
0.4	16
0.8	32
1.6	63
3.2	125
6.3	250
12.5	500
25.0	1000
50.0	2000

SIGNED ON BEHALF OF BFM® GLOBAL LTD

BLAIR MCPHEAT
DIRECTOR

BFMfitting

COMPLIANCE

BFM GLOBAL LTD
P O Box 66-087
Beachhaven,
Auckland 0749
New Zealand

Information for End Users of Food Grade Silicone Rubber Products

INTRODUCTION:

Many silicone rubber articles are designed for applications that bring them into direct contact with food or drinking water. These goods should not contain chemicals that are hazardous to health, nor should they impart unacceptable taste or odour.

There are a number of international organisations involved with the regulation of issues such as these.

The organisations most often referred to are:

- FDA - Food and Drug Administration, USA
- BGA - German Health Authorities (Bundes Gesundheits Amt),

FDA:

The FDA Recommendations are published in the Code of Federal Regulations.

The materials used in BFM Global Silicone Rubber intended for Food contact are covered in Chapter 177.2600, "Rubber articles intended for repeated use".

The vulcanising agent used in the manufacture of this compound is withinthe prescribed maximum of 1.5% by weight of rubber product.

BGA:

The BGA Recommendations are subdivided into classes determined by the nature of the polymer used in the article. The BGA recommendations are published (in German) in "Franck, Kunstoffe".

Each of the classes specifies a list of chemicals recommended for the manufacture of rubber articles that come into contact with food. For each chemical of group of chemicals maximum concentrations are given; in some cases they refer to the chemicals added, in other cases to the decomposition products in the finished article. In each of these recommendations it is stated that the finished article must not adversely affect taste and odour of the food coming into contact with it.

The relevant class for Silicone Rubber is - Class XV

The organic peroxide used as a vulcanising agent is specifically covered by these recommendations and state that "the ecomposition products originating from the cross-linking peroxide must not exceed 0.5% in the finished article". BFM Global post cure food grade articles to ensure that this requirement is met.

BFM GLOBAL SILICONE SEAL

The seal is manufactured from a compound where it is post cured. The material is cured using no more than 1.5% 2:4 Di-Chloro Benzoyl Peroxide (50% active in silicone oil), which is within the limits prescribed by the FDA regulatory standards.

This FDA regulation deals with rubber articles intended for repeated use in contact with food. (See Above)

The regulations contain limitations on extractables, which apply to the finished fabricated article.

Due to the wide variation of end uses to which the material is used, compliance with individual regulations must, of necessity, rest with the end user.

The materials are subject to post curing to ensure the minimum level of residual reaction by-products.

This post curing consists of 2 hrs @ 150°C and then 8 hrs at 200°C

BFMfitting

CERTIFICATE OF COMPLIANCE

BFM GLOBAL LTD
P O Box 66-087
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Auckland 0749
New Zealand

Seeflex Regulations – EC, FDA, USDA, 3A

19 JULY 2017

REGULATION (EC) 1935/2004

Materials and Articles intended to come into contact with food.

BFM® Global certifies that in the manufacture of our Seeflex 040E and 020E our raw material supplier and film manufacturer use monomers & starting substances that comply with relevant requirements of Regulation (EC) 1935/2004.

REGULATION (EC) 10/2011

Plastic materials and articles intended to come into contact with food.

BFM® Global Ltd certifies that in the manufacture of polyurethane films, designated with the prefixes 040E and 020E our raw materials suppliers use monomers and starting substances that comply with relevant requirements of Regulation (EC) 10/2011.

- 975/2009/EC - Amendments to directive 2002/72 EC
- 2002/72 EC - Repealed by this regulation

COMMISSION REGULATION (EC) 2023/2006

Good manufacturing practices for items intended to come into contact with food.

BFM® Global certifies that in the manufacture of our Seeflex 040E and 020E our raw material supplier and film manufacturer comply with relevant requirements in Commission Regulation (EC) 2023/2006 on good manufacturing practice for materials and articles intended to come in contact with food.

REGULATION (EC) 1907/2006 (REACH)

BFM® Global certifies that Seeflex 040E and 020E contain no dangerous ingredients according to the REACH-Regulation (EC) No. 1907/2006.

FDA FOOD ADDITIVE REGULATION 21 CFR, SECTIONS 177.2600 AND 177.1680

BFM® Global Ltd supplies Seeflex 040E, 020E and 040AS film that is composed of resin that "When used unmodified for the manufacture of food contact articles, will comply with the U.S. Food, Drug, and Cosmetic Act and Food Additive Regulation 21 CFR 177.2600 and 177.1680". In processing this resin into film we use ingredients that are considered by the FDA to be G.R.A.S. (Generally Recognised As Safe) under FDA 21 CFR 182.90. Those ingredients are sanctioned for food contact applications under 21 CFR 175.300. There are no chemical reactions that take place during the processing of polyurethane resin into polyurethane film.

USDA CERTIFIED

The Seeflex media supplied by BFM® Global Ltd is certified safe for food and dairy contact applications.

3A CERTIFIED

BFM® Global is 3A certified for the supply of both Spigot and all Seeflex connectors into food and dairy applications.

Signed

Blair McPheat

BFMfitting

SAFETY DECLARATION

BFM GLOBAL LTD
P O Box 66-087
Beachhaven,
Auckland 0749
New Zealand

31 JULY 2018

Declaration relating to

Seeflex Materials 040E, 040AS, 020E & 060ES

NOTE: This statement is made on the information provided to us by the material supplier and corresponds with our actual knowledge. BFM® Global uses Seeflex 040E, Seeflex 040AS, Seeflex 020E and Seeflex 060ES to manufacture our connectors, however, we cannot guarantee the suitability of the material for any given application and assume no liability in connection with the information provided below.

Leachable Substances:

To the best of our knowledge, BFM® Global's material suppliers do not use or intentionally incorporate the following agents into the Seeflex 040E, 040AS, 020E or 060ES that we use for production of our connectors.

- Bisphenol-A (BPA)
- Bis (2-ethylhexy) phthalate (DEPH)
- Dibutyl Phthalate (DBP)
- Benzyl Butyl Phthalate (BBP) or any other Phthalates)
- Cyanuric Acid
- Latex
- Melamine
- Nonylphenols
- Oleamide
- Silicone

TSE and BSE:

Seeflex 040E, Seeflex 040AS, Seeflex 020E and Seeflex 060ES are synthetic organic materials that do contain substances derived from tallow sources. Our suppliers have assured us that processing conditions used in the production of these tallow derivative products are in compliance with the minimum conditions described below for the processing of rendered fats listed in Annex XIII, Chapter XI of the EU Regulation 142/2011/EC, and the Notes for Guidance EMA/410/01 Rev 3.

Process Conditions: Regulation 142/2011/EC Annex XIII Chapter XI

A) Transesterification or hydrolysis at at least: 200°C, under corresponding appropriate pressure, for 20 minutes (glycerol, fatty acids and esters); or
B) Saponification with NaOH 12 M (glycerol and soap) in a batch process at 95°C for 3 hours, or in a continuous process at 140°C, 2 bars (2,000 hPa) for 8 minutes; or
C) Hydrogenation at 160°C at 12 bars (12,000 hPa) for 20 minutes.

These conditions are considered to be sufficient to inactivate BSE (Bovine Spongiform Encephalopathy) and TSE (Transmissible Spongiform Encephalopathy) transmitters. The conditions also meet the requirements of ISO 22442-1:2007 Annex C.5 regarding the processing of tallow derivatives used in medical devices.

Additionally, this tallow derivative product is compliant with the US Food and Drug Administration regulations regarding the use of prohibited cattle materials in food (21 CFR § 189.5) and cosmetics (21 CFR § 700.27), as prohibited cattle materials do not include tallow derivatives.

SIGNED ON BEHALF OF BFM GLOBAL LTD

BLAIR MCPHEAT

BFMfitting

DECLARATION OF COMPLIANCE

(CONTINUED)

Overall migration test for compliance with 10/2011 with amendments up to & including (EU) 2017/752:

TEST STIMULANT	TEST CONDITIONS	RESULTS (mg/kg)	SPECIFIC MIGRATION LIMITS SML
Olive Oil	10 days, 60°C	<2	10mg/dm²

Olive oil was used as it better simulates the most severe and realistic conditions.

CONFORMITY WITH SPECIFIC MIGRATION LIMITS:

The determined specific migration to the simulant is given in the table below. Components 1 to 3 are tested to EN 13130, with Component 4 tested to EN 13130-8.

SPECIFIC COMPOUND	TEST CONDITIONS	RESULTS (mg/kg)	SPECIFIC MIGRATION LIMITS SML
Component 1	48 hours, 60°C	0.06	0.6mg/kg
Component 2	48 hours, 60°C	<2	3mg/kg
Component 3	48 hours, 60°C	<2	5mg/kg
Component 4	48 hours, 60°C	0.3	1mg/kg (Qm)

Explanatory Note: Due to the diverse fields of application, worst case scenarios were chosen for test conditions.

SPECIFICATION ON THE USE OF THE MATERIAL

TYPE OF FOOD:

All dry food and powder product, including dry product and powder with fatty substances on the surface.

TIME AND TEMPERATURE IN CONTACT WITH FOOD:

Up to 48 hours direct contact at a temperature of 60°C.

RATIO OF FOOD CONTACT SURFACE TO PRODUCT VOLUME:

6dm² per kg of food, according to article 17 Regulation 10/2011/EC

SIGNED ON BEHALF OF BFM GLOBAL LTD:

BLAIR MCPHEAT
DIRECTOR

BFMfitting

| CERTIFICATE OF COMPLIANCE

BFM GLOBAL LTD
P O Box 66-087
Beachhaven,
Auckland 0749
New Zealand

Seeflex 060ES – EC & FDA Compliance

26 FEBRUARY 2018

BFM® Global's Seeflex 060ES product is manufactured from layers of BFM® Seeflex material - a thicker internal Seeflex 040E surface, and an external Seeflex 020E surface.

Both of these Seeflex surfaces are fully compliant with the following EU and FDA regulations as summarised below:

REGULATION (EC) 1935/2004
Materials and Articles intended to come into contact with food.
BFM® Global certifies that in the manufacture of our Seeflex 040E and 020E our raw material supplier and film manufacturer use monomers & starting substances that comply with relevant requirements of Regulation (EC) 1935/2004.

REGULATION (EC) 10/2011
Plastic materials and articles intended to come into contact with food.
BFM® Global Ltd certifies that in the manufacture of polyurethane films, designated with the prefixes 040E and 020E our raw materials suppliers use monomers and starting substances that comply with relevant requirements of Regulation (EC) 10/2011.

FDA FOOD ADDITIVE REGULATION 21 CFR, SECTIONS 177.2600 AND 177.1680
BFM® Global Ltd supplies Seeflex products made from a film that is composed of resin that "When used unmodified for the manufacture of food contact articles, will comply with the U.S. Food, Drug, and Cosmetic Act and Food Additive Regulation 21 CFR 177.2600 and 177.1680". In processing this resin into film we use ingredients that are considered by the FDA to be G.R.A.S. (Generally Recognised As Safe) under FDA 21 CFR 182.90. Those ingredients are sanctioned for food contact applications under 21 CFR 175.300. There are no chemical reactions that take place during the processing of polyurethane resin into polyurethane film.

Signed

Blair McPheat
Director

BFMfitting

STATEMENT OF COMPLIANCE

BFM GLOBAL LTD
P O Box 66-087
Beachhaven,
Auckland 0749
New Zealand

9 AUGUST 2018

FDA Food Contact Compliance Statement:

LM4 - Woven Polyester

NOTE: This statement is made on the information provided to us by the material supplier and corresponds with our actual knowledge. BFM® fitting uses the LM4 fibre to manufacture our LM4 connectors, however, we cannot guarantee the suitability of the material for any given application and assume no liability in connection with the information provided below.

LM4 is a 100% polyester fibre which meets with the compositional requirements of the following FDA regulations for Indirect Food Additives: Polymers, intended to come into contact with food:

CFR21, part 177.2800

This applies to all dry food and powder product.

SIGNED ON BEHALF OF BFM GLOBAL LTD

HUGO HERMANSON
COMPLIANCE OFFICER

BFM GLOBAL LTD
P O Box 66-087
Beachhaven,
Auckland 0749
New Zealand

Declaration of Compliance:

In Accordance with EU Regulations 1935/2004 and 10/2011
Plastic materials and articles to come into contact with food

ISSUED BY:

BFM® Global Limited
PO Box 66-087
Beachaven 0749
Auckland
New Zealand

ISSUED ON:

4 February 2020

FOR THE FOLLOWING PRODUCT:

LM4 (Polyester)

MANUFACTURED BY:

BFM® Global Limited
PO Box 66-087
Beachaven 0749
Auckland
New Zealand

CONFIRMATION:

LM4 is supplied in accordance with the following requirements with amendments up to & including (EU) 2019/988:

- Regulation No 2023/2006/EC (GMP Regulation)
- Regulation No 1935/2004/EC (Food Contact Materials)
- Regulation No 10/2011/EC (Plastic Food Contact Materials)

The conformity has been established by migration testing in accordance with regulations listed above.

CONFORMITY WITH OVER-ALL MIGRATION LIMITS:

The determined over-all migration from the sample to the simulant is given in the table below. The results are an average of three determinations as described in EN 1186.

TEST STIMULANT	TEST CONDITIONS	RESULTS (mg/dm^2)	OVERALL MIGRATION LIMITS OML
3% Acetic Acid (B)	2 hours, 100°C	<2.5	≤10mg/dm^2
95% Ethanol (D1)	3.5 hours, 60°C	<2.5	≤10mg/dm^2
Isooctane (D2)	1.5 hours, 60°C	<2.5	≤10mg/dm^2

Explanatory Note: Due to the diverse fields of application, worst case scenarios were chosen for test conditions.

BFMfitting

DECLARATION OF COMPLIANCE

CONFORMITY WITH SPECIFIC MIGRATION LIMITS:

The determined specific migration to the simulant is given in the table below. Components are tested to EN 13130.

SPECIFIC COMPOUND	TEST CONDITIONS	RESULTS (mg/kg)	SPECIFIC MIGRATION LIMITS SML
Component 1	2 hours, 100°C	<1	≤5mg/kg
Component 2	2 hours, 100°C	<0.02	≤0.04mg/kg
Component 3	2 hours, 100°C	<1	≤5mg/kg
Component 4	2 hours, 100°C	<1	≤30mg/kg (Qm)
Component 5	2 hours, 100°C	<4	≤7.5mg/kg
Component 6	2 hours, 100°C	<6	≤30mg/kg

Explanatory Note: Due to the diverse fields of application, worst case scenarios were chosen for test conditions.

SPECIFICATION ON THE USE OF THE MATERIAL

TYPE OF FOOD: All food products, including aqueous, acidic, alcoholic and dairy products.

TIME AND TEMPERATURE IN CONTACT WITH FOOD: Up to 2 hours direct contact at a temperature of 100°C.

RATIO OF FOOD CONTACT SURFACE TO PRODUCT VOLUME: 6dm² per kg of food, according to article 17 Regulation 10/2011/EC

SIGNED ON BEHALF OF BFM® GLOBAL LTD:

BLAIR MCPHEAT
DIRECTOR

BFM GLOBAL LTD
P O Box 66-087
Beachhaven,
Auckland 0749
New Zealand

Declaration of Compliance:

In Accordance with EU Regulations 1935/2004 and 10/2011
Plastic materials and articles to come into contact with food

ISSUED BY:

BFM® Global Limited
PO Box 66-087
Beachaven 0749
Auckland
New Zealand

ISSUED ON:

4 February 2020

FOR THE FOLLOWING PRODUCT:

LM3 (Polypropylene)

MANUFACTURED BY:

BFM® Global Limited
PO Box 66-087
Beachaven 0749
Auckland
New Zealand

CONFIRMATION:

LM3 is supplied in accordance with the following requirements with amendments up to & including (EU) 2019/988:

- Regulation No 2023/2006/EC (GMP Regulation)
- Regulation No 1935/2004/EC (Food Contact Materials)
- Regulation No 10/2011/EC (Plastic Food Contact Materials)

The conformity has been established by migration testing in accordance with regulations listed above.

CONFORMITY WITH OVER-ALL MIGRATION LIMITS:

The determined over-all migration from the sample to the simulant is given in the table below. The results are an average of three determinations as described in EN 1186.

TEST STIMULANT	TEST CONDITIONS	RESULTS (mg/dm^2)	OVERALL MIGRATION LIMITS OML
3% Acetic Acid (B)	2 hours, 100°C	<2.5	≤10mg/dm^2
95% Ethanol (D1)	3.5 hours, 60°C	<2.5	≤10mg/dm^2
Isooctane (D2)	1.5 hours, 60°C	<2.5	≤10mg/dm^2

Explanatory Note: Due to the diverse fields of application, worst case scenarios were chosen for test conditions.

BFMfitting

DECLARATION OF COMPLIANCE

CONFORMITY WITH SPECIFIC MIGRATION LIMITS:

The determined specific migration to the simulant is given in the table below. Components are tested to EN 13130.

SPECIFIC COMPOUND	TEST CONDITIONS	RESULTS (mg/kg)	SPECIFIC MIGRATION LIMITS SML
Component 1	2 hours, 100°C	<0.02	≤0.04mg/kg
Component 2	2 hours, 100°C	<1	≤5mg/kg
Component 3	2 hours, 100°C	<1	≤30mg/kg (Qm)
Component 4	2 hours, 100°C	<6	≤30mg/kg
Component 5	2 hours, 100°C	<1	≤5mg/kg
Component 6	2 hours, 100°C	<4	≤7.5mg/kg

Explanatory Note: Due to the diverse fields of application, worst case scenarios were chosen for test conditions.

SPECIFICATION ON THE USE OF THE MATERIAL

TYPE OF FOOD: All food products, including aqueous, acidic, alcoholic and dairy products.

TIME AND TEMPERATURE IN CONTACT WITH FOOD: Up to 2 hours direct contact at a temperature of 100°C.

RATIO OF FOOD CONTACT SURFACE TO PRODUCT VOLUME: 6dm² per kg of food, according to article 17 Regulation 10/2011/EC

SIGNED ON BEHALF OF BFM® GLOBAL LTD:

BLAIR MCPHEAT
DIRECTOR

STAINLESS Products Ltd

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web : www.stainlessproducts.co.nz

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Auckland , 1546
Ph :+64 9 6341241
Fax : +64 9 6341242

21st February 2020

To Matthew Bailey– BFM Fitting

We are pleased to confirm that the 216mm wide coil complies with the Dodd-Frank Act.

The mills we source this from are based in Taiwan and have confirmed that they too comply.

Signed on behalf of Merchant Friend

MERCHANT FRIEND CO., LIMITED

Yours Sincerely,

Jarrod Hedley
Director
Stainless Products Ltd

YUEN CHANG STAINLESS STEEL Co., Ltd.
13F, NO. 235 JUNGJENG 4TH ROAD, CHIANJIN CHIU, KAOHSIUNG, TAIWAN
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工廠:高雄市大寮區(大發工業區)華西路 12 號 TEL: 886-7-7879118 FAX: 886-7-7879728
http://www.yuenchang.com.tw E-mail:yuenchang@yuenchang.com.tw

25th February 2020

To Matthew Bailey– BFM Fitting

We are pleased to confirm that the 216mm wide coil complies with the Dodd-Frank Act.

-

Yours Sincerely,

運鋼鐵股份有限公司 顏德和

Test Report

IB-18-8-0083/1

about the electrostatic properties of BFM® standard connectors and their use in potentially explosive atmospheres

Freiberg, 21.03.2019
jl/ah/mh

Dipl.-Ing. Joachim Lucas
Editor

Dipl.-Ing. Alexander Henker
Editor

This document consists of: 18 pages text
1 Annex

Contents

Test Report
IB-18-8-0083/1
about the electrostatic properties of BFM® standard connectors and their use in potentially explosive atmospheres

1. Order

1.1	Customer:	BFM Global Limited, NZ-0749 Beach Haven, Auckland, New Zealand
1.2	Purchase order:	No. 300938 of 09.11.2018
1.3	Supplier:	IBExU Institut für Sicherheitstechnik GmbH, Freiberg, Germany

2. Origination, test procedure

Within the scope of the Test Reports IB-10-8-058 [1], IB-12-8-052 [2], IB-13-8-029 [3], IB-13-8-085 [4], IB-15-8-038 [5] and IB-17-8-0044/1 [6], the electrostatic properties of various BFM® connectors have been determined and corresponding conclusions have been drawn regarding their use in potentially explosive atmospheres. The examinations were based on the regulations / standards in force at that time, which have now been replaced in part by new regulations / standards, e.g. TRBS 2153 [7] → TRGS 727 [8] or Technical Report CLC/TR 50404 [9] → Technical Specification IEC/TS 60079-32-1 [10] or EN 13463-1 [11] → EN ISO 80079-36 [12].

This test report provides a summary of the previous test results [1] to [6] and an assessment according to the current regulations / standards. In addition, four new BFM® connectors should be tested (see sect. 3) and assessed.

3. Testing of the new BFM® connectors Seeflex 060ES, LM3, Teflex and Teflex NP

3.1 Test samples

The BFM® connectors in standard sizes - diameter 100 to 650 mm, as special connector up to 1650 mm – are dust-tight, flexible connectors. The two ends of the connectors are each provided with a spring steel ring. These spring steel rings are completely enclosed by flexible material (see figure 1). The BFM® connectors are attached in BFM spigots with special profile.

The flexible materials of the BFM® connectors Seeflex 060ES, LM3, Teflex and PTFE are as follows:

- Seeflex 060ES: clear ether based thermoplastic polyurethane alloy with a white internal polyester scrim, pressure-resistant, thickness: 1.3 mm (± 10 %)
- LM3: white woven polypropylene, thickness: 0.5 mm
- Teflex (TFLX): dark brown pure woven Teflon PTFE, thickness: 0.5 mm
- Teflex NP (TFLX NP): black pure Teflon PTFE, thickness: 0.23 mm

The following test samples were supplied for the tests (delivered on 12.11.2018 and 26.11.2018):

a) BFM® connector 060ES: part: test sample, size: 200/600 060ES, batch: 203917, diameter: 200 mm, length: 600 mm; IBExU no.: EXel 0818/18
b) BFM® connector LM3: part: test sample, size: 200/600 LM3, batch: 203912, diameter: 200 mm, length: 600 mm; IBExU no.: EXel 0819/18
c) BFM® connector Teflex: part: test sample, size: 200/600 TFLX, batch: 203912, diameter: 200 mm, length: 600 mm; IBExU no.: EXel 0820/18
d) BFM® connector Teflex NP: part: test sample, size: 200/600 TFLX NP, batch: 203912, diameter: 200 mm, length: 600 mm; IBExU no.: EXel 0821/18
e) 2 separate test samples each of Seeflex 060ES, LM3, Teflex and Teflex NP (15 cm x 15 cm)
f) BFM spigot 304/200, material: stainless steel 304, inner diameter 200 mm

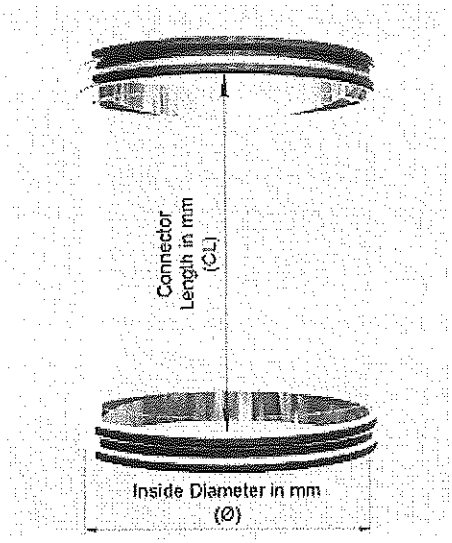

Figure 1: Illustrated BFM™ Flexible Connector below manufactured using Seeflex 040 material (Clear Urethane) (source: BFM homepage)

3.2 Measuring conditions

All measurements were carried out in a conditioned room with the following parameters:

- Test temperature: 21 - 22 °C
- Relative humidity: 25 - 26 %
- Before the tests: storage of the test samples for at least 24 hours under the specified conditions

3.3 Surface resistance

Test standards:	IEC 60093 [13], IEC 60167 [14], IEC 60079-32-2 [15]
Measuring instrument:	Tera Ohm-Meter F-H12.020 of comp. Knick Elektronische Messgeräte GmbH & Co. KG (test instrument no.: 0209)
Test electrode:	parallel electrodes acc. to [14], [15]
Electrode length l:	10 cm
Electrode distance a:	1 cm

Table 1: Measuring results at an instrument voltage of 500 V

Material	Surface resistance	Surface resistivity
Seeflex 060ES	$8.1 \cdot 10^{12}\ \Omega$	$8.1 \cdot 10^{13}\ \Omega$
LM3	$3.1 \cdot 10^{11}\ \Omega$	$3.1 \cdot 10^{12}\ \Omega$
Teflex	$> 10^{14}\ \Omega$	$> 10^{15}\ \Omega$
Teflex NP	$9.0 \cdot 10^{4}\ \Omega$	$9.0 \cdot 10^{5}\ \Omega$

3.4 Volume resistivity

Test standards: IEC 60093 [13], IEC 60079-32-2 [15]

Measuring instrument: Tera Ohm-Meter F-H12.020 of comp. Knick Elektronische Messgeräte GmbH & Co. KG (test instrument no.: 0209)

Test electrode: circular electrode

Electrode surface: 20 cm²

Table 2: Measuring results for the volume resistivity (instrument voltage for Teflex NP only 100 V, because greater fluctuations occurred in the read-out display at 500 V)

Material	Instrument voltage	Volume resistivity
Seeflex 060ES	500 V	$5.6 \cdot 10^{11}\ \Omega \cdot m$
LM3	500 V	$1.6 \cdot 10^{10}\ \Omega \cdot m$
Teflex	500 V	$4.6 \cdot 10^{13}\ \Omega \cdot m$
Teflex NP	100 V	$2.4 \cdot 10^{7}\ \Omega \cdot m$

3.5 Leakage resistance along the BFM® connector to the BFM spigot

Test standard: ISO 8031 [16]

Measuring instruments: Tera Ohm-Meter F-H12.020 of comp. Knick Elektronische Messgeräte GmbH & Co. KG (test instrument no.: 0209)

Insulation measuring instrument METRISO 1000D of comp. Gossen-Metrawatt (GMC-I Messtechnik GmbH) (test instrument no.: 0015)

Table 3: Measuring results for the leakage resistance

Material	Instrument voltage	Leakage resistance over a length of the BFM® connector of 600 mm
Seeflex 060ES	500 V	not determined
LM3	500 V	$> 10^{11}\ \Omega$
Teflex	500 V	not determined
Teflex NP	500 V	$3.5 \cdot 10^{4}\ \Omega$

3.6 Test for chargeability / dangerous discharges (transferred charge)

Test standard: DIN EN 60079-32-2 [15]

Measuring instrument: Coulombmeter HMG 11/02 of comp. SCHNIER Elektrostatik GmbH (test instrument no.: 0462)

Test execution:

The tests were carried out with different charging methods up to 10 times per method:

- Rubbing with a pure polyethylene cloth
- Rubbing with a cotton cloth
- Hitting with a leather glove
- Charging with a high voltage direct current source (U ≥ 30 kV)

After each charging of the test sample, the charge from a typical discharge is measured. This is done by discharging the test sample by slowly approaching a spherical electrode until a discharge occurs.

For the evaluation, the highest value from the charging methods is used [15].

The tests were performed on a separate test sample of the flexible material and with the BFM® connector in the mounting position. Because Teflex NP is not insulating, this material did not need to be tested here.

Table 4: Results of the test of a separate test sample of 15 cm x 15 cm, test sample e) or in the mounting position of the BFM® connectors ∅ 200, test samples a), b) and c),
n. d. = not determined, because not required according to the other measured values
values printed in bold type: above the upper limit value of 60 nC (see Table 7)

Material	Test sample		Transferred charge Q in nC per individual test			
			Rubbing with pure polyethylene cloth	Rubbing with cotton cloth	Hitting with leather glove	High voltage direct current source
Seeflex 060ES	e)		*n. d.*	*n. d.*	*n. d.*	**72**; **66**; **101**; 47
	a)	inside	No charges measurable	No charges measurable	0; 15; 0; 0; 0; 0; 42; 0; 0; 23	0; 0; 0; 14; 0; 0; 18; 0; 0; 0
		outside	**75**; 28; 43; 34	**103**; 49; **85**; **129**	58; 42; 13; **89**	No charges measurable
LM3	e)		No charges measurable	No charges measurable	No charges measurable	No charges measurable
	b)	inside	No charges measurable	No charges measurable	No charges measurable	No charges measurable
		outside	No charges measurable	No charges measurable	No charges measurable	No charges measurable
Teflex	e)		20; 34; 31; 29	25; 20; 39; 33	49; 48; 50; 43	35; 32; 42; 32; 39; 34; 32; 32; 41; 38
	c)	inside	*n. d.*	**74**; 29; 36; 41	*n. d.*	No charges measurable
		outside	*n. d.*	36; 49; 30; 35	56; 60; **63**; 35	*n. d.*

4. Assessment of the measuring results, conclusions

4.1 Classification of the BFM® connectors according to resistance / conductivity

The current Technical Specification IEC/TS 60079-32-1 [10] shows partially other criteria with regard to conductive / dissipative materials compared to the former Technical Report CLC/TR 50404 [9] and the German technical rules (previously: TRBS 2153 [7], current: TRGS 727 [8]) (compare Table 5 and Table 6). However, the differences are insignificant for the classification of the tested BFM® connectors Seeflex 060ES, LM3, Teflex and Teflex NP. The resistance measurements carried out within the scope of the Test Reports

IB-10-8-058 [1], IB-12-8-052 [2] and IB-13-8-085 [4] also do not result in any changes in the classification according to IEC/TS 60079-32-1 [10].

Based on the determined surface resistances and volume resistivities, The BFM® connectors are classified as follows:

- Seeflex 060ES: insulating
- LM3: insulating
- Teflex: insulating
- Teflex NP: dissipative

Table 5: Definitions according to IEC/TS 60079-32-1 [10]

Object	Material	Enclosure
Unit	Volume resistivity	Surface resistance
Conductive	$< 10^5\ \Omega$·m	$< 10^4\ \Omega$
Dissipative	$\geq 10^5\ \Omega$·m to $< 10^9\ \Omega$·m	$\geq 10^4\ \Omega$ and $< 10^{11}\ \Omega$ at (23 ± 2) °C and (25 ± 5) % r.H.
Insulating	$\geq 10^9\ \Omega$·m	$\geq 10^{11}\ \Omega$

Table 6: Definitions according to CLC/TR 50404 [9], TRBS 2153 [7] and TRGS 727 [8]

Substance, material or object	Volume resistivity	*or*	Surface resistance
Conductive	$\leq 10^4\ \Omega$·m		$\leq 10^4\ \Omega$
Dissipative	$> 10^4\ \Omega$·m to $< 10^9\ \Omega$·m		$> 10^4\ \Omega$ and $< 10^9\ \Omega$ (at 23 °C and 50 % r.H.) *or* $> 10^4\ \Omega$ and $< 10^{11}\ \Omega$ (at 23 °C and 30 % r.H.)
Insulating (Non-conductive)	Substance or material, that is neither conductive nor dissipative		

4.2 Chargeability / Hazardous discharges

With regard to the use of BFM® connectors of insulating material for gas explosion hazards, the charges measured during the chargeability test in sect. 3.6 are relevant. The limit values of the transferred charges listed in Table 7 are applying.
The test of LM3 did not show any transferred charges. The two other insulating materials Seeflex 060ES and Teflex showed transferred charges of > 60 nC in some tests, which restricts the use of these BFM® connectors for flammable gases / vapors accordingly (see sect. 4.4).

Table 7: Permissible transferred charges depending on gas zone and explosion group [8], [10] (limit values for Zone 0 are not yet included in the former regulations [7] and [9])

Explosion Group	Permissible max. transferred charge at	
	Zone 0	Zone 1 and 2
II A (or I)	25 nC	60 nC
II B	10 nC	25 nC (former 30 nC)
II C	No measurable discharge	10 nC

The two ends / fastening points of the BFM® connectors are each provided with a spring steel ring, which is embedded in the flexible plastic material. The following conclusions can be drawn from a test for hazardous charges of the spring steel rings in the event of excessive wear of the plastic material and the measurement of the electrical capacitance of these spring steel rings in [1] and [5]:
In the case of electrically insulating BFM materials, the flexible material before the spring steel ring shall not be worn to such an extent that the spring steel ring is completely or partially uncovered. If this cannot be made sure, these BFM® connectors may not be used for flammable gases and only for dusts with a Minimum Ignition Energy > 10 mJ.

4.3 Use of BFM® connectors in hazardous dust areas

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.

For pneumatic transport (strongly charge-generating process), the leakage resistance at each point on the inner wall of the BFM® connector must be less than 100 MΩ = 10^8 Ω as required in IEC/TS 60079-32-1 [10] (measured according to ISO 8031 [16]). As the values in Table 3 in sect. 3.5 show, the Teflex NP BFM® connector with a length of 600 mm meets this condition (leakage resistance = $3.5 \cdot 10^4$ Ω). The leakage resistance increases admittedly with increasing length. But with the typical (maximum) lengths of the BFM® connectors up to 6 m, the leakage resistance of Teflex NP will certainly remain below the permissible value.

The LM3 BFM® connector has a significantly higher leakage resistance of > 10^{11} Ω over a length of 600 mm. Similar high leakage resistances are expected for Seeflex 020E and Seeflex 040E, as these two materials with $2.0 \cdot 10^{11}$ Ω [2] have a similar surface resistance as LM3 with $3.1 \cdot 10^{11}$ Ω. The resistances of Seeflex 020E and Seeflex 040E are only slightly above the limit value for a conductive material. Therefore, in [3] these BFM® connectors up to a relatively short length of 200 mm have also been approved for pneumatic transport, provided that there is no explosive gas atmosphere present. Considering the current limit value of the leakage resistance of < 10^8 Ω [10], the BFM® connectors LM3, Seeflex 020E and Seeflex 040E may only be used for pneumatic transport if the following conditions are fulfilled:

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

The materials Seeflex 040AS and LM4 tested in [4] or [1] with surface resistances $1.6 \cdot 10^9$ Ω or $2.5 \cdot 10^{10}$ Ω are dissipative. However, even with these BFM® connectors, an exceeding of the leakage resistance of < 10^8 Ω 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} Ω·m) resistivity are transported and if very dry transport air with a relative humidity of < 25 % is avoided.
The Seeflex 060ES and Teflex BFM® connectors tested here have very high resistances and may generally not be used in strongly charge-generating processes.

Note: The pneumatic transport of bulk solids or the discharge of bulk solids (free fall) through the BFM® connectors with a drop height of more than 3 m are considered to be strongly charge-generating processes. Dedusting with a low dust concentration of typically < 1-2 g/m³ with Zone 22 or no zone or a free fall of ≤ 3 m does not represent a strongly charge-generating process [8].

For the BFM® connectors tested in [1] to [6], shorter drop heights of 1 m (Seeflex 020E [5], Seeflex 040E [3], LM4 [3]) or 2 m (Seeflex 040AS [4]) have been permitted for free fall. According to the current regulations, these BFM® connectors can now be used up to a drop height of 3 m [8]. This also applies to all BFM® connectors tested here.
The drop height of 3 m corresponds to the length of the BFM® connector, provided that above the BFM® connector there is no free fall through an insulating plastic pipe or similar. In this case, the length of the insulating plastic pipe must be subtracted from the 3 m of the BFM® connector. For free fall through an upstream, short (< 1 m), earthed metal pipe, its length does not need to be considered (higher speed of fall of dust particles in the BFM® connector, but also discharging of the particles in the wall area of the metal pipe).

4.4 Use of BFM® connectors in potentially explosive gas atmospheres and for hybride mixtures (always) without strongly charge-generating processes

The dissipative materials Seeflex 040AS, LM4 and Teflex NP can be used in all potentially explosive gas atmospheres (Zone 0, 1 and 2 inside / outside) without limiting the surface area of the BFM® connector.
The insulating LM3, for which no transferred charges could be measured (see sect. 3.6), may be used in Zones 1 and 2 without limiting the surface area of the BFM® connector.
A limitation of the surface area of the BFM® connector is required for the insulating materials Seeflex 020E, Seeflex 040E, Seeflex 060ES and Teflex, because transferred charges occurred during the tests for chargeability / hazardous discharges.
Table 8 lists the suitability / restrictions of the individual BFM® connectors. Dust explosion-hazardous zones were also included, as these partly have influence on the applicability of the BFM® connectors. For example according to sect. 3.2.1 in [8] for insulating materials, Zone 2 then requires suitable measures (in the sense of restrictions on the surface of the BFM® connectors) if experience has shown that incendive discharges occur. In sect. 6.7.5 in [11] or [12] is the following stipulated in the case that an equipment in intended use can cause frequent ignitable discharges during normal operation: the area limitations for Zone 1 are to be applied for Zone 2 and the area limitations for Zone 0 are to be applied for Zone 1. These requirements were included in Table 8 for the existing dust-explosion-hazardous Zones 20 and 21 for the following reasons:

- The frequent or occasional presence of an explosive dust atmosphere in Zones 20 or 21 also increases the risk of charging the insulating BFM materials compared with Zone 22.
- It is not known under which conditions the BFM® connectors are intended to be installed. Charges must be expected, for example, due to induction phenomena or installation close to ionizers and electrostatic spraying devices. In normal operation, such charging can possibly lead to frequent ignitable discharges.
- A hybrid mixture of combustible gas and dust results in an increased hazard.

In Table 8, no distinction was made between a gas/dust-explosion-hazardous zone inside and outside, since charging on the inner surface as a result of the dust movement general-

ly leads to a similar charging on the outer surface. However, a Zone 0 or 20 in the outer area is not usual.

In the presence of strongly charge-generating processes, the respective restrictions of use according to sect. 4.3 always apply additionally.

Table 8: Suitability / restrictions of the BFM® connectors depending on the potentially explosive zones in not strongly charge-generating processes

Gas zone inside and/or outside	Dust zone inside and/or outside	Permissible BFM surface[1] for Explosion Group		
		II A (or I)	II B	II C
Seeflex 040AS, LM3, LM4 and Teflex NP				
0, 1, 2	20, 21, 22	No restrictions [3]		
Seeflex 020E and Seeflex 040E				
0	20, 21, 22	100 cm²	50 cm² [2]	8 cm² [2]
1	20, 21	No restrictions [3]	50 cm² [2]	8 cm² [2]
	22	No restrictions [3]	200 cm²	40 cm² [2]
2	20, 21	No restrictions [3]	200 cm²	40 cm² [2]
	22	No restrictions [3]		
Seeflex 060ES and Teflex				
0	20, 21, 22	100 cm²	50 cm² [2]	8 cm² [2]
1	20, 21	100 cm²	50 cm² [2]	8 cm² [2]
	22	200 cm²	200 cm²	40 cm² [2]
2	20 oder 21	200 cm²	200 cm²	40 cm² [2]
	22	No restrictions [3]		

Annotations:

[1] Permissible projected BFM surface corresponds to the product of diameter and length [12] of the BFM® connector.

[2] BFM® connectors are not applicable, since the area criterion is already exceeded with smallest available connector (e.g.: 100 mm diameter and 80 mm length = 8000 mm² (80 cm²) projected BFM surface).

[3] No restrictions for the surface of the BFM® connector is required due to the results of the tests for chargeability / hazardous discharges.

Notes:

- *When transporting dusts / bulk solids in the presence of flammable gases / vapours, the choice of suitable BFM® connectors can prevent ignitable discharges from the BFM® connectors, but not discharges from the transported product [8].*
- *High charges are also possible when transporting non-explosive bulk solids, which can lead to ignition of flammable gases / vapors. The requirements of Table 8 must be applied for the presence of a gas zone and non-explosive bulk solids.*

The area limitations in Table 8 derived from [8] and [10] have been doubled because the BFM® connectors are surrounded by grounded metal on two sides [17].

5. Summary

For BFM Global Limited, the electrostatic properties of 4 BFM® connectors (Seeflex 060ES, LM3, Teflex and Teflex NP) were examined and conclusions were drawn for their use in potentially explosive atmospheres.

For various previously tested BFM® connectors (Seeflex 020E, Seeflex 040E, Seeflex 040AS and LM4), a summary of the test results including the evaluation according to the current regulations / standards was also made.

The materials of these standard BFM® connectors are electrically dissipative to insulating. Accordingly, there are partly different restrictions for the usage of these BFM® connectors in potentially explosive dust or gas atmospheres or with hybrid mixtures. Teflex NP has the clearly lowest ohmic resistance values and can therefore be used for all relevant applications.

Annex 1 shows a summary overview of all BFM® connectors evaluated here including their ranges of application / restrictions of use. All data apply to BFM® connectors with diameters up to 1650 mm.

6. Bibliography

[1] Test Report IB-10-8-058 about the electrostatical properties of the BFM® connectors Seeflex 040, Seeflex 400W and LM4 and their use in potentially explosive areas (Prüfbericht IB-10-8-058 über elektrostatische Eigenschaften der BFM® connectors Seeflex 040, Seeflex 400W und LM4 sowie zu deren Einsatz in explosionsgefährdeten Bereichen),
IBExU Institut für Sicherheitstechnik GmbH, Freiberg, 08.10.2010

[2] Test Report IB-12-8-052 about the electrostatic properties of the BFM® material Seeflex 040 E and its use in potentially explosive areas (Prüfbericht IB-12-8-052 über elektrostatische Eigenschaften des BFM® Materials Seeflex 040E sowie zu dessen Einsatz in explosionsgefährdeten Bereichen), IBExU Institut für Sicherheitstechnik GmbH, Freiberg, 24.07.2012

[3] Addition IB-13-8-029 to the Test Reports IB-10-8-058 and IB-12-8-052: BFM® connectors of Seeflex 020 and Seeflex 020E as well as larger hose lengths (Ergänzung IB-13-8-029 zu den Prüfberichten IB-10-8-058 und IB-12-8-052: BFM® connectors aus Seeflex 020 und Seeflex 020E sowie größere Schlauchlängen), IBExU Institut für Sicherheitstechnik GmbH, Freiberg, 11.03.2013

[4] Test Report IB-13-8-085 about the electrostatic properties of the BFM® material Seeflex 040AS and its use in potentially explosive areas (Prüfbericht IB-13-8-085 über elektrostatische Eigenschaften des BFM® Materials Seeflex 040AS sowie zu dessen Einsatz in explosionsgefährdeten Bereichen), IBExU Institut für Sicherheitstechnik GmbH, Freiberg, 11.09.2013

[5] Test Report IB-15-8-038 Electrostatic test of BFM® connectors Seeflex 020E with a wall thickness of 0.35 mm in regard to a use in potentially explosive atmospheres (Prüfbericht IB-15-8-038 Elektrostatische Prüfung der BFM® Verbindungen Seeflex 020E mit einer Wandstärke von 0,35 mm hinsichtlich des Einsatzes in explosionsgefährdeten Bereichen), IBExU Institut für Sicherheitstechnik GmbH, Freiberg, 07.05.2015

[6] Supplement IB-17-8-0044/1 to the Test Report IB-13-8-085: Use of the BFM® material Seeflex 040AS in explosive gas atmospheres and at hybrid mixtures in the interior (Ergänzung IB-17-8-0044/1 zum Prüfbericht IB-13-8-085: Verwendung des BFM® Materials Seeflex 040AS bei gasexplosionsfähiger Atmosphäre und bei hybriden Gemischen im Inneren), IBExU Institut für Sicherheitstechnik GmbH, Freiberg, 07.08.2017

[7] TRBS 2153: Technische Regeln für Betriebssicherheit - Vermeidung von Zündgefahren infolge elektrostatischer Aufladungen, Februar 2009

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[10] Technical Specification IEC/TS 60079-32-1: Explosive atmospheres – Part 32-1: Electrostatic hazards, guidance, Edition 1.0, 2013-08, https://webstore.iec.ch/

[11] EN 13463-1:2009: Non-electrical equipment for use in potentially explosive atmospheres – Part 1: Basic method and requirements (DIN EN 13463-1:2009-07: Nichtelektrische Geräte für den Einsatz in explosionsgefährdeten Bereichen, Teil 1: Grundlagen und Anforderungen, Deutsche Fassung EN 13463-1:2009)

[12] EN ISO 80079-36:2016: Explosive atmospheres - Part 36: Non-electrical equipment for explosive atmospheres - Basic method and requirements (ISO 80079-36:2016) [DIN EN ISO 80079-36:2016-12: Explosionsfähige Atmosphären - Teil 36: Nichtelektrische Geräte für den Einsatz in explosionsfähigen Atmosphären - Grundlagen und Anforderungen (ISO 80079-36:2016); Deutsche Fassung EN ISO 80079-36:2016]

[13] IEC 60093:1980: Methods of test for insulating materials for electrical purposes; Volume resistivity and surface resistivity of solid electrical insulating, HD 429 S1:1983 [DIN IEC 60093 (VDE 0303-30):1993-12: Prüfverfahren für Elektroisolierstoffe; Spezifischer Durchgangswiderstand und spezifischer Oberflächenwiderstand von festen, elektrisch isolierenden Werkstoffen (IEC 60093:1980); Deutsche Fassung HD 429 S1:1983]

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[15] IEC 60079-32-2:2015: Explosive atmospheres - Part 32-2: Electrostatics hazards - Tests, https://webstore.iec.ch/ [DIN EN 60079-32-2 (VDE 0170-32-2):2015: Explosionsgefährdete Bereiche – Teil 32-2: Elektrostatische Gefährdungen – Prüfverfahren (IEC 60079-32-2:2015); Deutsche Fassung EN 60079-32-2:2015]

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[17] U. v. Pidoll: Bewertung der Zündfähigkeit elektrostatischer Entladungen
VII Fachtagung: Maßnahmen des Brand- und Explosionsschutzes – Mittel zur Anlagen- und Arbeitssicherheit, Merseburg, 24.09.2003

Properties of BFM® connectors (diameter up to 1650 mm) and ranges of application in hazardous zones

BFM® connector			Seeflex 020E	Seeflex 040E	Seeflex 040AS	Seeflex 060ES	LM3	LM4	Teflex	Teflex NP
Material			Ether based thermoplastic polyurethane	Ether based thermoplastic polyurethane	Ether based thermoplastic polyurethane with antistatic infusion	Ether based thermoplastic polyurethane with a polyester scrim	100% woven polypropylene	100% woven polyester	100% woven Teflon PTFE	100% Teflon PTFE
Thickness			0.35 mm	0.9 mm	0.9 mm	1.3 mm	0.5 mm	0.5 mm	0.5 mm	0.23 mm
Surface resistance [1]			$2.0 \cdot 10^{11}\ \Omega$	$2.0 \cdot 10^{11}\ \Omega$	$1.6 \cdot 10^{9}\ \Omega$	$8.1 \cdot 10^{12}\ \Omega$	$3.1 \cdot 10^{11}\ \Omega$	$2.5 \cdot 10^{10}\ \Omega$	$> 10^{14}\ \Omega$	$9.0 \cdot 10^{4}\ \Omega$
Transferred charge [2]			< 60 nC	< 60 nC	n. r. [3]	> 60 nC	No charges measurable	n. r. [3]	> 60 nC	n. r. [3]
Dust zone / Gas zone / Explosion Group [7]			Use of BFM® connectors **without** strongly charge-generating processes [4]							
20, 21, 22 (without Gas)			yes	yes	yes	yes	yes	yes	yes	yes
20, 21, 22	0	IIA o.I	100 cm² [6]	100 cm² [6]	yes	100 cm² [6]	yes	yes	100 cm² [6]	yes
		IIB	50 cm² [6]	50 cm² [6]	yes	50 cm² [6]	yes	yes	50 cm² [6]	yes
		IIC	8 cm² [6]	8 cm² [6]	yes	8 cm² [6]	yes	yes	8 cm² [6]	yes
20, 21	1	IIA o.I	yes	yes	yes	100 cm² [6]	yes	yes	100 cm² [6]	yes
		IIB	50 cm² [6]	50 cm² [6]	yes	50 cm² [6]	yes	yes	50 cm² [6]	yes
		IIC	8 cm² [6]	8 cm² [6]	yes	8 cm² [6]	yes	yes	8 cm² [6]	yes
22	1	IIA o.I	yes	yes	yes	200 cm² [6]	yes	yes	200 cm² [6]	yes
		IIB	200 cm² [6]	200 cm² [6]	yes	200 cm² [6]	yes	yes	200 cm² [6]	yes
		IIC	40 cm² [6]	40 cm² [6]	yes	40 cm² [6]	yes	yes	40 cm² [6]	yes

BFM® connector			Seeflex 020E	Seeflex 040E	Seeflex 040AS	Seeflex 060ES	LM3	LM4	Teflex	Teflex NP
20, 21	2	IIA o.I	yes	yes	yes	200 cm² [6]	yes	yes	200 cm² [6]	yes
		IIB	200 cm² [6]	200 cm² [6]	yes	200 cm² [6]	yes	yes	200 cm² [6]	yes
		IIC	40 cm² [6]	40 cm² [6]	yes	40 cm² [6]	yes	yes	40 cm² [6]	yes
22	2	IIA o.I	yes	yes	yes	yes	yes	yes	yes	yes
		IIB	yes	yes	yes	yes	yes	yes	yes	yes
		IIC	yes	yes	yes	yes	yes	yes	yes	yes
			Use of BFM® connectors **with** strongly charge-generating processes [4]							
20, 21, 22 (without Gas)			yes up to 20 cm length [5]	yes up to 20 cm length [5]	yes up to 20 cm length [5]	no	yes up to 20 cm length [5]	yes up to 20 cm length [5]	no	yes
20, 21, 22	0, 1, 2	IIA o.I	no	no	yes up to 20 cm length [5]	no	no	yes up to 20 cm length [5]	no	yes
		IIB	no	no		no	no		no	yes
		IIC	no	no		no	no		no	yes

Explanations:

1) Surface resistance according to IEC 60079-32-2:2015 determined at 500 V and a relative humidity in the range of 25-30 %
2) Maximum value of the transferred charge according to IEC 60079-32-2:2015 determined at a relative humidity in the range of 25-30 %
3) n. r. = not relevant, as dissipative material (dissipative)
4) Strongly charge-generating processes, here especially: pneumatic transport and free fall > 3 m
5) Can be used if no dust with a high (> 10^{10} Ω·m) resistivity is transported and very dry transport air with a relative humidity < 25 % is avoided
6) Permissible maximum projected BFM surface area: corresponds to the arithmetic product of diameter and length of the BFM® connector
7) Dust zone / gas zone as well as hybrid mixture possible both inside and outside (zone 0 or 20 in the outside area, however, is not usual) / explosion group for gases (subdivision into dust groups not necessary, as information applies to all dust groups IIIA, IIIB and IIIC)

Notes:

- *In the case of electrically insulating BFM materials, the flexible material before the spring steel ring shall not be worn to such an extent that the spring steel ring is completely or partially uncovered. If this cannot be made sure, these BFM® connectors may not be used for flammable gases and only for dusts with Minimum Ignition Energy > 10 mJ.*
- *When transporting dusts / bulk solids in the presence of flammable gases / vapours, the choice of suitable BFM® connectors can prevent ignitable discharges from the BFM® connectors, but not discharges from the transported product.*
- *High charges are also possible when transporting non-explosive bulk solids, which can then lead to ignition of flammable gases / vapours. In the presence of a gas zone and non-explosive bulk solids, the requirements of the above table must therefore be applied correspondingly.*

Report
IB-18-8-0083/2
about non-standard BFM® connectors
for use in potentially explosive atmospheres

Freiberg, 28.03.2019
jl/ah/mh

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This document consists of: 10 pages text

Contents

Report
IB-18-8-0083/2
about non-standard BFM® connectors
for use in potentially explosive atmospheres

1. Order

1.1	Customer:	BFM Global Limited, NZ-0749 Beach Haven, Auckland, New Zealand
1.2	Purchase order:	No. 300938 of 09.11.2018
1.3	Supplier:	IBExU Institut für Sicherheitstechnik GmbH, Freiberg, Germany

2. Origination, test procedure

The Test Report IB-18-8-0083/1 [1] describes the electrostatic testing of 4 BFM® standard connectors (Seeflex 060ES, LM3, Teflex and Teflex NP) and includes a summary of the test results for 4 other BFM® standard connectors (Seeflex 020E, Seeflex 040E, Seeflex 040AS and LM4), which have already been tested within the scope of individual reports. The test report IB-18-8-0083/1 [1] includes also the conclusions for the use of these BFM® standard connectors in explosive atmospheres, including an evaluation according to the current regulations / standards.

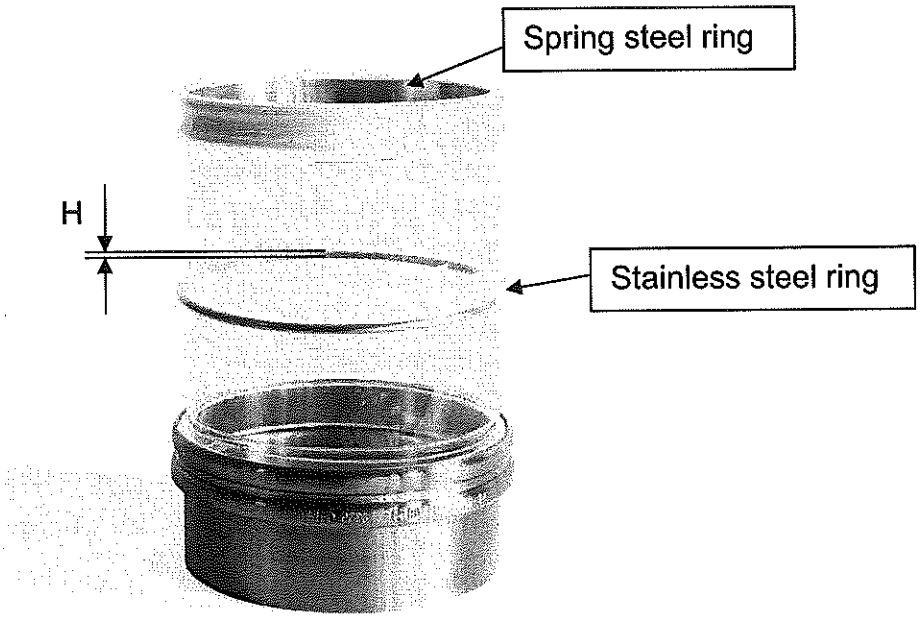
The testing and evaluation of the explosion protection aspects of various non-standard BFM® connectors have been carried out and documented in the Reports IB-16-8-071/1 [2] and IB-17-8-0027/1 [3]. The report at hand summarizes the relevant test results of these non-standard BFM® connectors and assesses them according to the current regulations / standards. The new BFM® standard connectors examined in [1] are included as well.

3. Assessment of the non-standard BFM® connectors

3.1 BFM® connectors with stainless steel rings embedded in the material

3.1.1 Design / geometry of the stainless steel rings

The BFM® connectors Seeflex 020E, Seeflex 040E, Seeflex 040AS, LM3, LM4 and Teflex can be equipped with stainless steel rings. These rings are completely embedded in the respective plastic material (see picture 1). There can be 1 to 10 rings in different dimensions and different spaces between the rings for BFM® connectors with diameters up to 500 mm.



Picture 1: BFM® connector with stainless steel ring

Each stainless steel ring represents an insulated electrical capacitance. Because these stainless steel rings are located in the free space between the connection points on the BFM® connectors, it can be assumed that the stainless steel rings have a lower electrical capacitance than the spring steel rings located at the ends (assumption: same area dimensions of the stainless steel rings and spring steel rings). However, due to the greater distance of the stainless steel rings from the clamping location of the BFM® connectors, any existing charges can worse dissipate to earth via the respective plastic material.

The following assessments of the usability of stainless steel rings apply to the following geometric dimensions / conditions:

- Dimension H (see picture 1) of the stainless steel rings should be limited as follows:
  - Diameter of BFM® connectors: < 200 mm: → H ≤ 25 mm
  - Diameter of BFM® connectors: ≥ 200 mm - ≤ 500 mm: → H ≤ 12.5 mm
- The distance between the individual stainless steel rings must be so large that the stainless steel rings cannot touch each other.

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.

3.1.3 *Use of the stainless steel rings in gas-explosion-hazardous areas and for hybrid mixtures*

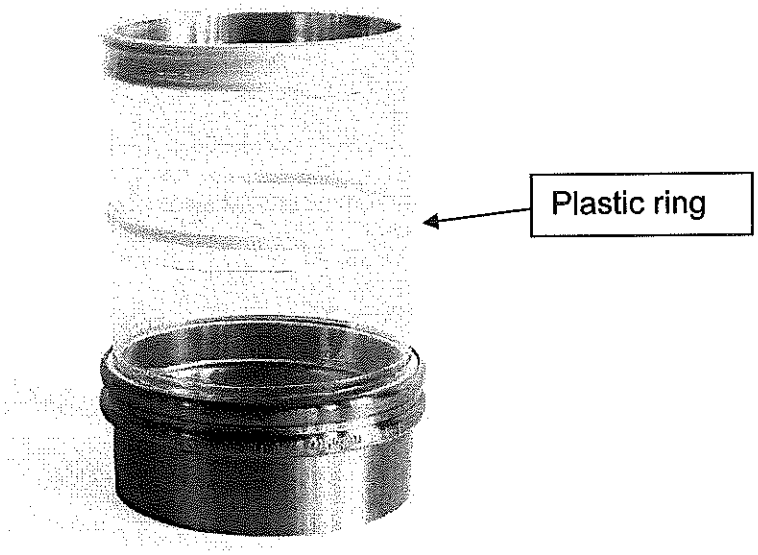
The following assessment results for internal and / or external gas-explosion-hazardous atmospheres and hybrid mixtures:

- - Zone 1 or 0: in general, use of stainless steel rings is not permitted

- Zone 2 without strongly charge-generating processes:
  - o Stainless steel rings are permitted for Seeflex 020E, Seeflex 040E and Seeflex 040AS; The plastic material layer around the stainless steel must not be worn to such an extent that the stainless steel ring is completely or partially uncovered.
  - o Use of stainless steel rings is not permitted for LM3, LM4 and Teflex
- Zone 2 with strongly charge-generating processes:
  in general, use of stainless steel rings is not permitted

3.2 BFM® connectors with plastic rings (nylon rods) embedded in the material

The plastic rings (nylon rods) of BFM® connectors are completely embedded in the respective plastic materials (see picture 2). There can be 1 to 10 rings in different dimensions and different spaces between the rings for BFM® connectors with diameters up to 1000 mm.



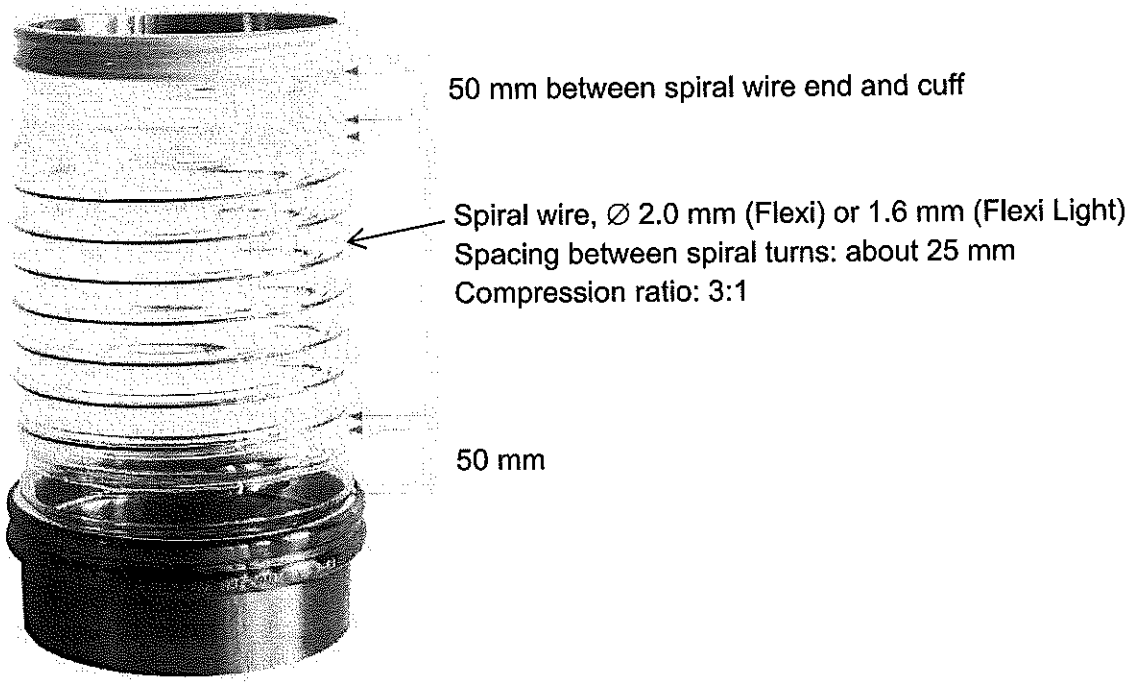
Picture 2: BFM® connector with plastic ring

Assessment: Nylon is usually electrically insulating and it therefore does not represent an electrical capacitance. Since the plastic rings are completely surrounded by Seeflex, LM3, LM4 or Teflex material, their resistance is not relevant. This means that there are no restrictions for use for these plastic rings.

3.3 BFM® Flexi- and Flexi Earthed-Connectors with spiral wire embedded in the material

3.3.1 *Design of the BFM® Flexi- and Flexi Earthed-Connectors*

The BFM® Flexi-Connector is provided with a thin spiral wire (corrosion-resistant steel) which is completely embedded in the plastic material (see picture 3). The plastic material consists of ether-based thermoplastic polyurethane and has a wall thickness of 0.6 mm (for diameters of 100-200 mm) or 0.7 mm (for diameters of 250-300 mm) [4] (variant Flexi Light with 0.4 mm wall thickness [5]). The wire length can vary and the diameter of the BFM® Flexi Connector is up to 300 mm. The spiral wire can be provided without (Flexi / Flexi Light) or with (Flexi-Earthed) earthing connections.



Picture 3: BFM® Flexi-Connector with spiral wire

3.3.2 *Assessment of the BFM® Flexi Earthed-Connectors*

In the case of BFM® Flexi Earthed-Connectors, the earthing connections on the two end points must be earthed (e.g. connection to the upstream and downstream BFM spigot, which effects potential bonding between the upstream and downstream apparatus). In this

case, there are no restrictions for use with regard to the spiral wire. The use of BFM® Flexi Earthed-Connectors is then restricted only by the plastic material, which is identical to the Seeflex 020E or Seeflex 040E BFM® connectors [1].

3.3.3 *Assessment of BFM® Flexi-Connectors (+ Flexi Light)*

Within the scope of the Report IB-17-8-0027/1 [3], the electrical capacitance of the spiral wires of 1 m long BFM® Flexi- / Flexi-Earthed Connectors with diameters of 100 mm, 200 mm and 300 mm has been measured. In addition, the leakage resistance between the spiral wire and the BFM spigot has been tested.
Without earthing of the spiral wire, the leakage resistance of the spiral wire is in the range of 10^{12} Ω [3]. The spiral wire thus represents an electrically insulated capacitance for the BFM® Flexi and Flexi Light Connectors, which can discharge by spark discharges.
According to the electrical capacitances measured in [3] and the estimated possible charging energies of the spiral wires, the following assessment of the use of the BFM® Flexi- and Flexi Light-Connectors results according to the current regulations / standards:

a) Dust explosion hazard at *not strongly charge-generating processes* (free fall with hose lengths up to 3 m): Use is permitted with the following restrictions:
   - Hose length up to 1 m: Minimum Ignition Energy of the dust > 10 mJ
   - Hose length > 1 m up to 3 m: Minimum Ignition Energy of the dust > 30 mJ

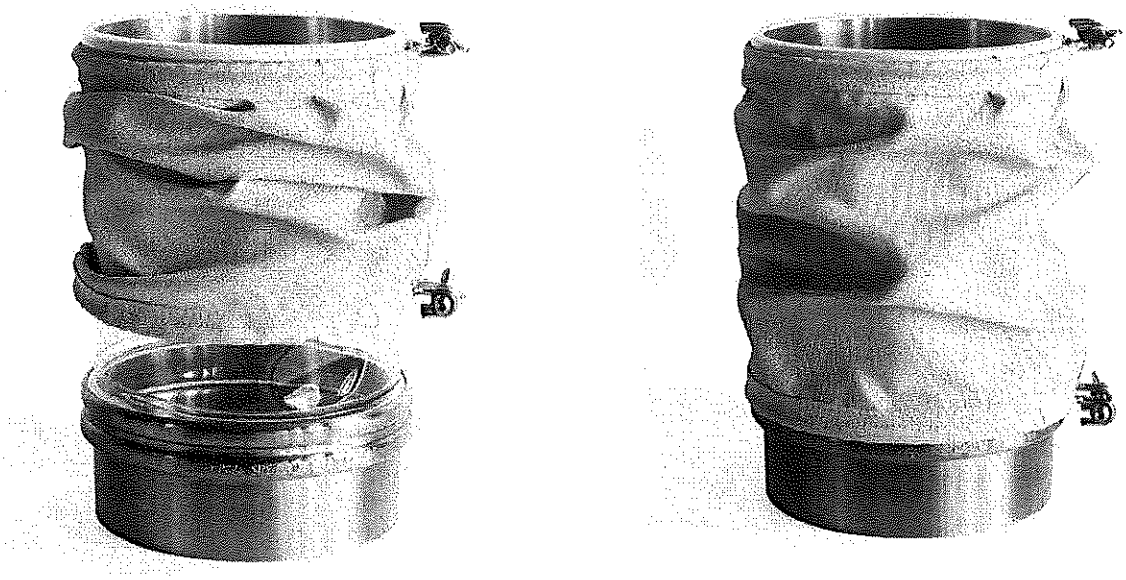
   (Minimum Ignition Energy values are valid for BFM® connectors with diameters up to 300 mm)

b) Dust explosion hazard at *strongly charge-generating processes* (pneumatic transport or free fall with hose lengths > 3 m): Use is only possible, if the following 3 conditions are fulfilled at the same time:
   - Max. length of the BFM® Flexi-Connector is 20 cm
   - No transport of dusts with high (> 10^{10} Ω·m) resistivity
   - No use of very dry transport air with rel. humidity < 25 %

c) Gas explosion hazard: use is not permitted

3.4 Kevlar cover over the BFM® standard connectors

For enclosing with woven Kevlar [6], the assessment in [2] remains valid:
Kevlar (aromatic polyamide: aramide) is an electrically insulating material. From a safety-related point of view, there are no restrictions for the use of Kevlar as a cover in explosive dust atmospheres. However, picture 4 shows metallic rings / connectors at the two ends of the Kevlar cover. These should be earthed or included in the equipotential bonding. Otherwise, restrictions for use in external potentially explosive zones would be necessary in accordance with the respective electrical capacitance (measurements would be necessary for this purpose).



Picture 4: Kevlar cover over BFM® standard connector

For use of Kevlar covers in a gas zone outside, additional tests and measurements for chargeability / hazardous discharges at the Kevlar would be required or the maximum permissible surface area of the Kevlar covers would have to be limited according to the gas zone and explosion group as per Table 3 in [7] / Table 1a in [8].

4. Bibliography

[1] Test Report IB-18-8-0083/1 about the electrostatic properties of BFM® standard connectors and their use in potentially explosive atmospheres (Prüfbericht IB-18-8-0083/1 über elektrostatische Eigenschaften von BFM® Standard-Verbindungen sowie zu deren Einsatz in explosionsgefährdeten Bereichen), IBExU Institut für Sicherheitstechnik GmbH, Freiberg, 21.03.2019

[2] Report IB-16-8-071/1 about modifications to BFM® Connectors in regard to a use in potentially explosive atmospheres (Bericht IB-16-8-071/1 zu Modifikationen an BFM® Verbindungen hinsichtlich des Einsatzes in explosionsgefährdeten Bereichen), IBExU Institut für Sicherheitstechnik GmbH, Freiberg, 27.07.2016

[3] Report IB-17-8-0027/1 about BFM® Flexi Connectors with spiral wire in regard to a use in potentially explosive atmospheres (Bericht IB-17-8-0027/1 zu BFM® Flexi-Verbindungen mit Spiraldraht hinsichtlich des Einsatzes in explosionsgefährdeten Bereichen), IBExU Institut für Sicherheitstechnik GmbH, Freiberg, 02.11.2017

[4] BFM Global Limited: Product spec sheet: Flexi Connector, October 2017

[5] BFM Global Limited / WALTER Gerätebau GmbH: Technisches Datenblatt: BFM® Flexi Light Verbindung, 04.09.2017

[6] BFM Global Limited: Product spec sheet: Kevlar Cover, March 2017

[7] IEC/TS 60079-32-1: Explosive atmospheres – Part 32-1: Electrostatic hazards, guidance, Edition 1.0, 2013-08, https://webstore.iec.ch/

[8] TRGS 727: Technische Regeln für Gefahrstoffe - Vermeidung von Zündgefahren infolge elektrostatischer Aufladungen (bisherige BGR 132 / TRBS 2153), Ausgabe: Januar 2016, Fassung 12.04.2016, GBMI 2016 S. 256-314 [Nr. 12-17] (v. 26.04.2016)

Health Canada | Santé Canada

Health Products and Food Branch | Direction générale des produits de santé et des aliments

Bureau of Chemical Safety
Food Directorate, Health Canada
251 Sir Frederick Banting Drwy
Postal Locator: 2201C
Ottawa, Ontario, K1A 0K9, Canada

April 28, 2014

Our file: KP12101901
X-ref: KS12091702

Miles Henderson
BFM Global Ltd.
milesh@bfmfitting.com

Dear Mr. Henderson:

RE: Seeflex 040E

This is in response to your e-mail of March 27, 2014 and April 9, 2014, wherein you asked about the status of the subject product for use in food contact applications.

The subject product is intended to be used as a flexible connector, which will be used at the maximum temperature of 50°C in food processing in direct contact with any dry food only such as milk powder, wheat flour, cocoa, sugar, etc. The contact time of the subject connector with food will be few seconds at most.

Based on the information submitted, we see no reason to object to the use of the subject product as proposed, provided that it is technically suitable for the intended end-uses.

It should be noted that the Canadian Food Inspection Agency (CFIA) will be advised of our comments by copy of this letter.

We trust that the foregoing will be of use to you.

Yours truly,

Elena Emelianova, Ph.D.
Scientific Evaluator
Food Packaging Materials and
Incidental Additives Section
Chemical Health Hazard Assessment Division

cc Canadian Food Inspection Agency (**CFIA**), reflist@inspection.gc.ca

BFMfitting

STATEMENT OF COMPLIANCE

BFM GLOBAL LTD
P O Box 66-087
Beachhaven,
Auckland 0749
New Zealand

24 MARCH 2016

FDA Food Contact Compliance Statement:

FM1 - Polyester Needlefelt

NOTE: This statement is made on the information provided to us by the material supplier and corresponds with our actual knowledge. BFM® fitting uses the FM1 fibre to manufacture our FM1 breather bags, however, we cannot guarantee the suitability of the material for any given application and assume no liability in connection with the information provided below.

FM1 is a 100% polyester fibre which meets with the compositional requirements of the following FDA regulations for Indirect Food Additives: Polymers, intended to come into contact with food:

FDA CFR21, Part 177

This applies to all dry food and powder product.

SIGNED ON BEHALF OF BFM GLOBAL LTD

MILES HENDERSON
COMPLIANCE OFFICER

BFM® GLOBAL LTD
P O Box 66-087
Beachhaven,
Auckland 0749
New Zealand

Declaration of Compliance:

In Accordance with EU Regulations 2014/34/EU
Equipment for use in Potentially Explosive Atmospheres

ISSUED BY:	BFM® Global Limited PO Box 66-087 Beachaven 0749 Auckland New Zealand
ISSUED ON:	12 December 2019
FOR THE FOLLOWING PRODUCT:	BFM® fitting, comprising of BFM® spigot and BFM® connector. The BFM® connector materials are set out in the table on page 2.
MANUFACTURED BY:	BFM® Global Limited PO Box 66-087 Beachaven 0749 Auckland New Zealand
CONFIRMATION:	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.

1. Report 1B-10-8-058 August 2010 – Tested the BFM® concept and LM4 material
2. Report 1B-12-8-052 July 2012 – Tested Seeflex 040E
3. Report 1B-13-8-029 March 2013 – Tested Seeflex 020E and Longer Length Connectors
4. Report 1B-13-8-085 August 2013 – Tested Seeflex 040AS
5. Report 1B-15-8-038 May 2015 – Tested Seeflex 020E, with a lesser wall thickness
6. Report 1B-16-8-071 June 2016 - Tested modifications to BFM® Connectors
7. Report 1B-17-8-0027 June 2017 - Tested Flexi & Flexi Earthed
8. Report IB-18-8-0083/1 March 2019 - Tested Seeflex 060ES, LM3, Teflex, Teflex NP and updated assessments to current standard
9. Report IB-18-8-0083/2 March 2019 - Tested Non-Standard BFM®s - SS and PE rings, Flexi & Flexi Earthed, Kevlar Covers

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.

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 ie. those dusts that need no oxygen from the surrounding air for an explosion, such as gun powder,

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 ***without rings***)								
		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 permissable for connector material 040AS ONLY!)*	2a = 3m 2b = Zone 1/22 & 2/20,21 - 200cm² *(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 permissable)*		200mm		200mm			6m		

PROCESS TYPE	EXPLOSION ZONE:	MAXIMUM POSSIBLE TOTAL LENGTH* (of non-conductive, un-earthed pipework including BFM® Connectors ***with rings***)									
		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 permissable for connector material 040AS ONLY!)*	Zone 2 only = 3m	2a = 3m 2b = Zone 1/22 & 2/20,21 - 200cm² *(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.*

TABLE KEY:

Restrictions apply - contact us for details | Not recommended due to restrictions - contact us for details | Not Suitable

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 (< 10^5 Ω·m) or middle (< 10^{10} Ω·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 $1.6 \cdot 10^9$ Ω or $2.5 \cdot 10^{10}$ Ω are dissipative. However, even with these BFM® connectors, an exceeding of the leakage resistance of < 10^8 Ω 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} Ω·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 [1] for Explosion Group		
		II A (or I)	II B	II C
Seeflex 040AS, LM3, LM4 and Teflex NP				
0, 1, 2	20, 21, 22	No restrictions [3]		

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 IBExU 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 IBExU 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. Relavant section from report IB-18-8-0083/1 is pasted below.

Seeflex 060ES and Teflex				
0	20, 21, 22	100 cm²	50 cm² [2]	8 cm² [2]
1	20, 21	100 cm²	50 cm² [2]	8 cm² [2]
	22	200 cm²	200 cm²	40 cm² [2]
2	20 oder 21	200 cm²	200 cm²	40 cm² [2]
	22	No restrictions [3]		

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

BFMfitting

DECLARATION OF COMPLIANCE

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

Addition
IB-13-8-029
to the Test Reports IB-10-8-058 and IB-12-8-052:
BFM® connectors of Seeflex 020 and Seeflex 020E
as well as larger hose lengths

- Translation -

Freiberg, 11 March 2013
Luc/Leh

Dipl.-Ing. Joachim Lucas
Editor

Dipl.-Ing. Alexander Henker
Editor

This document consists of: 4 pages text

Addition

IB-13-8-029

to the Test Reports IB-10-8-058 and IB-12-8-052:
BFM® connectors of Seeflex 020 and Seeflex 020E
as well as larger hose lengths

(Translation)

1 Order / Background

Within the scope of the Test Reports IB-10-8-058 [1] and IB-12-8-052 [2] the BFM® connectors of the company BFM Global Ltd, Beach Haven 0749, Auckland, New Zealand were assessed regarding their suitability at the free fall of explosible dusts through these connectors. The presence of a possible explosive gas atmosphere has also been taken into account.

The tested plastic materials Seeflex 040 and Seeflex 040E of the BFM® connectors have a wall thickness of 1 mm each. The connectors shall be produced in future also from the materials Seeflex 020 and Seeflex 020E. These materials are chemically identical with the aforementioned Seeflex materials, but they have a wall thickness of only 0.5 mm.

In addition, it is intended to use also larger hose lengths than the tested standard length of 200 mm.

BFM Global Ltd. has commissioned the IBExU Institut für Sicherheitstechnik GmbH, Freiberg, Germany, with a corresponding assessment.

2 Safety technical assessment

2.1 Reduced wall thickness of 0.5 mm at Seeflex 020 and Seeflex 020E

The half wall thickness of Seeflex 020 and Seeflex 020E does not cause any significant changes in the electrostatic behaviour of the BFM® connectors in comparison with the materials Seeflex 040 and Seeflex 040E. From the view of the explosion protection the BFM® connectors made of Seeflex 020 and Seeflex 020E can be used in explosive atmospheres, but the analogous conditions / criteria for Seeflex 040 in [1] and Seeflex 040E in [2], respectively, have to be applied.

2.2 Larger hose lengths

At the pneumatic transport [3] and also at the free fall of dusts an increasing charging of the hoses at increasing distance from the spigot (flange) has to be expected with an increasing hose length of the homogeneous hose materials.
Because the BFM® connectors made of Seeflex 040, Seeflex 400W and Seeflex 040 examined in [1] and [2] as well as the BFM® connectors made of Seeflex 020 and Seeflex 020E show resistances which lie only insignificantly about the limiting value of a dissipative material and because the material LM4 is still dissipative [1], these materials can be used in explosive dust atmosphere up to a hose length of maximum 1 m at the free fall (Up to this length additional tests are not necessary.). Particularly at dusts with very high resistances and at a very dry atmosphere (air) the risk of dangerous charging increases with an increasing hose length.
BFM® connectors with a length up to 1 m can also be used at the free fall at an outer explosive gas atmosphere of the zone 1 and 2 in the case of the material LM4 as well as zone 2 in the case of the other materials. The length of the BFM® connectors has to be limited on the standard length of 200 mm at the use in zone 1 in the outside area, except the material LM4. It has to be pointed out that the same area criteria of the standard length also apply to an increased hose length (see table 6 in [1] or table 2 in [2]). At the BFM® connectors made of Seeflex 020 the respective criteria which applies to Seeflex 040 [1] have to be considered (analogous: Seeflex 020E → Seeflex 040E [2]).

2.3 Note, validity

The here evaluated and in [1] and [2] contained results apply to the free fall of explosible dust through BFM® connectors. BFM® connectors with a standard length up to 200 mm can also be used for the pneumatic transport, presupposed that no explosive gas atmosphere is then present (exception: material LM4 with explosive gas atmosphere in the outside area according to table 6 in [1]).

Particularly at larger hose lengths (see chapter 2.2) the test results are not transferable to a pneumatic dust transport at which considerably higher charging can arise.

Literature:

[1] Test Report IB-10-8-058 about the electrostatical properties of the BFM® connectors Seeflex 040, Seeflex 400W and LM4 and their use in potentially explosive areas,
IBExU Institut für Sicherheitstechnik GmbH, Freiberg, 08 October 2010

[2] Test Report IB-12-8-052 about the electrostatic properties of the BFM® material Seeflex 040 E and its use in potentially explosive areas,
IBExU Institut für Sicherheitstechnik GmbH, Freiberg, 24 July 2012

[3] Blum, C., M. Glor, C.-D. Walther und W. Fath: Elektrostatische Zündgefahren beim pneumatischen Transport brennbarer Stäube durch isolierende oder ableitfähige Rohre und Schlauchleitungen,
VDI-Berichte Nr. 2182, S. 163-170, Düsseldorf: VDI-Verlag 2012

IBExU Institut für Sicherheitstechnik GmbH
An-Institut der Technischen Universität Bergakademie Freiberg

Test Report

IB-12-8-052

about the electrostatic properties of the BFM® material Seeflex 040E and its use in potentially explosive areas

(Translation)

Freiberg, 24 July 2012
Luc/Leh

Dipl.-Ing. Joachim Lucas
Editor

This document consists of: 6 pages text

Test Report

IB-12-8-052

about the electrostatic properties of the BFM® material Seeflex 040E and its use in potentially explosive areas

(Translation)

1 Order

1.1	Customer:	BFM Global Ltd, Beach Haven 0749, Auckland, New Zealand
1.2	Supplier:	IBExU Institut für Sicherheitstechnik GmbH, Freiberg, Germany

1.3 Delivery of the test sample: 31 May 2012

2 Test object, origination

In the scope of the Report IB-10-8-058 [1] BFM® connectors of 3 different flexible materials (Seeflex 040, Seeflex 400W and LM4) were examined for the BFM Global Ltd in Auckland (New Zealand) with regard to the electrostatic behaviour.

The following material sample was delivered for the examination which was carried out here:

- BFM® material Seeflex 040E (clear ether based thermoplastic polyurethane alloy): material sample of 16 cm x 17 cm, thickness = 1 mm

3 Execution of the tests and test results

3.1 Measuring conditions

The measuring was carried out in a conditioned room with the following parameters:

- Test temperature: 25 - 26 °C
- Relative humidity: 26 - 29 %
- Before the tests: storage of the material sample for at least 24 hours under the mentioned conditions

3.2 Surface resistance and volume resistivity

Test standards:	IEC 93:1993, IEC 167:1993
Measuring instrument:	Tera Ohm-Meter F-H12.020 of company Knick Elektronische Messgeräte GmbH & Co. KG (test instrument no.: 0209)

3.2.1 *Surface resistance*

Test electrode:	parallel electrodes according to IEC 167
Electrode length l:	10 cm
Electrode distance a:	1 cm

Measuring results at an instrument voltage of 500 V:

Surface resistance:	$2.0 \cdot 10^{11}\ \Omega$
Surface resistivity:	$2.0 \cdot 10^{12}\ \Omega$

3.2.2 *Volume resistivity*

Test electrode:	circular electrode
Electrode surface:	20 cm²

Volume resistivity at

Instrument voltage = 100 V:	$5.8 \cdot 10^{11}\ \Omega \cdot m$
Instrument voltage = 500 V:	$1.2 \cdot 10^{11}\ \Omega \cdot m$

3.3 Test with respect to the electrostatic charge / dangerous discharges

Test standard: EN 13463-1, Annex D: „Charging tests with non conductive materials"

Measuring instruments: Electrostatic voltmeter C 196 (former UdSSR), (test instrument no.: 0003)
Coulombmeter HMG 11/02 of company SCHNIER Elektrostatik GmbH (test instrument no.: 0462)

Test execution:

There are three different methods for charging:

- Charging with a DC high voltage power supply (U ≥ 30 kV)
- Rubbing with a pure polyamide cloth
- Rubbing with a cotton cloth

After each charging of the material sample, the charge from a typical discharge is measured. This is done by discharging the material sample by slowly approaching a spherical electrode until a discharge occurs.

Table 1: Results of the tests of a material sample (16 cm x 17 cm) Seeflex 040E

Methods for charging		Rubbing with a cotton cloth	Rubbing with a polyamide cloth	DC high voltage power supply
Charge Q in nC per individual test	Front side of the material sample	no measurable charges	no measurable charges	25, 27, 36, 37, 29, 26, 37, 32, 26, 30
	Rear side of the material sample	33, 35, 41, 51, 44, 41, 42, 41, 31, 32	27, 13, 13, < 5, < 5, 41, 15, 23, 11, 40	37, 47, 33, 56, 37, 29, 41, 43, 42, 37

4 Assessment of the measuring results

It was noticed with the determined surface resistance and the volume resistivity that Seeflex 040E is a non-conductive material [2, 3].

When rubbing with cotton cloth resp. polyamide cloth in the scope of the test for the electrostatic charge / dangerous discharges according to chapter 3.3 measurable discharges arose only on one side of the material sample although the surface resistance of the two sides was almost identical.

In accordance with the results in Table 1 and [1] the tested BFM® Material Seeflex 040E can be used without restrictions in all dust explosion hazardous areas (dust explosion hazardous zones are possible both inside and outside of the BFM® connector), if the mechanical design of the BFM® connector is as per [1].

Corresponding restrictions respectively limitations of the surfaces of the BFM® connectors are partly required at the presence of an outer gas explosion hazardous area of the zone 1 respectively 2 (see table 2; outer zone 0 is not considered because it is normally not present there). The limitations of the surfaces deduced from [4] were doubled since the BFM® connectors are surrounded from 2 sides with earthed metal [5].

Table 2: Maximum permissible dimensions of BFM® connectors of Seeflex 040E at an outer gas explosion hazardous zone

Zone outside	Zone inside and/or outside	Permissible surface of the BFM[1] at Explosion Group		
		II A	II B	II C
1	20 or 21	no restrictions [4]	not applicable [2]	not applicable [2]
	22	no restrictions [4]	200 cm² [3]	not applicable [2]
2	20 or 21	no restrictions [4]	200 cm² [3]	not applicable [2]
	22	no restrictions [4]		

Notes:

[1] Permissible surface of the BFM corresponds to the product of diameter x length of the BFM® connector

[2] BFM® connectors are not applicable since the surface criterion is already exceeded at the smallest available connector

[3] BFM® connectors are applicable for example at ∅ 100 mm and a length of max. 200 mm

[4] Restrictions of the surface of the BFM® connector are not required (see test results in table 1)

Literature:

[1] Test Report IB-10-8-058 about the electrostatical properties of the BFM® connectors Seeflex 040, Seeflex 400W and LM4 and their use in potentially explosive areas,
IBExU Institut für Sicherheitstechnik GmbH, Freiberg, 08 October 2010

[2] TRBS 2153: Technische Regeln für Betriebssicherheit - Vermeidung von Zündgefahren infolge elektrostatischer Aufladungen, Februar 2009

[3] Technical Report CLC/TR 50404: Electrostatics – Code of practice for the avoidance of hazards due to static electricity, June 2003

[4] EN 13463-1:2009: Non-electrical equipment intended for use in potentially explosive atmospheres – Part 1: Basic method and requirements

[5] U. v. Pidoll: Bewertung der Zündfähigkeit elektrostatischer Entladungen
VII Fachtagung: Maßnahmen des Brand- und Explosionsschutzes – Mittel zur Anlagen- und Arbeitssicherheit, Merseburg, 24.09.2003

Test Report

IB-13-8-085

about the electrostatic properties of the BFM® material Seeflex 040AS and its use in potentially explosive areas

(Translation)

Freiberg, 11.09.2013
Luc/Leh

Dipl.-Ing. Joachim Lucas
Editor

This document consists of: 5 pages text

Test Report

IB-13-8-085

about the electrostatic properties of the BFM® material Seeflex 040AS and its use in potentially explosive areas

(Translation)

1 Order

1.1 Customer: BFM Global Ltd, Beach Haven 0749, Auckland, New Zealand

1.2 Supplier: IBExU Institut für Sicherheitstechnik GmbH, Freiberg, Germany

1.3 Delivery of the test sample: 21 August 2013

2 Test object, origination

In the scope of the Reports IB-10-8-058 [1] and IB-12-8-052 [2] as well as the Addition IB-13-8-029 [3] BFM® connectors of 4 different flexible materials (Seeflex 040, Seeflex 400W, LM4 and Seeflex 040E) were examined for the BFM Global Ltd in Auckland (New Zealand) with regard to the electrostatic behaviour.

The following material sample was delivered for the examination which was carried out here:

- BFM® material Seeflex 040AS (clear ether based thermoplastic polyurethane alloy with antistatic infusion): material sample of 30 cm x 20 cm, thickness = 1,1 mm

3 Execution of the tests and test results

3.1 Measuring conditions

The measuring was carried out in a conditioned room with the following parameters:

- Test temperature: 23 °C
- Relative humidity: 30 %

- Before the tests: storage of the material sample for at least 24 hours under the mentioned conditions

3.2 Surface resistance and volume resistivity

Test standards:	IEC 93:1993, IEC 167:1993
Measuring instrument:	Tera Ohm-Meter F-H12.020 of company Knick Elektronische Messgeräte GmbH & Co. KG (test instrument no.: 0209)

3.2.1 *Surface resistance*

Test electrode:	parallel electrodes according to IEC 167
Electrode length l:	10 cm
Electrode distance a:	1 cm

Measuring results at an instrument voltage of 500 V:

Surface resistance:	$1.6 \cdot 10^9\ \Omega$
Surface resistivity:	$1.6 \cdot 10^{10}\ \Omega$

3.2.2 *Volume resistivity*

Test electrode:	circular electrode
Electrode surface:	20 cm²

Volume resistivity at

Instrument voltage = 100 V:	$6.6 \cdot 10^8\ \Omega \cdot m$
Instrument voltage = 500 V:	$1.7 \cdot 10^8\ \Omega \cdot m$

4 Assessment of the measuring results

Seeflex 040AS is a dissipative material both with regard to the determined surface resistance and the volume resistivity. Dissipative substances and materials have a volume resistivity higher than 10^4 Ω·m but equal to or lower than 10^9 Ω·m, or a surface resistance between 10^4 Ω and 10^9 Ω (measured at 23 °C and 50 % relative humidity), or a surface resistance between 10^4 Ω and 10^{11} Ω (measured at 23 °C and 30 % relative humidity) [4, 5].

In accordance with the test results and [1] the tested BFM® Material Seeflex 040AS can be used without restrictions in all dust explosion hazardous areas (dust explosion hazardous zones are possible both inside and outside the BFM® connector), if the mechanical design of the BFM® connector is as per [1] (length of the BFM® connector: 200 mm).

BFM® connectors with a standard length up to 200 mm can also be used without restrictions in outer gas explosion hazardous areas of the zone 1 and 2, respectively (outer zone 0 is not considered because it is normally not present there).

The aforementioned conclusions apply both to the free fall of explosive dust through the BFM® connectors and to the pneumatic transport.

Larger hose lengths

At the pneumatic transport [6] and also at the free fall of dusts an increasing charging of the hoses at increasing distance from the spigot (flange) has to be anticipated with an increasing hose length of the homogeneous hose materials.

Because the material Seeflex 040AS is dissipative, but the resistances are still relatively high, this material can be used in explosive dust atmospheres up to a hose length of maximum 2 m in the free fall (Up to this length additional tests are not necessary.). Particularly at dusts with very high resistances and at a very dry atmosphere (air) the risk of dangerous charging increases with an increasing hose length.

In the case of the material Seeflex 040AS, BFM® connectors with a length up to 2 m can also be used at the free fall at an outer explosive gas atmosphere of the zone 1 and 2.

At the pneumatic dust transport at which considerably higher charging can arise the BFM® connectors made of Seeflex 040AS can be used only with a standard length up to 200 mm.

Literature:

[1] Test Report IB-10-8-058 about the electrostatical properties of the BFM® connectors Seeflex 040, Seeflex 400W and LM4 and their use in potentially explosive areas,
IBExU Institut für Sicherheitstechnik GmbH, Freiberg, 08 October 2010

[2] Test Report IB-12-8-052 about the electrostatic properties of the BFM® material Seeflex 040 E and its use in potentially explosive areas,
IBExU Institut für Sicherheitstechnik GmbH, Freiberg, 24 July 2012

[3] Addition IB-13-8-029 to the Test Reports IB-10-8-058 and IB-12-8-052: BFM® connectors of Seeflex 020 and Seeflex 020E as well as larger hose lengths
IBExU Institut für Sicherheitstechnik GmbH, Freiberg, 11 March 2013

[4] TRBS 2153: Technische Regeln für Betriebssicherheit - Vermeidung von Zündgefahren infolge elektrostatischer Aufladungen, Februar 2009

[5] Technical Report CLC/TR 50404: Electrostatics – Code of practice for the avoidance of hazards due to static electricity, June 2003

[6] Blum, C., M. Glor, C.-D. Walther und W. Fath: Elektrostatische Zündgefahren beim pneumatischen Transport brennbarer Stäube durch isolierende oder ableitfähige Rohre und Schlauchleitungen,
VDI-Berichte Nr. 2182, S. 163-170, Düsseldorf: VDI-Verlag 2012

ISSUE DATE: June 29, 2007 CERTIFICATE AUTHORIZATION NUMBER: 1437

THIS IS TO CERTIFY THAT

BFM Global Ltd.

PO Box 66087, Beach Haven, Auckland City 0749 , New Zealand

is hereby authorized to continue to apply the
3-A Symbol to the models of equipment, conforming to 3-A Sanitary Standards for:

Number 63-03
63-03 (Sanitary Fittings)

set forth below

Manual Cleaning Model Number(s): BFM fitting (BFM spigot and BFM connector)

VALID THROUGH: **December 31, 2019**

Timothy R. Rugh
Executive Director
3-A Sanitary Standards, Inc.

The issuance of this authorization for the use of the 3-A Symbol is based upon the voluntary certification, by the applicant for it, that the equipment listed above complies fully with the 3-A Sanitary Standard(s) designated. Legal responsibility for compliance is solely that of the holder of this Certificate of Authorization, and 3-A Sanitary Standards, Inc. does not warrant that the holder of an authorization at all times complies with the provisions of the said 3-A Sanitary Standards. This in no way affects the responsibility of 3-A Sanitary Standards, Inc. to take appropriate action in such cases in which evidence of nonconformance has been established.

NEXT TPV INSPECTION/REPORT DUE: **May 2023**

ISSUE DATE: October 20, 2008 CERTIFICATE AUTHORIZATION NUMBER: 1485

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20-27 (Multiple Use Plastic Materials)

set forth below

CIP Models: Seeflex 020E, Seeflex 040E, Seeflex 040AS, Seeflex 040E/Camlon, Seeflex 060ES, Seeflex Flexi, Seeflex Flexi Light

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NEXT TPV INSPECTION/REPORT DUE: **May 2023**

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Certification & Compliance

BFM® fitting have been independently tested and conform with the leading internationally recognised health and safety legislation.

The table below summarises the key certifications in place for our Seeflex range of products.

Many of our other products also conform to these important global standards - see the documents adjacent for a selection of these certifications. Contact your local BFM® Distributor (https://www.bfmfitting.com/distributors) or email us here (https://www.bfmfitting.com/contact) if you have any questions regarding the safety of our products.

Category		Certificate / Report *(Click to download)*:	Issued By:	For:	Applicable Country/ Region:	Seeflex 020E	Seeflex 040E	Seeflex 040AS
Explosion		BFM® ATEX Declaration of Compliance (/files/41)	BFM® Global Ltd	Use of BFM® fitting in potentially explosive environments.	EU	✓	✓	✓
Explosion		ATEX (IBExU Report) Seeflex 020E & Longer Lengths (/files/89)	IBExU Institute, Germany	The use of Seeflex 020E and other longer length connectors in potentially explosive areas.	EU	✓	✓	✓

Category		Certificate / Report *(Click to download)*:	Issued By:	For:	Applicable Country/ Region:	Seeflex 020E	Seeflex 040E	Seeflex 040AS
Explosion		ATEX (IBExU Report) Seeflex 040AS (/files/90)	IBExU Institute, Germany	Electrostatic properties and use in potentially explosive areas.	EU			✓
Explosion		ATEX (IBExU Report) Seeflex 040E (/files/91)	IBExU Institute, Germany	The use of Seeflex 040E in potentially explosive areas.	EU		✓	
Explosion & Food Safety		Third Party Declaration (/files/93)	Harold Wainess & Associates Inc.	Independent review of compliance testing for EU, 3A and Atex regulations.	ALL		✓	
Explosion & Food Safety		Seeflex Regulations (Summary) (/files/40)	BFM Global Ltd	Description of key relevant regulations applicable to Seeflex material (EC, FDA, USDA, 3A)	ALL	✓	✓	
Food Safety		3A Certificaton 20-27 (Multiple Use Plastic Materials) (/files/94)	3-A Sanitary Standards Inc, USA	Plastic used in Seeflex connectors as sanitary for use in food manufacturing.	USA	✓	✓	
Food Safety		3A Certificaton 63-03 (Sanitary Fittings) (/files/95)	3-A Sanitary Standards Inc, USA	BFM® fitting connector as sanitary for use in food manufacturing.	USA	✓	✓	✓
Food Safety		USDA Equipment Acceptance Certificate (/files/96)	USDA	Confirmation of acceptance of Seeflex for use in dairy processing applications.	USA	✓	✓	

Category		Certificate / Report *(Click to download)*:	Issued By:	For:	Applicable Country/ Region:	Seeflex 020E	Seeflex 040E	Seeflex 040AS
Food Safety		Letter of No Objection (/files/97)	Health Canada	Approval for the use of Seeflex 040E for use in food contact applications.	CANADA		✓	
Food Safety		Declaration of Compliance with EU Regulations 1935/2004 and 10/2011 (/files/42)	BFM® Global Ltd	Confirming compliance with EU Regulations regarding plastic materials and articles to come into contact with food.	EU	✓	✓	
Food Safety		Information on Food Grade Silicon (/files/44)	BFM® Global Ltd	Information on BFM®'s silicon seal in relation to FDA & BGA recommendations.	ALL	✓	✓	✓
Food Safety		Safety Declaration Seeflex Material (/files/43)	BFM® Global Ltd	Declaration regarding safety of Seeflex Material (eg. No Oleamides, Phthalates used in manufacturing, BSE/TSE etc.)	ALL	✓	✓	✓
Materials		Certificate of Compliance: Spigots Ra (/files/39)	BFM® Global Ltd	Declaration of Ra (average roughness) of BFM® Stainless Steel Spigots	ALL	N/A	N/A	N/A

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Related tags:

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Related Items

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Seeflex-060ES-Compliance-Declaration (https://www.bfmfitting.com/files/236) 65kb

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Seeflex-Leaching-TSE-BSE-Safety-Declaration (https://www.bfmfitting.com/files/43) 88kb

Seeflex-Regulations-Compliance (https://www.bfmfitting.com/files/40) 73kb

Silicon Seal Specification FDA (https://www.bfmfitting.com/files/44) 47kb

Spigots-Ra-Certificate-of-Compliance (https://www.bfmfitting.com/files/39) 483kb

USDA-Equipment-Acceptance-Certificate (https://www.bfmfitting.com/files/96) 119kb

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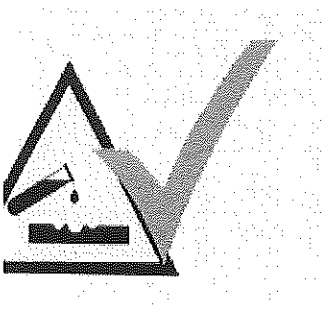

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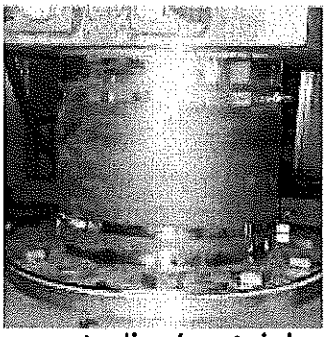

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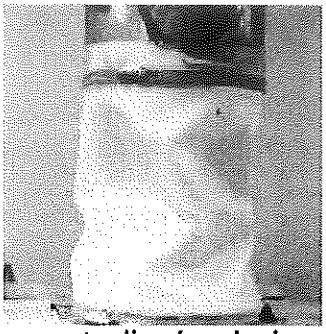

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Explosion Risk Reduction (Construction Additives)

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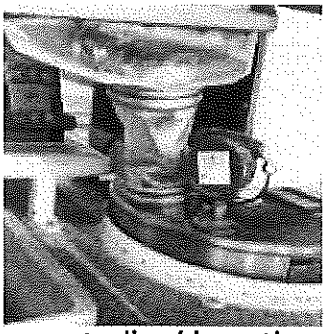

Bob's Red Mill Natural Foods Inc, USA, mills a range of flours, meals and cereals 2...

Downtime Reduction (Food)

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