



DEKRA Testing and  
Certification GmbH  
Standort Bochum

Explosionsschutz  
Elektrotechnik

Dinnendahlstraße 9  
44809 Bochum

**Prüfprotokoll - Test and Assessment Report  
Nachtrag 4 - Supplement 4**  
Umstellung auf die Richtlinie 2014/34/EU - *Change to Directive 2014/34/EU*  
**BVS PP 08.2118 EU**

**EU - Baumusterprüfung für Produkte  
zur Verwendung in explosionsgefährdeten Bereichen  
(Richtlinie 2014/34/EU)**

**EU - Type Examination for Products  
Intended for Use in Potentially Explosive Atmospheres  
(Directive 2014/34/EU)**



Gegenstand: Gerät Typ  
Subject: Equipment type

Hergestellt und zur Prüfung vorgelegt  
Manufactured and submitted for  
examination  
Anschrift  
Address

Prüfgrundlage  
Basis for verifications and tests

Verwendete Normen  
Standard basis

Prüfgrundlage für Sicherheits- und  
Gesundheitsanforderungen, die nicht von  
den verwendeten Normen abgedeckt  
werden.  
Basis for those health and safety  
requirements not covered by the standard  
basis

Kennzeichnung  
Marking

Antragsnummer / Jobnummer  
Project number / Job number

Schwingungswächter Typ ESW®-small-Ex....  
Vibration monitor type ESW®-small-Ex....

holthausen elektronik GmbH

Wevelinghoven 38, 41334 Nettetal

Anhang II der Richtlinie 2014/34/EU  
Annex II of Directive 2014/34/EU

EN IEC 60079-0:2018  
EN 60079-1:2014  
EN 60079-31:2014

Allgemeine Anforderungen General requirements  
Druckfeste Kapselung „d“ Flameproof enclosure “d”  
Schutz durch Gehäuse „t” Protection by enclosures “t”

Entfällt

Not relevant



II 2G Ex db IIC T4 up to T6 Gb  
II 2D Ex tb IIIC T80°C up to T115°C Db

A 20230327 / 343066200

## 1) Gegenstand und Typ

Schwingungswächter Typ ESW®-small-Ex....

Die Punkte in der Typenbezeichnung werden durch Kennziffern für die Materialausführung, die Gehäusegröße und die Position der Kabel- und Leitungseinführung ersetzt.

### **Subject and Type**

*Vibration monitor type ESW®-small-Ex....*

*The dots in the type reference will be replaced by numbers representing the material, the enclosure size and the position of the cable entry.*

## 2) Beschreibung

Der Schwingungswächter Typ ESW®-small-Ex.... ist in der Zündschutzart Druckfeste Kapselung „d“ und Schutz durch Gehäuse „t“ ausgeführt. Er ist für den Schutz von Maschinen vor unzulässiger Schwingung und für den Einsatz in durch brennbare Gase und Stäube gefährdete Bereiche bestimmt.

### **Grund des Nachtrags:**

- Umstellung auf die Richtlinie 2014/34/EU
- Aktualisierung des angewendeten Normenstandes
- Änderung der zulässigen Mindestumgebungstemperatur von -20 °C auf -60 °C

### **Description**

*The vibration monitor type ESW®-small-Ex... is manufactured to meet the requirements of the type of protection Flameproof Enclosure “d” and Protection by Enclosure “t”. It is intended to protect machines against non-permissible vibration and for the use in atmospheres where combustible gases or dusts are present.*

### **Reason for supplement**

- *Change to Directive 2014/34/EU*
- *Update of the used revision of the standards*
- *Change of the permitted minimum ambient temperature from -20 °C to -60 °C*

## 3) Dokumentation - **Descriptive Documents**

### **3.1 Neue Dokumentation - New documents**

3.1.1 Beschreibung (2 Seiten) - *Description (2 pages)*, unterschrieben am - *signed* 18.04.2023

3.1.2 Zeichnung Nr. - <i>Drawing No.</i>	vom - <i>dated</i>	unterschrieben am - <i>signed</i>
SMG1A Rev.1	14.04.2023	10.07.2023
SMG1B Rev.2	14.04.2023	10.07.2023
SMG2A Rev.1	17.04.2023	10.07.2023
SMG2B Rev.2	17.04.2023	11.07.2023
SMG2C Rev.2	17.04.2023	11.07.2023
SMG3A Rev.1	17.04.2023	11.07.2023
SMG3B Rev.1	17.04.2023	17.04.2023
SMG3C Rev.2	17.04.2023	11.07.2023
SMG4A Rev.1	18.04.2023	11.07.2023
SMG4B Rev.2	18.04.2023	11.07.2023

SMG4C Rev.2	18.04.2023	11.07.2023
SMD1 Rev.1	18.04.2023	18.04.2023
SMD2 Rev.1	18.04.2023	18.04.2023
SMD3 Rev.1	18.04.2023	18.04.2023

- 3.1.3 Technische Daten (1 Seite) – *Technical Data (1 page)*, unterschrieben am - *signed* 18.04.2023
- 3.1.4 Leistungstemperaturabhängigkeit (4 Seiten) – *Power-Temperature-dependency (4 pages)*, unterschrieben am - *signed* 14.06.2023
- 3.1.5 Auszug aus der Betriebsanleitung (5 Seiten) – *Extract from the Operation manual (5 pages)*, unterschrieben am - *signed* 18.04.2023
- 3.1.6 Typenschild Muster (1 Seite) – *Nameplate sample (1 page)*, unterschrieben am – *signed* 18.04.2023
- 3.1.7 Informationen zu den Aufklebern (1 Seite) – *Information about the stickers (1 page)*, unterschrieben am – *signed* 18.04.2023
- 3.1.8 Stückliste (1 Seite) – *Part list (1 page)*, unterschrieben am – *signed* 18.04.2023

**3.2 Weiterhin gültige Dokumentation – Documents which remain valid**

Aus BVS PP 08.2118 EG mit N1, N2 und N3 – *from BVS PP 08.2118 EC with N1, N2 and N3*  
Keine – *None*

**4) Kenngrößen**

4.1 Elektrische Kenngrößen

Bemessungsspannung	DC	24	V
Maximale Spannung	DC	30	V
Bemessungsleistung	bis	2.5	W
Stromstärke des Analogausganges	bis	20	mA
Spannung des potentialfreien Schaltkontaktes	bis	30	V
Stromstärke des potentialfreien Schaltkontaktes	bis	1	A

4.2 Temperaturklassenzuordnung

Untere Umgebungstemperatur -60 °C bis -20 °C

Die jeweilig ausgeführte untere Umgebungstemperatur wird in der Kennzeichnung des Gerätes angegeben und erfolgt in Verbindung mit der Auswahl einer geeigneten Kabel- und Leitungseinführung und eines geeigneten Kabels.

Obere Umgebungstemperatur Siehe Tabelle 4.3 "Obere Umgebungstemperatur / Upper ambient temperature"

## Parameters

### 4.1 Electrical parameters

Rated voltage	DC	24	V
Maximum voltage	DC	30	V
Rated power	up to	2.5	W
Current of analogue output	up to	20	mA
Voltage of potential-free switch contact	up to	30	V
Current of potential-free switch contact	up to	1	A

### 4.2 Temperature class allocation

Lower ambient temperature -60 °C up to -20 °C  
 The used lower ambient temperature will be included in the marking of the equipment and is related with a choice of an applicable cable entry and cable.

Upper ambient temperature See table 4.3 "Obere Umgebungstemperatur / Upper ambient temperature" below

### 4.3 Tabelle „Obere Umgebungstemperatur“ / table „Upper ambient temperature“

Gehäusegröße Typ	Maximale Verlustleistung	Obere Umgebungstemperatur	Temperaturklasse für Kategorie 2G	Temperaturangabe für Kategorie 2D	Mindesttemperaturbeständigkeit des Kabels	Mindesttemperaturbeständigkeit der Kabel- und Leitungseinführung
Enclosure size type	Maximum Power in W	Upper ambient temperature	Temperature-class for category 2G	Temperature-marking for category 2D	Necessary temperature for the cable	Necessary temperature for the cable entry
1	0.5 W	+70 °C	T6	T 80 °C	80 °C	80 °C
1	0.5 W	+80 °C	T5	T 90 °C	90 °C	90 °C
1	1.0 W	+65 °C	T6	T 80 °C	85 °C	85 °C
1	1.0 W	+70 °C	T5	T 85 °C	90 °C	90 °C
1	1.0 W	+85 °C	T4	T 100 °C	105 °C	100 °C
1	1.5 W	+60 °C	T6	T 80 °C	85 °C	85 °C
1	1.5 W	+65 °C	T5	T 85 °C	90 °C	90 °C
1	1.5 W	+85 °C	T4	T 105 °C	110 °C	105 °C
1	2.0 W	+55 °C	T6	T 80 °C	90 °C	90 °C
1	2.0 W	+70 °C	T5	T 95 °C	105 °C	95 °C
1	2.0 W	+85 °C	T4	T 110 °C	120 °C	110 °C
1	2.5 W	+50 °C	T6	T 80 °C	90 °C	90 °C
1	2.5 W	+65 °C	T5	T 95 °C	105 °C	95 °C
1	2.5 W	+85 °C	T4	T 115 °C	125 °C	115 °C
2	0.5 W	+70 °C	T6	T 80 °C	80 °C	80 °C
2	0.5 W	+80 °C	T5	T 90 °C	90 °C	90 °C
2	1.0 W	+65 °C	T6	T 80 °C	80 °C	80 °C
2	1.0 W	+75 °C	T5	T 90 °C	90 °C	90 °C
2	1.0 W	+85 °C	T4	T 100 °C	100 °C	100 °C
2	1.5 W	+60 °C	T6	T 80 °C	80 °C	80 °C
2	1.5 W	+70 °C	T5	T 90 °C	90 °C	90 °C
2	1.5 W	+85 °C	T4	T 105 °C	105 °C	105 °C
2	2.0 W	+55 °C	T6	T 80 °C	80 °C	80 °C
2	2.0 W	+65 °C	T5	T 90 °C	90 °C	90 °C
2	2.0 W	+85 °C	T4	T 110 °C	110 °C	105 °C
2	2.5 W	+55 °C	T6	T 80 °C	85 °C	85 °C
2	2.5 W	+60 °C	T5	T 85 °C	90 °C	105 °C
2	2.5 W	+85 °C	T4	T 110 °C	115 °C	110 °C
3	0.5 W	+70 °C	T6	T 80 °C	80 °C	80 °C
3	0.5 W	+80 °C	T5	T 90 °C	90 °C	90 °C
3	1.0 W	+65 °C	T6	T 80 °C	80 °C	80 °C

3	1.0 W	+75 °C	T5	T 90 °C	90 °C	90 °C
3	1.0 W	+85 °C	T4	T 100 °C	100 °C	100 °C
3	1.5 W	+60 °C	T6	T 80 °C	80 °C	80 °C
3	1.5 W	+70 °C	T5	T 90 °C	90 °C	90 °C
3	1.5 W	+85 °C	T4	T 105 °C	105 °C	105 °C
3	2.0 W	+55 °C	T6	T 80 °C	80 °C	80 °C
3	2.0 W	+65 °C	T5	T 90 °C	90 °C	90 °C
3	2.0 W	+85 °C	T4	T 110 °C	110 °C	105 °C
3	2.5 W	+55 °C	T6	T 80 °C	85 °C	85 °C
3	2.5 W	+60 °C	T5	T 85 °C	90 °C	105 °C
3	2.5 W	+85 °C	T4	T 110 °C	115 °C	110 °C
4	0.5 W	+70 °C	T6	T 80 °C	80 °C	80 °C
4	0.5 W	+80 °C	T5	T 90 °C	90 °C	90 °C
4	1.0 W	+65 °C	T6	T 80 °C	80 °C	80 °C
4	1.0 W	+75 °C	T5	T 90 °C	90 °C	90 °C
4	1.0 W	+85 °C	T4	T 100 °C	100 °C	100 °C
4	1.5 W	+60 °C	T6	T 80 °C	85 °C	85 °C
4	1.5 W	+70 °C	T5	T 90 °C	90 °C	90 °C
4	1.5 W	+85 °C	T4	T 105 °C	105 °C	100 °C
4	2.0 W	+60 °C	T6	T 80 °C	85 °C	85 °C
4	2.0 W	+65 °C	T5	T 90 °C	90 °C	90 °C
4	2.0 W	+85 °C	T4	T 105 °C	110 °C	105 °C
4	2.5 W	+55 °C	T6	T 80 °C	85 °C	85 °C
4	2.5 W	+60 °C	T5	T 85 °C	90 °C	90 °C
4	2.5 W	+85 °C	T4	T 110 °C	115 °C	110 °C

Die jeweilig ausgeführte obere Umgebungstemperatur wird in der Kennzeichnung des Gerätes angegeben und erfolgt in Verbindung mit der Auswahl einer geeigneten Kabel- und Leitungseinführung und eines geeigneten Kabels.

*The used lower ambient temperature will be included in the marking of the equipment and is related with a choice of an applicable cable entry and cable.*

## 5) Kennzeichnung

Die Kennzeichnung (gut sichtbar, lesbar und dauerhaft) umfasst die folgenden Angaben:

### 5.1 Name und Anschrift des Herstellers

Typ ESW®-small-Ex....

Herstellungsjahr



**II 2D Ex db IIC T4 bis zu T6 Gb \*\***

**II 2D Ex tb IIC T80°C bis zu T115°C Db**

\*\*\*) siehe Kenngrößen

Fertigungsnummer

Bescheinigungsnummer

Umgebungstemperaturbereich

Gegebenenfalls Hinweis auf temperaturbeständige Leitungen und Kabel- und Leitungseinführungen

### 5.2 Eine CE - Kennzeichnung gefolgt durch die Kennnummer der benannten Stelle, die in der Phase der Fertigungskontrolle tätig wird.

### 5.3 Die Kennzeichnung, die normalerweise für den betreffenden Gegenstand in den Konstruktionsnormen vorgesehen ist.

## Marking

The marking shall be visible, legible and durable. It shall contain the following:

5.1 The name and address of the manufacturer

Type ESW@-small-Ex....

Year of construction

 II 2D Ex db IIC T4 up to T6 Gb \*\*

II 2D Ex tb IIC T80°C up to T115°C Db \*\*

\*\* ) see parameters

Serial number

Certificate number

Ambient temperature range

If applicable warning to use heat resistant cables and cable entries

5.2 A CE marking followed by the identification number of the notified body which is involved in the

5.3 The regular marking corresponding to the product standard for the subject.

## 6) Stückprüfungen

Der Hersteller muss die laufende Überwachung und Prüfungen nach EN IEC 60079-0:2018 und notwendige Prüfungen durchführen, um sicherzustellen, dass der gefertigte Gegenstand mit den Unterlagen, die der Prüfstelle zusammen mit dem Prototyp oder dem Muster eingereicht wurden, übereinstimmt. Er muss auch die Stückprüfungen durchführen, die in den betreffenden Europäischen Normen vorgeschrieben sind.

Die Durchführung der Stückprüfungen ersetzt nicht das laut Konformitätsbewertungsverfahren (Artikel 13 der Richtlinie 2014/34/EU) zusammen mit dem Modul der EU-Baumusterprüfung erforderliche und vom Hersteller zu unterhaltende Verfahren gemäß Anhang IV bis VII der Richtlinie 2014/34/EU.

Die Stückprüfung des Schwingungswächters nach 16.1.2 von EN 60079-1:2014 kann entfallen, da die Überdruckprüfung nach 15.2.3.2 dieser Norm mit einem Prüfdruck entsprechend dem vierfachen Bezugsdruck bestanden wurde.

### Routine verifications and tests

The manufacturer shall carry out the routine verifications and tests by EN IEC 60079-0:2018 necessary to ensure that the subject produced complies with the specification submitted to the testing station together with the prototype or sample. He shall also make any routine verifications and tests required by the respective European Standards.

These routine verifications and tests do not substitute for the procedure defined in annexes IV to VII inclusive of Directive 2014/34/EU as required, in addition to the module EU-Type Examination, for the conformity assessment procedure (article 13 of Directive 2014/34/EU).

The routine test as specified in 16.1.2 of EN 60079-1:2014 may be omitted as the overpressure test according to 15.2.3.2 of said standard was carried out successfully with a pressure of four times the reference pressure.

## 7) Besondere Bedingungen für die Verwendung

- 7.1 Besondere Bedingungen für die Verwendung zur Auflistung in der EU-Baumusterprüfbescheinigung
  - 7.1.1 Die Abmessungen der zünddurchschlagsicheren Spalte dieses Betriebsmittels sind teils anders als minimal oder maximal in EN 60079-1:2014 gefordert. Informationen zu den Abmessungen sind beim Hersteller zu erfragen.
  - 7.1.2 Das Gehäuse muss über die Befestigung oder die vorhandene Anschlussklemme in den Potentialausgleich der zu überwachenden Maschine einbezogen werden.
  - 7.1.3 Das freie Leitungsende des Schwingungswächters muss in einem Gehäuse entsprechend einer der nach Abschnitt 1 der EN IEC 60079-0:2018 genannten Zündschutzarten oder außerhalb des explosionsgefährdeten Bereiches angeschlossen werden.
  - 7.1.4 Bei Anwendungen in Zone 21 muss bei der Installation der Anschlussleitung sichergestellt sein, dass elektrostatische Aufladung nicht zu zündfähigen Entladungen führen kann.
  - 7.1.5 Bei Anwendungen in Zone 21: Der Schwingungswächter darf nur in Bereichen verwendet werden, in denen nicht mit dem Auftreten starker oder wiederholter Aufladeprozesse zu rechnen ist.
- 7.2 Weitere Bedingungen
  - 7.2.1 Für den Schwingungswächter muss eine zugelassene Leitungseinführung und ein Kabel bzw. eine Leitung für eine Einsatztemperatur, entsprechend der unter Kenngrößen Abschnitt 4.3 angegebenen Tabellenwerte verwendet werden.

### **Special conditions for use**

- 7.1 *Special conditions for use to be listed in EU Type Examination Certificate*
  - 7.1.1 *The dimensions of the flameproof joints are in parts other than the relevant minimum or maximum values of EN 60079-1:2014. For information on the dimensions of the flameproof joints contact the manufacturer.*
  - 7.1.2 *The enclosure has to be integrated into the potential equalization of the machine to be monitored; this can be done either via the fastenings or via the connecting terminal.*
  - 7.1.3 *The free cable end of the vibration monitor has to be connected either in an enclosure in one the types of protection stated in section 1 of EN IEC 60079-0:2018 or outside the explosive atmosphere.*
  - 7.1.4 *In applications in Zone 21 it must be ensured when installing the connection cable that electrostatic charging cannot lead to ignitable discharges.*
  - 7.1.5 *In applications in Zone 21: The vibration monitor must be used only in areas where strong or repeated charging processes are not expected to occur.*
- 7.2 *Additional conditions*
  - 7.2.1 *For the vibration monitor it has to be used a certified cable entry and a cable usable for a minimum service temperature according to the parameters in table 4.3.*

## 8) Sicherheitstechnisch relevante Informationen

Die Kenntnis der Angaben unter den Nummern 1, 2, 4 und 7 ist für die sichere Verwendung erforderlich. Die Angaben sind in der im Auszug vorgelegten Betriebsanleitung enthalten.

### **Information relevant for safety**

*The information as given in clauses 1, 2, 4 and 7 is relevant for safe use. The information is included in the relevant extract of the manufacturer's instructions.*

Bochum, 15.08.2023  
BVS-KSC/Kir/Mu A 20230327

**DEKRA Testing and Certification GmbH**  
**Explosionsschutz Elektrotechnik**

  
Überprüft durch  
Reviewed by

  
Erstellt durch  
Compiled by

## Anhänge - Annexes

Protokoll	Allgemeine Bestimmungen IEC 60079-0:2017
Report	General requirements IEC 60079-0:2017
Protokoll	Druckfeste Kapselung IEC 60079-1:2014
Report	Flameproof enclosure IEC 60079-1:2014
Protokoll	Schutz durch Gehäuse IEC 60079-31:2013
Report	Protection by enclosure IEC 60079-31:2013

Hinweis: Die im Anhang verwendeten IEC-Normen sind technisch gleichwertig zu den auf der 1. Seite aufgelisteten EN-Normen. Die Kennzeichnung entspricht der Richtlinie 2014/34/EU (siehe Abschnitt 5 dieses Prüfprotokolls).

Note: *The IEC standards used in the annex are technically identical to the EN standards listed on the front page. The marking meets the requirements of Directive 2014/34/EU (see clause 5 of this Test Report).*



## Report

**Explosive atmospheres**  
**IEC 60079-0:2017**  
**Equipment – General requirements**

Possible test case verdicts:

- test case does not apply to the test object : N/A
- test object does meet the requirement : Pass

IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict
1	SCOPE		

2	NORMATIVE REFERENCES		
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3	TERMS AND DEFINITIONS		
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4	EQUIPMENT GROUPING		
4.1	General	Group II and III	Pass
4.2	Group I		N/A
4.3	Group II	IIC	Pass
4.4	Group III	IIIC	Pass
4.5	Equipment for a particular explosive gas atmosphere		N/A

5	TEMPERATURES		
5.1	Environmental influences		
5.1.1	Ambient temperature	-60 °C ... -20 °C ≤ T <sub>amb</sub> ≤ 50 ... 85 °C The used ambient temperature will be included in the marking of the equipment and is related with a choice of an applicable cable gland and cable.	Pass
5.1.2	External source of heating or cooling	No external source	N/A
5.2	Service temperature	See 26.5.1	Pass
5.3	Maximum surface temperature		
5.3.1	Determination of maximum surface temperature	See 26.5.1	Pass
5.3.2	Limitation of maximum surface temperature		
5.3.2.1	Group I electrical equipment	Group II and III	N/A

IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict
5.3.2.2	Group II electrical equipment	The temperature class T6 up to T4 or the max. surface temperature of T 80 °C up to 115 °C are met. The temperature classes / surface temperatures and the ambient temperatures are allocated by the size of the enclosure and the power loss and further determined in the instruction manual.	Pass
5.3.2.3	Group III electrical equipment		
5.3.2.3.1	Maximum surface temperature for EPL Da		N/A
5.3.2.3.2	Maximum surface temperature for EPL Db	See clause 5.3.2.2	Pass
5.3.2.3.3	Maximum surface temperature determined without a layer of dust for EPL Dc		N/A
5.3.3	Small component temperature for Group I or Group II electrical equipment		N/A
5.3.4	Component temperature of smooth surfaces for Group I or Group II electrical equipment		N/A

6 REQUIREMENTS FOR ALL ELECTRICAL EQUIPMENT			
6.1	General		Pass
6.2	Mechanical strength of equipment	See clause 26.4	Pass
6.3	Opening times	Time to fall below the limits of rest energy is less than 5 seconds.	Pass
6.4	Circulating currents in enclosures (e.g. of large electric machines)	Circulating currents are not expected.	N/A
6.5	Gasket retention	O-Ring gasket is fixed in a groove in the cover.	N/A
6.6	Electromagnetic and ultrasonic energy radiating equipment		N/A

7 NON-METALLIC ENCLOSURES AND NON-METALLIC PARTS OF ENCLOSURES			
7.1	General		
7.1.1	Applicability	Clause 7.4 is applicable for the adhesive nameplate	Pass
7.1.2	Specification of materials		
7.1.2.1	General		Pass
7.1.2.2	Plastic materials	No plastic materials	N/A

IEC 60079-0																							
Clause	Requirement – Test	Result – Remark	Verdict																				
7.1.2.3	Elastomers	<p>Sealing O-Ring gasket between cover and enclosure</p> <table border="0"> <tr> <td>Type</td> <td>Si 970</td> </tr> <tr> <td>Material</td> <td>Silicone</td> </tr> <tr> <td>Manufacturer</td> <td>COG</td> </tr> <tr> <td>Hardness</td> <td>65 (IRHD)</td> </tr> <tr> <td>Service temperature</td> <td>-60 °C up to +200 °C</td> </tr> </table> <p>Additional aging test of gasket material see BVS test report BVSPS26217.</p> <p>or</p> <table border="0"> <tr> <td>Type</td> <td>LT 170</td> </tr> <tr> <td>Material</td> <td>FKM</td> </tr> <tr> <td>Manufacturer</td> <td>C. OTTO Gehrckens</td> </tr> <tr> <td>Hardness</td> <td>70</td> </tr> <tr> <td>Service temperature</td> <td>-40 °C up to +200 °C</td> </tr> </table> <p>Additional ageing test of gasket material see BVS test report BVSVB6119.</p>	Type	Si 970	Material	Silicone	Manufacturer	COG	Hardness	65 (IRHD)	Service temperature	-60 °C up to +200 °C	Type	LT 170	Material	FKM	Manufacturer	C. OTTO Gehrckens	Hardness	70	Service temperature	-40 °C up to +200 °C	Pass
Type	Si 970																						
Material	Silicone																						
Manufacturer	COG																						
Hardness	65 (IRHD)																						
Service temperature	-60 °C up to +200 °C																						
Type	LT 170																						
Material	FKM																						
Manufacturer	C. OTTO Gehrckens																						
Hardness	70																						
Service temperature	-40 °C up to +200 °C																						
7.1.2.4	Materials used for cementing	<p>The cable gland and an adapter are fixed mounted by a thread and a highly strong glue for temperature use from -60 °C up to +140 °C.</p> <p>The enclosure is completely or partially filled with non-flammable cement.</p> <p>The cement is not used for sealing the joints.</p>	Pass																				
7.2	Thermal endurance		N/A																				
7.3	Resistance to ultraviolet light		N/A																				
7.4	Electrostatic charges on external non-metallic materials																						
7.4.1	Applicability	This clause applies to the adhesive nameplate.	Pass																				
7.4.2	Avoidance of a build-up of electrostatic charge for Group I or Group II	The thickness of the layer is below 0.2 mm.	Pass																				
7.4.3	Avoidance of a build-up of electrostatic charge for Group III	When using the adhesive nameplate for Group III: An X-marking in connection with the special condition for safe use (see “Special conditions for use”)	Pass																				
7.5	Attached external conductive parts		N/A																				

IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict
8	METALLIC ENCLOSURES AND METALLIC PARTS OF ENCLOSURES		
8.1	Material composition		
8.2	Group I	Group II and III	N/A
8.3	Group II	Enclosure made of steel or aluminium AlMg 4.5 Mn	Pass
8.4	Group III	See clause 8.3	Pass
8.5	Copper Alloys	No copper alloys	N/A
9	FASTENERS		
9.1	General	The cover is mounted by a thread and secured by a hexagon socket screw, additionally the use of a special tool is necessary to open the cover.	Pass
9.2	Special fasteners	Cover is not fastened by screws but secured by a hexagon socket screw.	Pass
9.3	Holes for special fasteners		
9.3.1	Thread engagement		N/A
9.3.2	Tolerance and clearance		N/A
9.4	Hexagon socket set screws	Tolerance of all threads is 6h in accordance to ISO 965-1 and -3	Pass
10	INTERLOCKING DEVICES	The cover is mounted by a thread and secured by a hexagon socket screw, additionally the use of a special tool is necessary to open the cover.	Pass
11	BUSHINGS		N/A
12	(RESERVED FOR FUTURE USE)		
13	EX COMPONENTS		N/A
14	CONNECTION FACILITIES		
14.1	General		Pass
14.2	Type of protection	Type of protection “db” and “tb”	Pass
14.3	Creepage and clearance	No specific requirements for Ex “db” and “tb”	N/A

IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict
15	CONNECTION FACILITIES FOR EARTHING OR BONDING CONDUCTORS		
15.1	Equipment requiring earthing or bonding		
15.1.1	Internal earthing		Pass
15.1.2	External bonding	The earthing has to be connected by the terminal or by the mounting connection, a hint is included in the instructions.	Pass
15.2	Equipment not requiring earthing		N/A
15.3	Size of protective earthing conductor connection		N/A
15.4	Size of equipotential bonding conductor connection	Max. 4 mm <sup>2</sup>	Pass
15.5	Protection against corrosion	Stainless steel	Pass
15.6	Secureness of electrical connections		Pass
15.7	Internal earth continuity plate		N/A

16	ENTRIES INTO ENCLOSURES		
16.1	General	Thread hole	Pass
16.2	Identification of entries	Cable gland is separately certified for this use. The thread size, the value for necessary service temperature for the cable gland and the cable is given in the test report and in the description; because the cable gland thread is unmoveable and fixed glued in the enclosure wall the information about the thread could be omitted in the instructions.	Pass
16.3	Cable glands	See clause 16.2	Pass
16.4	Blanking elements		N/A
16.5	Thread adapters	An adapter is fixed mounted by a thread and a highly strong glue for temperature use from -60 °C up to +140 °C.	Pass
16.6	Temperature at branching point and entry point	No impermissible rise of the temperature at the cable glands or branching points.	Pass
16.7	Electrostatic charges of cable sheaths	See clause 16.2 and special conditions for use.	Pass

17	SUPPLEMENTARY REQUIREMENTS FOR ELECTRIC MACHINES		N/A
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18	SUPPLEMENTARY REQUIREMENTS FOR SWITCHGEAR		N/A
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19	RESERVED FOR FUTURE USE		
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IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict
20	SUPPLEMENTARY REQUIREMENTS FOR EXTERNAL PLUGS, SOCKET OUTLETS AND CONNECTORS FOR FIELD WIRING CONNECTION		N/A
21	SUPPLEMENTARY REQUIREMENTS FOR LUMINAIRES		N/A
22	SUPPLEMENTARY REQUIREMENTS FOR CAPLIGHTS AND HANDLIGHTS		N/A
23	EQUIPMENT INCORPORATING CELLS AND BATTERIES		N/A
24	DOCUMENTATION		Pass
25	COMPLIANCE OF PROTOTYPE OR SAMPLE WITH DOCUMENTS		Pass
26	TYPE TESTS		
26.1	General		Pass
26.2	Test configuration		Pass
26.3	Tests in explosive test mixtures	See IEC 60079-1	Pass
26.4	Tests of enclosures		
26.4.1	Order of tests		
26.4.1.1	Metallic enclosures, metallic parts of enclosures and glass parts of enclosures	<ul style="list-style-type: none"> <li>- Resistance to impact (see clause 26.4.2)</li> <li>- Drop test (N/A)</li> <li>- Degree of protection IP (see clause 26.4.5)</li> <li>- Other tests required by this standard (N/A)</li> <li>- Other tests specific to the type of protection (see IEC 60079-1)</li> </ul>	Pass
26.4.1.2	Non-metallic enclosures or non-metallic parts of enclosures		N/A
26.4.2	Resistance to impact	Enclosure and cover with 7 J at -45 °C (See BVSPS15081) Enclosure and cover with 7 J at -65 °C (See BVSPS26218)	Pass
26.4.3	Drop test	Not applicable for non-handheld apparatus	N/A
26.4.4	Acceptance criteria	See 26.4.2	Pass
26.4.5	Degree of protection (IP) by enclosures		Pass
26.4.5.1	Test procedure	IP 68 IP X8 (See BVSPS13706) IP 6X after test procedure (thermal endurance, impact and overpressure) for change to -60 °C ambient temperature (see BVSPS26220).	Pass
26.4.5.2	Acceptance criteria	No dust or water inside of the enclosure	Pass

IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict
26.5	Thermal tests		
26.5.1	Temperature measurement		
26.5.1.1	General	The surface temperature and material temperatures have been measured at different enclosure sizes depending of an internal power from 0.5 up to 2.5 W. The measures have been recorded after the temperature rise was less than 2 K/h. (See BVS VB6357)	Pass
26.5.1.2	Service temperature	See 26.5.1.1	Pass
26.5.1.3	Maximum surface temperature	See 26.5.1.1	Pass
26.5.2	Thermal shock test		N/A
26.5.3	Small component ignition test (Group I and Group II)		N/A
26.6	Torque test for bushings		N/A
26.7	Non-metallic enclosures or non-metallic parts of enclosures		N/A
26.8	Thermal endurance to heat	The thermal endurance test as pre-conditioning for the IP test has been omitted because of the very high performance of the service temperature range of the gasket.	N/A
26.9	Thermal endurance to cold	Test procedure (thermal endurance, impact and overpressure) for change to -60 °C ambient temperature. 1 day at -65 °C see BVSPS26217	Pass
26.10	Resistance to UV light		N/A
26.11	Resistance to chemical agents for Group I equipment	Group II and III	N/A
26.12	Earth continuity		N/A
26.13	Surface resistance test of parts of enclosures of non-metallic materials		N/A
26.14	Measurement of capacitance		N/A
26.15	Verification of ratings of ventilating fans	No ventilating fans	N/A
26.16	Alternative qualification of elastomeric sealing O-rings		N/A
26.17	Transferred charge test		N/A
27	ROUTINE TESTS	These tests have to be done by the manufacturer. They are not an item of this test report.	N/A

IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict
28	MANUFACTURER'S RESPONSIBILITY	This is not a subject of the type examination.	N/A

29	MARKING		
29.1	Applicability		Pass
29.2	Location		Pass
29.3	General		Pass
29.4	Ex marking for explosive gas atmospheres	Ex db IIC T6 up to T4 Gb	Pass
29.5	Ex marking for explosive dust atmospheres	Ex tb IIIC T 80°C up to 115°C Db	Pass
29.6	Combined types (or levels) of protection		N/A
29.7	Multiple types of protection		N/A
29.8	Ga equipment using two independent Gb types (or levels) of protection		N/A
29.9	Boundary wall		N/A
29.10	Ex Components		N/A
29.11	Small Ex Equipment and small Ex Components		N/A
29.12	Extremely small Ex Equipment and extremely small Ex Components		N/A
29.13	Warning markings		N/A
29.14	Cells and batteries		N/A
29.15	Electric machines operated with a converter		N/A
29.16	Examples of marking		

30	INSTRUCTIONS		
30.1	General		Pass
30.2	Cells and batteries		N/A
30.3	Electrical machines		N/A
30.4	Ventilating fans		N/A
30.5	Cable glands	Separately tested and certified	Pass

Annex A (Normative)	SUPPLEMENTARY REQUIREMENTS FOR CABLE GLANDS	Separately tested and certified	Pass
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IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict
Annex B (Normative)	REQUIREMENTS FOR EX COMPONENTS		N/A
Annex C (Informative)	EXAMPLE OF RIG FOR RESISTANCE TO IMPACT TEST		
Annex D (Informative)	ELECTRIC MACHINES CONNECTED TO CONVERTERS		
Annex E (Informative)	TEMPERATURE EVALUATION OF ELECTRIC MACHINES		
Annex F (Informative)	GUIDELINE FLOWCHART FOR TESTS OF NON-METALLIC ENCLOSURES OR NON-METALLIC PARTS OF ENCLOSURES (26.4)		
Annex G (Informative)	GUIDANCE FLOWCHART FOR TESTS OF CABLE GLANDS		
Annex H (Informative)	SHAFT VOLTAGES RESULTING IN MOTOR BEARING OR SHAFT BRUSH SPARKING DISCHARGE ENERGY CALCULATION		

## Report

**Explosive atmospheres**  
**IEC 60079-1: 2014**  
**Equipment protection by Flameproof Enclosure “d”**

Possible test case verdicts:

- test case does not apply to the test object : N/A
- test object does meet the requirement : Pass

IEC 60079-1			
Clause	Requirement – Test	Result – Remark	Verdict
1	SCOPE		

2	NORMATIVE REFERENCES		
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3	TERMS AND DEFINITIONS		
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4	LEVEL OF PROTECTION (EQUIPMENT PROTECTION LEVEL, EPL)		
4.1	General	Protection level “db”	Pass
4.2	Requirements for level of protection “da”		N/A
4.3	Requirements for level of protection “db”		Pass
4.4	Requirements for level of protection “dc”		N/A

5	FLAMEPROOF JOINTS		
5.1	General requirements		Pass
5.2	Non-threaded joints		
5.2.1	Width of joints ( <i>L</i> )		N/A
5.2.2	Gap ( <i>i</i> )		N/A
5.2.3	Spigot joints		N/A
5.2.4	Holes in joint surfaces		N/A
5.2.5	Conical joints		N/A
5.2.6	Joints with partial cylindrical surfaces (not permitted for Group IIC)		N/A
5.2.7	Flanged joints for acetylene atmospheres		N/A
5.2.8	Serrated joints		N/A
5.2.9	Multi-step joints		N/A

IEC 60079-1			
Clause	Requirement – Test	Result – Remark	Verdict
5.3	Threaded joints	See Appendix: Additional remarks	Pass
5.4	Gaskets (including O-rings)	Outside of the flameproof joint	N/A
5.5	Equipment using capillaries		N/A

6	SEALED JOINT		
6.1	Cemented joints		
6.1.1	General	The cable gland and an adapter are fixed mounted by thread and a highly strong glue for temperature use from -60 °C up to +140 °C.	Pass
6.1.2	Mechanical strength	The cement is not used for sealing the joints.	N/A
6.1.3	Width of cemented joints		N/A
6.2	Fused glass joints		

7	OPERATING RODS		N/A
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8	SUPPLEMENTARY REQUIREMENTS FOR SHAFTS AND BEARINGS		N/A
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9	LIGHT-TRANSMITTING PARTS		N/A
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10	BREATHING AND DRAINING DEVICES WHICH FORM PART OF A FLAMEPROOF ENCLOSURE		N/A
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11	FASTENERS AND OPENINGS		
11.1	Type of fastener	Group II	Pass
11.2	Plastic material or light alloys		N/A
11.3	Yield stress		N/A
11.4	Studs		N/A
11.5	Fasteners through walls		N/A
11.6	Blind holes	Thread hole for installation	Pass
11.7	Screws into blind holes		N/A
11.8	Closing of through holes		N/A
11.9	Separate fastening arrangements for threaded doors/covers	The cover is mounted by a thread and secured by a hexagon socket screw, additionally the use of a special tool is necessary to open the cover.	Pass

IEC 60079-1			
Clause	Requirement – Test	Result – Remark	Verdict
12	MATERIALS		
12.1	Tests prescribed by Clauses 14 to 16	See clause 14 to 16	Pass
12.2	Assembly of multiple flameproof enclosures		N/A
12.3	Intercommunicating enclosure compartments		N/A
12.4	Use of cast iron		N/A
12.5	Use of liquids	The electrolytic capacitors are surrounded by cement with a layer thickness of at least 10 mm.	Pass
12.6	Insulating materials for Group I apparatus	IIC	N/A
12.7	Zinc content	No zinc	Pass
12.8	Copper or copper alloys in explosive gas atmospheres containing acetylene	No copper or copper alloys	N/A

13	ENTRIES FOR FLAMEPROOF ENCLOSURES		
13.1	General		Pass
13.2	Threaded holes	Because the cable gland thread is unmoveable and fixed glued in the enclosure wall the information about the thread could be omitted in the instructions.	N/A
13.3	Non-threaded holes (for Group I only)	Group II and III	N/A
13.4	Cable glands	Cable gland separately certified, see also clause 16 of IEC 60079-0. The information about the thread at the enclosure is included in the instructions.	Pass
13.5	Conduit sealing devices		N/A
13.6	Plugs and sockets and cable couplers		N/A
13.7	Bushings		N/A
13.8	Blanking elements		N/A

14	VERIFICATION AND TESTS		Pass
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IEC 60079-1			
Clause	Requirement – Test	Result – Remark	Verdict
15	TYPE TESTS		
15.1	General	a) Reference pressure (see 15.1.2) b) Overpressure test (see 15.1.3) c) Non-transmission test (see 15.2)	Pass
15.2	Tests of ability of the enclosure to withstand pressure		
15.2.1	General		Pass
15.2.2	Determination of explosion pressure (reference pressure)		
15.2.2.1	General	Reference pressure (group IIC, for -40 °C): 8.4 bar (see BVSPS15083)  Reference pressure (group IIC, for -60 °C): 8.4 bar (see BVSPS15083) * factor 1.62 for -60 °C divided by 1.26 (pre-compression factor used at the -40 °C reference pressure test) =10.8 bar.  The enclosure has a simple geometry and a volume below 10 litre, the overpressure test has been carried out with the four times reference pressure. So the table 15.2.2 for determination of the reference pressure without a new reference pressure test at the lower ambient temperature could be used.	Pass
15.2.2.2	Test procedure		Pass
15.2.2.3	Rotating electrical machines		N/A
15.2.2.4	Pressure-piling		N/A
15.2.2.5	Apparatus intended for use in a single gas		N/A
15.2.3	Overpressure test		
15.2.3.1	General	See following clauses	Pass
15.2.3.2	Overpressure test - First method (static)	4 x reference pressure for -40 °C: 34 bar (see BVSPS15169)  4 x reference pressure for -60 °C: 43.2 bar (see BVSPS26211)	Pass
15.2.3.3	Overpressure test - Second method (dynamic)	1.5 x reference pressure: > 12.6 bar (see BVSPS15083)	Pass
15.3	Test for non-transmission of an internal ignition		

IEC 60079-1			
Clause	Requirement – Test	Result – Remark	Verdict
15.3.1	General	The thread joints of the cable entry and the cover was reduced (4 threads engaged) The flanged joints between cover and enclosure and at the cable entry adapter were enlarged up to 0.3 mm, so they are optional. (See BVSPS 15083 and measurement BVSPS15078)	Pass
15.3.2	Electrical equipment of groups I, IIA and IIB		N/A
15.3.3	Electrical apparatus of group IIC		Pass
15.3.3.1	General		Pass
15.3.3.2	First method – Testing by increased test gap		N/A
15.3.3.3	Second method – Testing by increased pressure	Only threaded joints	Pass
15.3.3.4	Third method – Testing by oxygen enrichment of test gases		N/A
15.3.3.5	Number of tests for single piece production		N/A
15.4	Tests of flameproof enclosures with breathing and draining devices		N/A
15.5	Tests for “dc” devices		N/A
16	ROUTINE TESTS	The routine test is not a subject of this test report.	N/A
17	SWITCHGEAR FOR GROUP I		N/A
18	LAMP HOLDERS AND LAMP CAPS		N/A
19	NON-METALLIC ENCLOSURES AND NON-METALLIC PARTS OF ENCLOSURES		N/A
20	MARKING		
20.1	General	“db”	Pass
20.2	Caution and warning markings		N/A
20.3	Informative markings		N/A
21	INSTRUCTIONS	See IEC 60079-0, clause 30 (INSTRUCTIONS)	Pass

IEC 60079-1			
Clause	Requirement – Test	Result – Remark	Verdict
Annex A (Normative)	ADDITIONAL REQUIREMENTS FOR CRIMPED RIBBON ELEMENTS AND MULTIPLE SCREEN ELEMENTS OF BREATHING AND DRAINING DEVICES		N/A

Annex B (Normative)	ADDITIONAL REQUIREMENTS FOR ELEMENTS, WITH NON-MEASURABLE PATHS, OF BREATHING AND DRAINING DEVICES		N/A
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Annex C (Normative)	ADDITIONAL REQUIREMENTS FOR FLAMEPROOF ENTRY DEVICES		
C.1	General	This clause is filled analogously for the adapter, although it is not intended to use separately.	Pass
C.2	Constructional requirements		
C.2.1	Sealing methods		
C.2.1.1	Cable glands with elastomeric sealing rings		N/A
C.2.1.2	Cable glands sealed with setting compound	The cable gland and an adapter are fixed mounted by thread and a highly strong glue for temperature use from -60 °C up to +140 °C. The cable gland is separately tested and certified.	Pass
C.2.1.3	Conduit sealing devices with setting compound		N/A
C.2.1.4	Bushings		N/A
C.2.2	Flameproof joints		
C.2.2.1	Threaded joints	See Appendix: Additional remarks	Pass
C.2.2.2	Non threaded joints (Group I only)		N/A
C.2.3	Constructional requirements for Ex blanking elements		N/A
C.2.4	Constructional requirements for Ex thread adapters		
C.2.4.1	Compliance of threads	See C.2.2.1	Pass
C.2.4.2	Threads co-axial	The thread of the adapter is co-axial	Pass
C.2.4.3	Length and internal volume		Pass
C.3	Type tests		
C.3.1	Sealing test	The cable gland is separately tested and certified.	Pass
C.3.2	Test of mechanical strength	The cable gland is separately tested and certified.	Pass
C.3.3	Type tests for Ex blanking elements		N/A
C.3.4	Type tests for Ex thread adapters		
C.3.4.1	Torque test	The adapter is fixed mounted by a thread and a highly strong glue. Without the glue the adapter would rotate until it falls into the enclosure. So the torque test was omitted.	N/A

IEC 60079-1			
Clause	Requirement – Test	Result – Remark	Verdict
C.3.4.2	Impact test	Because of the small length of the adapter and because this device was rated as a whole, the impact test for the adapter was omitted.	N/A
C.3.4.3	Over-pressure test	See IEC 60079-0, clause 15.2.3.2	Pass
Annex D (Normative)	EMPTY FLAMEPROOF ENCLOSURES AS EX COMPONENTS		N/A
Annex E (Normative)	CELLS AND BATTERIES USED IN FLAMEPROOF “d” ENCLOSURES		N/A
Annex F (Informative)	MECHANICAL PROPERTIES FOR SCREWS AND NUTS		
Annex G (Normative)	ADDITIONAL REQUIREMENTS FOR FLAMEPROOF ENCLOSURES WITH AN INTERNAL SOURCE OF RELEASE (CONTAINMENT SYSTEM)		N/A
Annex H (Normative)	REQUIREMENTS FOR MACHINES WITH FLAMEPROOF “d” ENCLOSURES FED FROM CONVERTERS		N/A



**Measurement Section, including Additional Narrative Remarks (as deemed applicable)**

**5.3 Threaded joints**

Thread between	Thread length [mm]	Number of threads	Thread type and quality
Enclosure and cover	9	6	M48x1.5
	6	4	
Enclosure and cable entry or adapter	7	>5	M18x1
Enclosure and cable entry or adapter	7	>5	M22x1
Adapter and cable entry	12	>5	M12x1.5
Adapter and cable entry	12	>5	M16x1.5

Note: The Volume of the enclosure is less than 100 cm<sup>3</sup>.

For the test for non-transmission of an internal ignition the flanged joint was distances and the threaded joints were reduced (4 threads engaged).

The threaded joint between the enclosure and cable gland or adapter (M22x1) was not part of the explosion test. Because of the location and the size of the other two threaded joints a new test was omitted.

## Report

### *Explosive atmospheres*

#### *IEC 60079-31: 2013*

#### *Equipment protection by Protection by Enclosure "t"*

Possible test case verdicts:

- test case does not apply to the test object : N/A
- test object does meet the requirement : Pass

IEC 60079-31			
Clause	Requirement – Test	Result – Remark	Verdict
1	SCOPE		

2	NORMATIVE REFERENCES		
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3	TERMS AND DEFINITIONS		
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4	GENERAL		
4.1	Levels of protection	"tb"	Pass
4.2	Equipment groups and ingress protection	"tb"	Pass
4.3	Requirements for electrical equipment with level of protection "ta"	See clause 4.1	N/A
4.4	Requirements for electrical equipment with Level of Protection "tb" and "tc"		
4.4.1	Maximum surface temperature	See cl. 6.1.2	Pass
4.4.2	Over pressure	See cl. 6.1.1.3	Pass
4.4.3	Dust exclusion	See cl. 6.1.1.4	Pass

5	CONSTRUCTION		
5.1	Joints		
5.1.1	General	See IEC 60079-1	Pass
5.1.2	Threaded joints	See IEC 60079-1 clause 5.3	Pass
5.1.3	Gaskets and seals		Pass
5.1.4	Cemented joints	See IEC 60079-1, clause 6.1.2	N/A
5.1.5	Operating rods, spindles and shafts		N/A
5.1.6	Windows		N/A
5.2	Cable glands	Separately certified	Pass
5.3	Entries		
5.3.1	Plain entries		N/A

IEC 60079-31			
Clause	Requirement – Test	Result – Remark	Verdict
5.3.2	Threaded entries	> 5 threads and tolerance class 6H	Pass

6	VERIFICATION AND TESTS		
6.1	Type tests		
6.1.1	Type tests for dust exclusion by enclosures		
6.1.1.1	General		Pass
6.1.1.2	Impact test for supplementary enclosures	No supplementary enclosures	N/A
6.1.1.3	Pressure test	The standard pressure test could be omitted, because of the O-ring construction between cover and enclosure. For -60 °C see BVSPS26219 with 20 mbar. The test was carried out after the thermal endurance and the impact test.	N/A
6.1.1.4	IP test	IP 68 (see IEC 60079-0 clause 26.4.5)	Pass
6.1.2	Thermal tests	See IEC 60079-0 clause 26.5.1	Pass
6.2	Routine tests		

7	MARKING	Ex tb IIIC T80°C up to 115°C Gb	Pass
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