IECEx TEST REPORT COVER

ExTR Reference Number ..... :	DE/BVS/ExTR13.0006/01	
ExTR Free Reference Number ..... :	DE/BVS/13/2006/N1	A20230257 / 343038600
Compiled by + signature (ExTL) .... :	Dipl.-Ing. Thomas Kircher	.....
Reviewed by + signature (ExTL).... :	Dipl.-Ing. Deniz Pezzutto	.....
Endorsed by + signature (ExCB) ... :	Dr.-Ing. Michael Wittler	.....
Date of issue ..... :	2023-08-15	
Ex Testing Laboratory (ExTL) ..... :	DEKRA Testing and Certification GmbH – Location Bochum	
Address ..... :	Dinnendahlstr. 9 44809 Bochum, Germany	
Ex Certification Body (ExCB) ..... :	DEKRA Testing and Certification GmbH – Location Bochum	
Address ..... :	Dinnendahlstr. 9 44809 Bochum, Germany	
Applicant's name..... :	holthausen elektronik GmbH	
Address ..... :	Wevelinghoven 38, 41334 Nettetal, Germany	
Standards associated with this ExTR package ..... :	IEC 60079-0:2017, Ed. 7.0 IEC 60079-1:2014, Ed. 7.0 IEC 60079-31:2013, Ed. 2.0	
Clauses considered ..... :	All clauses considered	
Test Report Form Number ..... :	ExTR Cover_9 (released 2021-09)	
Related Amendments, Corrigenda or ISHs ..... :	IEC 60079-0:2017; Ed. 7.0 ISH1:2019 + ISH2:2019, COR1:2020 IEC 60079-1:2014, Ed. 7.0 ISH1:2020	
Test item description..... :	Vibration monitor	
Model/type reference ..... :	ESW®-small-Ex….	
Code (e.g. Ex __ II__ T__)..... :	Ex db IIC T4 up to T6 Gb Ex tb IIIC T80°C up to T115°C Db	
Rating..... :	See "General product information"	

ExTR Package Contents
Assembled ExTR documents and Additional reference material:
IECEx Test Report Cover
IECEx Test Report: IEC 60079-0, Edition 7.0
IECEx Test Report: IEC 60079-1, Edition 7.0
IECEx Test Report: IEC 60079-31, Edition 2.0

Manufacturer's name ..... :	holthausen elektronik GmbH
Address ..... :	Wevelinghoven 38, 41334 Nettetal, Germany
Trademark ..... :	holthausen elektronik GmbH
Certificate No. (optional) ..... :	IECEx BVS 13.0006X issue No: 1
QAR Reference No. (optional) ..... :	DE/TUR/QAR12.0002/05

Particulars: Test item vs. Test requirements

Classification of installation and use ..... :	Fixed
Ingress protection ..... :	IP68
Rated ambient temperature range (°C) ..... :	-60 … -20 °C ≤ T_{amb} ≤ 50 … 85 °C

General remarks:

The test results presented in this ExTR package relate only to the item or product tested.

- "(See Attachment #)" refers to additional information appended to the ExTR package.
- "(See appended table)" refers to a table appended to the ExTR package.
- Throughout this ExTR package, a point is used as the decimal separator.
- *Where the term "N/A" appears in any part of an ExTR package, it indicates that the associated issue was considered "Not applicable" to the involved evaluation.*
- *In accordance with IECEx 02, a Receiving ExCB may request a sample of the Ex equipment and copies of the documentation referred to in an ExTR Cover.*

Use of uncertainty of measurement for decisions on conformity (Decision rule):

No decision rule is specified by the standards associated with this ExTR package, when comparing the measurement result with the applicable limit according to the specification in these standards. The decisions on conformity are made without applying the measurement uncertainty as described in IECEx OD 012 (i.e. "simple acceptance" decision rule, previously known as "accuracy method").

General product information:

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.

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.

Parameters

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

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 gland and cable.

Upper ambient temperature See table 3 “Upper ambient temperature“ below

3 Table “Upper ambient temperature

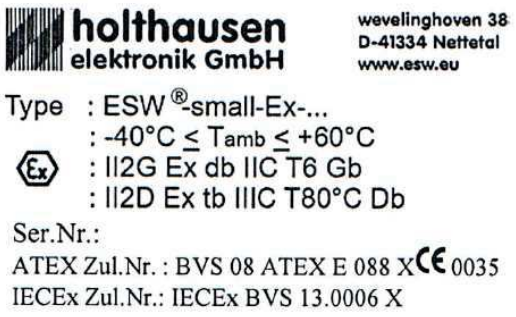
Enclosure size type	Maximum Power in W	Upper ambient temperature	Temperature-class for EPL Gb	Temperature-marking for EPL Db	Necessary temperature for the cable	Necessary temperature for the cable gland
1	0.5 W	+70 °C	T6	T 80 °C	80 °C	80 °C
1	0.5 W	+80 °C	T5	T 90 °C	90 °C	90 °C
1	1.0 W	+65 °C	T6	T 80 °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

Details of change (applicable only when revising an existing ExTR package):

- Update of the used revision of the standards including the Ex-marking
- Change of the permitted minimum ambient temperature from -20 °C to -60 °C

Copy of Marking Plate (example):



Details regarding 'trade agent' / 'local assembler' application in accordance with OD 203:

N/A

Testing not fully performed by ExTL staff at the above ExTL address:

N/A

National differences considered as part of this evaluation:

N/A

Specific Conditions of Use:

1. The dimensions of the flameproof joints are in parts other than the relevant minimum or maximum values of IEC 60079-1:2014. For information on the dimensions of the flameproof joints contact the manufacturer.
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.
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 IEC 60079-0:2017 or outside the explosive atmosphere.
4. In applications in Zone 21 it must be ensured when installing the connection cable that electrostatic charging cannot lead to ignitable discharges.
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.

Routine tests:

The manufacturer shall carry out the routine verifications and tests by IEC 60079-0:2017 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 IEC Standards.

The routine test as specified in 16.1.2 of IEC 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.

Date(s) of performance for all testing:

Type of test	Date(s) of performance
Ingress protection X8	see BVSPS13706
Ingress protection 6X	see BVSPS26220
Gap measurement	see BVSPS15078
Impact test	see BVSPS15081
Impact test	see BVSPS26218
Explosion test	see BVSPS15083
Overpressure test	see BVSPS15169
Overpressure test (4x)	see BVSPS26221
Overpressure test	see BVSPS26219
Thermal endurance to heat and cold	see BVSVB6357
Ageing test	see BVSVB6119
Thermal endurance to cold	see BVSPS26217

Technical Documents			
Title:	Drawing No.:	Rev. Level:	Date:
*Description – Supplement (2 pages)	Document: C_HOL-660_Description-2023.pdf	--	2023.04.18
*Extract from the user manual (5 pages)	Document: B_HOL-660_A_Manual_Extract_2023.pdf	--	2023.04.18
*Technical data (1 page)	Document: A_HOL-660_Datasheet_2023.pdf	--	2023.04.18
*Nameplate sample	Document: D_HOL-660_Nameplate_Sample_2023.pdf	--	2023.04.18
*Information about the stickers on the ESW-small-Compact	Document: E_HOL660_Sticker-Explanation_2023.pdf	--	2023.04.18
*Power-Temperature-dependence of the ESW-small-Ex (5 pages)	Document: H_HOL-660_ Power temperature dependence_2023.pdf	--	2023.04.18
*Drawing	SMG1A	1	2023.04.14
*Drawing	SMG1B	2	2023.04.14
*Drawing	SMG2A	1	2023.04.17
*Drawing	SMG2B	2	2023.04.17
*Drawing	SMG2C	2	2023.04.17
*Drawing	SMG3A	1	2023.04.17
*Drawing	SMG3B	1	2023.04.17
*Drawing	SMG3C	2	2023.04.17
*Drawing	SMG4A	1	2023.04.18
*Drawing	SMG4B	2	2023.04.18
*Drawing	SMG4C	2	2023.04.18
*Drawing	SMD1	1	2023.04.18
*Drawing	SMD2	1	2023.04.18
*Drawing	SMD3	1	2023.04.10
*Part list	Document: J_HOL-660_partlist_Mechanical_2023.pdf	--	2023.04.18

*Note: An * is included before the title of documents that are new or revised.*

IECEx TEST REPORT
IEC 60079-0
Explosive atmospheres – Part 0: Equipment – General requirements

ExTR Reference Number.....:	DE/BVS/ExTR13.0006/01	
ExTR Free Reference Number .....:	DE/BVS/13/2006/N1	A 20230257 / 343038600
Compiled by + signature (ExTL).....:	Dipl.-Ing. Thomas Kircher	.....
Reviewed by + signature (ExTL) ....:	Dipl.-Ing. Deniz Pezzutto	.....
Date of issue .....:	2023-08-15	
Ex Testing Laboratory (ExTL) .....:	DEKRA Testing and Certification GmbH - Location Bochum	
Address .....:	Dinnendahlstr. 9 44809 Bochum, Germany	
Applicant's name.....:	holthausen elektronik GmbH	
Address .....:	Wevelinghoven 38, 41334 Nettetal, Germany	
Standard.....:	IEC 60079-0:2017, Edition 7.0	
Test procedure .....:	IECEx System	
Test Report Form Number .....:	ExTR60079-0_7B_DS (released 2018-01)	
Related Amendments, Corrigenda or ISHs.....	IEC 60079-0:2017; Ed. 7.0 ISH1:2019 + ISH2:2019 + COR1:2020	

Possible test case verdicts:

- test case does not apply to the test item.....: N/A

- test item does meet the requirement .....: Pass

General remarks:
The test results presented in this Ex Test Report relate only to the item or product tested.

- "(see Attachment #)" refers to additional information appended to this document.
- "(see appended table)" refers to a table appended to this document.
- Throughout this document, a point "." is used as the decimal separator.

The technical content of this Ex Test Report shall not be reproduced except in full without the written approval of the Issuing ExCB and ExTL.

In this ExTR the subsequent listed Decision Sheets are considered:

DS 2012/003, DS 2014/001, DS 2015/011A, DS 2016/002, DS 2017/001, DS 2017/004, DS 2017/006, DS 2018/002, DS 2018/004, DS 2019/002, DS 2021/004, DS 2021/005, DS 2022/006

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

2	NORMATIVE REFERENCES		

3	TERMS AND DEFINITIONS		

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 … -20°C ≤ T_{amb} ≤ 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
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 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

IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict
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	Sealing O-Ring gasket between cover and enclosure: Type: Si 970 Material: Silicone Manufacturer: COG Hardness: 65 (IRHD) Service temperature: -60 °C up to +200 °C Additional ageing test of gasket material see BVS test report BVSPS26217 or Type: LT 170 Material: FKM Manufacturer: C. OTTO Gehrckens Hardness: 70 Service temperature: -40 °C up to +200 °C Additional ageing test of gasket material see BVS test report BVSVB6119.	Pass
7.1.2.4	Materials used for cementing	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. The enclosure is completely or partially filled with non-flammable cement. The cement is not used for sealing the joints.	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 fasten 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^2	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

18	SUPPLEMENTARY REQUIREMENTS FOR SWITCHGEAR	N/A

19	RESERVED FOR FUTURE USE

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	- Resistance to impact (see clause 26.4.2) - Drop test (N/A) - Degree of protection IP (see clause 26.4.5) - Other tests required by this standard (N/A) - Other tests specific to the type of protection (see IEC 60079-1)	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
26.5	Thermal tests		

IEC 60079-0			
Clause	Requirement – Test	Result – Remark	Verdict
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 BVSVB6357)	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 minimum 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

28	MANUFACTURER'S RESPONSIBILITY	This is not a subject of the type examination.	N/A

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

Annex B (Normative)	REQUIREMENTS FOR EX COMPONENTS	N/A

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

IECEx TEST REPORT
IEC 60079-1
Explosive atmospheres – Part 1: Equipment protection by flameproof enclosures "d"

ExTR Reference Number ..... :	DE/BVS/ExTR13.0006/01	
ExTR Free Reference Number ..... :	DE/BVS/13/2006/N1	A 20230257 / 343038600
Compiled by + signature (ExTL) .... :	Dipl.-Ing. Thomas Kircher	.....
Reviewed by + signature (ExTL).... :	Dipl.-Ing. Deniz Pezzutto	.....
Date of issue ..... :	2023-08-15	
Ex Testing Laboratory (ExTL)..... :	DEKRA Testing and Certification GmbH - Location Bochum	
Address ..... :	Dinnendahlstr. 9 44809 Bochum, Germany	
Applicant's name..... :	holthausen elektronik GmbH	
Address ..... :	Wevelinghoven 38, 41334 Nettetal, Germany	
Standard ..... :	IEC 60079-1:2014, 7th Edition	
	ISH1:2020, Cor1:2018	
Test procedure..... :	IECEx System	
Test Report Form Number ..... :	ExTR60079-1_7A_DS (released 2020-06)	

Possible test case verdicts:

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

General remarks:
The test results presented in this Ex Test Report relate only to the item or product tested.

- "(see Attachment #)" refers to additional information appended to this document.
- "(see appended table)" refers to a table appended to this document.
- Throughout this document, a point "." is used as the decimal separator.

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In this ExTR the subsequent listed Decision Sheets are considered:

DS 2010/006A, DS 2014/001, DS 2015/006, DS 2015/008, DS 2015/015, DS 2015/018, DS 2018/003, DS 2019/003, DS 2021/003, DS 2022/002

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

2	NORMATIVE REFERENCES		

3	TERMS AND DEFINITIONS		

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 (*L*)		N/A
5.2.2	Gap (*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
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 is 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		N/A

IEC 60079-1			
Clause	Requirement – Test	Result – Remark	Verdict
7	OPERATING RODS		N/A

8	SUPPLEMENTARY REQUIREMENTS FOR SHAFTS AND BEARINGS	N/A

9	LIGHT-TRANSMITTING PARTS	N/A

10	BREATHING AND DRAINING DEVICES WHICH FORM PART OF A FLAMEPROOF ENCLOSURE	N/A

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

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

IEC 60079-1			
Clause	Requirement – Test	Result – Remark	Verdict
13	ENTRIES FOR FLAMEPROOF ENCLOSURES		
13.1	General		Pass
13.2	Threaded holes	Because the cable gland thread is unmovable 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

15	TYPE TESTS		
15.1	General	a) Reference pressure (see 15.2.2) b) Overpressure test (see 15.2.3) c) Non-transmission test (see 15.3)	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

IEC 60079-1			
Clause	Requirement – Test	Result – Remark	Verdict
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		
15.3.1	General	The threaded joints of the cable gland and the cover were reduced (4 threads engaged) The flanged joints between cover and enclosure and at the cable gland adapter were enlarged up to 0.3 mm, so they are optional. (see BVSPS15083 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	LAMPHOLDERS AND LAMP CAPS	N/A

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

IEC 60079-1			
Clause	Requirement – Test	Result – Remark	Verdict
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
C.3.4.2	Impact test	Because of the small length of the adapter and because this devise 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*	6 *4*	M48x1.5
Enclosure and cable gland or adapter	7	>5	M18x1
Enclosure and cable gland or adapter	7	>5	M22x1
Adapter and cable gland	12	>5	M12x1.5
Adapter and cable gland	12	>5	M16x1.5

Note: The Volume of the enclosure is less than 100 cm^3.
For the test for non-transmission of an internal ignition the flanged joint was distanced 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.

IECEx TEST REPORT
IEC 60079-31
Explosive atmospheres –
Part 31: Equipment dust ignition protection by enclosure "t"

ExTR Reference Number ..... :	DE/BVS/ExTR13.0006/01	
ExTR Free Reference Number..... :	DE/BVS/13/2006/N1	A 20230257 / 343038600
Compiled by + signature (ExTL).... :	Dipl.-Ing. Thomas Kircher	.....
Reviewed by + signature (ExTL) ... :	Dipl.-Ing. Deniz Pezzutto	.....
Date of issue..... :	2023-08-15	
Ex Testing Laboratory (ExTL)..... :	DEKRA Testing and Certification GmbH - Location Bochum	
Address..... :	Dinnendahlstr. 9 44809 Bochum, Germany	
Applicant's name ..... :	holthausen elektronik GmbH	
Address..... :	Wevelinghoven 38, 41334 Nettetal, Germany	
Standard ..... :	IEC 60079-31:2013, 2nd edition	
Test procedure ..... :	IECEx System	
Test Report Form Number..... :	ExTR60079-31_2A_DS (released 2017-09)	

Possible test case verdicts:

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

General remarks:
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In this ExTR the subsequent listed Decision Sheets are considered:

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

2	NORMATIVE REFERENCES		

3	TERMS AND DEFINITIONS		

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
5.3.2	Threaded entries	> 5 threads and tolerance class 6H	Pass

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