REPORT ON THE JOINT CROSS-BORDER ATEX MARKET SURVEILLANCE CAMPAIGN (2022-2023)

Cable glands

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Summary

18 cable glands were scrutinized in the Nordic cooperation group NKS ATEX Joint Cross Border ATEX Market Surveillance Campaign. The project has reached its end and highlighted some issues and recommended actions.

The product range of ATEX cable glands is large and widely used in many applications. As a result, these products play a major role in many electrical installations' fulfilment of the strict requirements set for use in potentially explosive atmospheres. Therefore, the NKS ATEX group targeted these products for the joint cross border campaign. The project involved assessment of markings, documentation and physical testing. The tests were limited, to be efficient, to a few tests from the relevant harmonized standard.

Some findings

These are some highlighted findings, more details in the report.

Only 56 % of the products had a correct Declaration of Conformity.

78 % of the products lacked instructions of use in correct language. This means that the installer may not fully understand how to install and use the gland safely.

No plastic cable glands of smaller size (M20) passed the impact test. The reason could be to the lack of correct instructions.

Lack of clear instructions on how to mount and use the glands in different applications, with or without gasket.

Conclusions

The manufacturer needs to ensure that sufficient instructions of use, in the correct language is to be supplied with the product. Otherwise, the product cannot be used safely.

The installer must be observant and read the user instructions of use carefully. It is easy to miss a needed gasket or any other detail that can make a big impact on the overall safety of the electrical installation. If instructions are missing, the electrician must report this to the manufacturer.

There are some unclear issues with what the directive states as needed in instructions, the standard and Notified bodies. These differences are to be discussed further between the involved parties.

The campaign kicked off in the spring of 2022 and were finalized during autumn of 2023. The participating countries were Finland, Norway and Sweden. In total 18 different products were purchased and tested.

1. Introduction

In 2020, the NKS ATEX meeting decided to start planning a new Join Cross-Border ATEX Market Surveillance Campaign, and during the spring meeting in 2021, it was decided that the target would be ATEX cable glands.

Cable glands may be certified as either Ex-equipment or as an Ex-component. The cable glands may only be certified as equipment provided that the device includes a flange gasket and the manufacturer's instructions state that the device shall be mounted in such a way that the joints between the flange and the enclosure fulfils the required degree of ingress protection after mounting. If cable glands may be certified as an Ex-component, the device certificate number shall include the suffix 'U'. The 'X' at the end of the certificate number is a symbol indicating there is some specific condition(s) that should be taken into account when using the equipment in Ex areas.

The produce range of ATEX cable glands, which are suitable for use in different gas zones and dust zones, is wide. The ATEX cable glands can be found for all different zones (0,1, 2, 20, 21 and 22) in the Nordic markets. The ATEX cable glands are available for different cable types in many sizes, different materials (both metallic and non-metallic), and types of explosion protection.

Fig.1. Examples of the cable glands to be tested in the JA.

2. Purpose and overview of the campaign

The primary purpose of the campaign was to assess the compliance (formal and technical compliance) of the ATEX cable glands, samples taken from the Nordic markets, with the requirements of the ATEX Directives 2014/34/EU.

The campaign was also intended to provide the market surveillance authority's (MSAs), with the opportunity to participate in ATEX market surveillance, to improve the exchange of information and to raise economic operator and end-user's awareness of the need for conformity with the requirements of the ATEX Directive.

This report provides an overview of the findings and makes recommendations on next steps and future actions.

3. Participation in the campaign

Participation in the campaign was voluntary and open to all members of NKS-ATEX. However, all NKS-ATEX members are encouraged to participate in order to gain maximum effect on the Nordic markets. NKS ATEX also offered for ATEX ADCO members the opportunity to participate in the campaign. Tukes (FI), Elsäkerhetsverket (SE) and DSB (NO) participated in the campaign.

To make the testing easier, all MSAs contracted the same testing laboratory for all tests. The chosen testing laboratory was Eurofins Expert Services Oy in Finland

4. Campaign schedule

The campaign was planned to last nine months, the test plan, testing laboratory etc. were fixed during the spring 2022. During the autumn 2022 samples were selected, the formal requirements were assessed. From January samples were tested, the test report was available mid-March 2023. The obtained results of assessment were evaluated and filled in the ATEX DIFs.

During the last 3 months all results of formal and technical assessment was collected together and the final report of the joint action was prepared. The economical operators were informed of the results during summer/autumn 2023.

5. Sampling

The MSAs paid special attention to products that were manufactured in its own country, or the importer of products was located to its country.

To ensure the success of the campaign and to facilitate testing, the devices to be assessed in the campaign was limited to protection types:

- d (protection by flameproof enclosures),
- e (protection by increased safety) and
- t (protection by enclosure)

and the limited to only few thread sizes (M20 and M40). The limiting size is the outer diameter of cable glands.

6. Formal requirements

a. Markings

Participating MSAs have ensured that the selected samples are marked according to 1.0.5. in ANNEX II of ATEX Directive. The results of the assessment were filled in the ATEX data input form.

Traceability
- Product identification

- Name or registered trademark and address of the manufacturer
- Name or registered trademark and address /importer

CE marking
- Layout
- Size (at least 5 mm height)
- Notified Body number (if applicable)

ATEX markings
- Year of construction
- Specific marking of explosion protection followed by the symbol of the equipment-group and category
- For equipment-group II, the letter 'G' (concerning explosive atmospheres caused by gases, vapours or mists), and/or the letter 'D' (concerning explosive atmospheres caused by dust).
- Furthermore, where necessary, they must also be marked with all information essential to their safe use

If cable glands were certified as an Ex-component, the device certificate number shall include the suffix 'U'. The 'X' at the end of the certificate number is a symbol indicating there is some specific condition(s) that should be taken into account when using the equipment in Ex areas.

b. EU Declaration of Conformity

Participating MSAs ensured that the selected samples have EU Declaration of Conformity and the content of the EU declaration of conformity is according to ANNEX X of ATEX Directive. The Declaration of Conformity is vital document in the procedure to place safe product on the market. The results of the assessment were filled in the ATEX data input form.

c. Instructions

Participating MSAs ensured that the instructions of selected samples fulfil the national language requirements. Instructions and safety information must be translated in a language which can be easily understood by end-users, as determined by the Member State concerned. Such instructions and safety information, as well as any labelling, shall be clear, understandable and intelligible.

The testing laboratory checked the content of the instructions in accordance with the requirements of the standard EN 60079-0 Annex A chapter A.5.

7. Testing

For the purposes of the campaign, it was agreed to assess compliance with the ATEX essential health and safety requirements by measuring against the relevant parts of harmonised standards according to the DoC issued by the manufacturer.

During testing ATEX cable glands were fixed to the metal plate o according to the installation instructions by the manufacturer. The torque used to attach the threaded cable glands was also in accordance with the manufacturer's installation instructions.

The purpose of the campaign was not to perform full type testing for selected devices, only to perform few lightened versions of type testing and take advantage of visual assessment. The tests were based on EN IEC 60079-0:2018 and EN 60079-31:2014 (IEC 60079-31:2022) but are either partial, simplified or modified to reduce the costs of full testing. These tests were less onerous than the actual tests.

a. Resistance to impact

According to EN IEC 60079-0 chapter 26.4.2, the equipment shall be submitted to the effect of a test mass of 1 kg falling vertically from a height h. The mass is fitted with an impact head made of hardened steel in the form of a hemisphere of 25 mm diameter.

The height h is specified in Table 13 of the standard according to the application of the equipment. For some products, including cable glands and blanking elements, the manufacturer may choose between two drop heights, “high” and “low”. When the manufacturer requests the equipment is submitted to tests corresponding to the low risk of mechanical danger, the equipment shall have a specific condition of use. In this case the heights were either 0,7 m (impact strength high) corresponding to 7 J or 0,4 m (impact strength low) corresponding to 4 J according to the instructions of the product.

The resistance to impact test shall be made on equipment which is completely assembled and ready for use; however, if this is not possible (for example, for light-transmitting parts), the test shall be made with the relevant parts removed but fixed in their mounting or an equivalent frame. In this case the cable glands and blanking elements were attached on a test plate (thickness 3 mm) using a locknut using a torque value provided by the manufacturer.

The points of impact shall be the places considered to be the weakest and shall be on the external parts which may be exposed to impact. If the enclosure is protected by another enclosure, only the external parts of the assembly shall be subjected to the resistance to impact tests. In this case, the products were impact tested on parts that would be outside the enclosure it is attached to.

The equipment shall be mounted on a steel base so that the direction of the impact is normal to the surface being tested if it is flat, or normal to the tangent to the surface at the point of impact if it is not flat. The base shall have a mass of at least 20 kg or be rigidly fixed or inserted in the floor, for example, secured in concrete. Annex C of the standard gives an example of a suitable test rig. For testing of cable glands, the principle of the test rig is presented in Figure A.3 of EN IEC 60079-0. The samples were impacted according to Figure A.3 on a cable gland that was horizontally attached on the test plate. For the second impact, the test plate was rotated 90 degrees. The blanking elements do not protrude enough to be impacted in the same position as the cable glands. Instead, the tests plate was laid horizontally and the blanking elements were impacted directly on the face of the blanking element.

According to A.3.3 of EN IEC 60079-0 the cable gland shall be fitted with the smallest mandrel or cable size. As seen in flow chart of Annex G, the resistance to impact tests is performed on the same samples that go through the thermal endurance and IP testing. In this case a cable of random size was attached if one was available for additional support of the body against mechanical impact. In all cases, the nut part was tightened for the tests.

When the impact head strikes the test sample, it may exhibit one or more ”bounces”. The impact head shall not be removed from the surface of the test sample until it has come to rest.

The resistance to impact tests are performed at upper and lower test temperatures for equipment that have the enclosure or part of enclosure made of non-metallic material other that glass or ceramic. In this case, the tests are performed only at room temperature.

Acceptance criteria:
According to EN 60079-0 chapter 26.4.4, the resistance to impact and drop tests shall not produce damage so as to invalidate the type of protection of the electrical equipment.
Superficial damage, chipping to paint work, breakage of cooling fins or other similar parts of the electrical equipment and small dents shall be ignored.

For further reading, please see figure A.3 in EN IEC 60079-0 on how the impact rig was constructed.

b. Visual IP test

The IP test for cable glands is described in chapter A.3.4 (EN IEC 60079-0 Annex A) and the test shall be carried out in accordance with IEC 60529. Required IP classes for the cable glands:

Group I – IP54 minimum
Group II – IP54 minimum
Group III, EPL Da – IP6X minimum
Group III, EPL Db – IP6X minimum
Group IIIC, EPL Dc – IP6X minimum
Group IIIA or IIIB, EPL Dc – IP5X minimum

Complete IP test is a bit unnecessarily laborious, so instead of requirements of standards, in this campaign, the sealing test was done by visual inspection: visually inspected for ingress protection, e.g. that the sealing between the cable gland and the enclosure is properly placed relative to the clearance hole and the sealing is under compression. The sealing between the cable and the cable gland was not inspected.

The assessment according to Annex B of the joint cross-border ATEX market surveillance campaign was attached the cable gland on the test plate and visually inspect and assess for the possibility of meeting the required IP class. Due to the small tolerances (typical value of 0,2 mm), the cable glands were instead inspected with a digital vernier calliper to compare the size of the seal to the maximum clearance hole including the tolerance.

c. Instructions

The instructions were assessed against the requirements of EN IEC 60079-0 Annex A chapter A.5.

8. Results

The list of the assessed products by country can be found in Annex A.

Traceability Requirements

Manufacturers shall ensure that products which they have placed on the market bear a type, batch or serial number or other element allowing its identification. Manufacturers and importers (if manufacturer is not established in the EU) shall indicate, on the product, their name, registered trade name or registered trade mark and the postal address at which they can be contacted.

Table 1 – Compliance with traceability requirements			
Requirement of traceability	Number checked	Number compliant	Compliance (%)
Identification requirements (type designation)	18	14	77
Name of the manufacturer	18	14	77
Address of the manufacturer	18	1	5
Name of the importer (if needed)	-		
Address of the importer (if needed)	-		

CE marking

The CE marking was checked for the size (at least 5 mm height), layout and Notified Body number (if applicable).

Table 2 – Compliance with requirements of the CE marking			
Requirement of CE marking	Number checked	Number compliant	Compliance (%)
CE marking affixed	18	17	94
Layout of CE marking	17	14	82
Height of CE marking	17	0	0
NB number	17	17	100

ATEX markings

Table 3 – Compliance with ATEX markings			
Requirement of traceability	Number checked	Number compliant	Compliance (%)
Year of construction	18	4	22
Specific marking of explosion protection ( , equipment group and category)	18	12	66
Letter 'G' and/or the letter 'D	18	12	66
Other essential safety use marking	18	10	56

EU Declaration of Conformity

Participating MSA ensured that the selected samples have EU Declaration of Conformity and the content of the EU declaration of conformity is according to ANNEX X of ATEX Directive.

Table 4 – Compliance with DoC requirements				
Number of EUT assessed	DoC available	DoC not made available	DoC with no issues found	Overall DoC compliance (%) *
18	**17**	**1**	**10**	**56**

Instructions

MSA ensured that the instructions of selected samples fulfil the national language requirements.

Table 6 – Compliance with language requirements of instructions		
Number assessed	Compliant Manual	Overall instruction compliance (%)
18	4	22

Note:
In Norway, the regulation states that instructions for safety is in Norwegian but other instructions may be in Swedish, Danish or English.
In Sweden, the regulation states that all instructions are in Swedish.
In Finland, the regulation states that all instructions are in Finnish and Swedish

Resistance to impact

Cable glands and blanking elements were attached on a 3 mm steel plate using a locknut and impacted at room temperature using drop height 0,4 m or 0,7 m according to instructions.

Table 7 – Compliance with Resistance to impact test

Type of product	Number checked	Number compliant	Compliance (%)
Metal cable gland (M20)	6	6	100
Plastic cable gland (M20)	5	0	0
Plastic cable gland (M40)	2	2	100
Blanking element (M20/M40)	4	4	100

Visual IP test

The cable glands and blanking elements were visually inspected for the possibility of complying with the required IP class (joint between cable gland / blanking element and enclosure).

Table 8 – Findings of Visual IP test

Findings	Number of findings
No issues found	7
Sample was provided with a flat gasket, but instructions did not specify tolerance for the clearance hole, likely not an issue due to large margin in flat gaskets	2
Sample was provided with an O-ring, but instructions did not specify tolerance for the clearance hole	4
Sample did not have any gasket, but the instructions mention a specific gasket is required for dust applications according to EN 60079-31:2014	1
Sample did not have any gasket and the instructions do not mention a gasket needs to be used in dust applications according to EN 60079-31:2014	3

Instructions

The instructions were assessed against the requirements of EN IEC 60079-0 Annex A chapter A.5.

Table 9 – Compliance with Instructions requirements

Instructions requirement	Number compliant	Compliance (%)
Minimum and maximum diameter of the cable of circular cables	17	100
Minimum and maximum dimensions of non-circular and metal-sheathed cables	N/A	N/A
Tightening process of the compression element, including the tightening torque (only gable glands)	11	85
For compound-filled glands, details on the installation of the filling compound	N/A	N/A
For compound-filled glands, the maximum diameter over cores of the cable that the gland is intended to accept and the maximum numbers of cores that can pass through the compound	N/A	N/A
For entries into enclosures: Threaded entries		
Thread size	15	88
Tolerance class	5	29
Enclosure material limitations	14	82
Enclosure interface sealing method	14	82
Maximum surface roughness of the enclosure face for sealing	4	24
Thickness range of the enclosure wall (minimum)	8	47
Thickness range of the enclosure wall (maximum)	3	18
Perpendicularity	5	29
Permitted use and location of any earth tags	-	
For entries into enclosures: Clearance holes		
Hole dimensions, including tolerance	9	53
Enclosure material limitations	N/A	N/A
Thickness range of the enclosure wall (minimum)	7	41
Thickness range of the enclosure wall (maximum)	3	18
Enclosure interface sealing method	14	82
Maximum surface roughness of the enclosure face for sealing	4	24
Perpendicularity	5	29
Cable gland securing details	15	88
Permitted use and location of any earth tags	-	

9. Conclusion and recommendations

In general, the level of compliance with the formal requirements was very low. In particular, the products lacked manufacturer's information, the height of CE marking was too small and the provided instructions and safety information did not meet the national language requirements. The language requirements differ regarding each country's national legislation.

The purpose of the campaign was not to perform full type testing for selected devices, only to perform few lightened versions of type testing and take advantage of visual assessment. The results of testing were quite good.

Some feedback from an economic operator indicated that the use of number of turns to achieve the correct tightening, is a better model than to use a specified torque spanner. This issue is something for the TC 31 to look further into.

The impact test on cable glands made out of plastics and of small sizes (M20) is particular interesting as all failed. The reason could be to the lack of correct instructions for installment in the plate, and that shows the importance of the manufacturer to provide these.

The results of the campaign should be publicized widely throughout Europe.

Comments from manufacturer/importers regarding non-compliance

IP ratings

Some cable glands failed in the visual IP-check because they were not supplied with gasket fitted even if the instruction stated that sealing washer is required to achieve the stated IP-ratings. The user of the cable gland will normally understand that they must use gasket to achieve the IP-rating. Probably we should have informed the economical operators which test we planned and asked for a complete product including sealing washers.

Fitting instructions

From some of the manufacturers we got feedback that some details in the Annex regarding instruction is not fully incorporated, and do not fit all situations and combination to the cable gland and enclosure. It is also stated from one manufacturer that Notified Bodies have accepted how to make the instructions that now is stated as a non-compliance. Specifically, these are about surface roughness of the enclosure, the thickness of the wall and the torque values.

The standardisation committee, Notified Bodies and Manufacturers should review the standard and update the requirements. It must be commented that some of the manufacturers have no remarks regarding these requirements.

Annex A

Finland

The following products were assessed in Finland:

Type of product	Brand	Type
Cable gland	Thermon / Bimed	BMD BM-X2S (DS)
Blanking element	Thermon / Bimed	BMD TP-X1S
Cable gland	WISKA Hoppmann GmbH	ESKE
Blanking element	WISKA Hoppmann GmbH	EX-*VSG ** (LT)
Cable gland	Pflitsch GmbH	blueglobe TRI
Blanking element	Pflitsch GmbH	Ex e*
Cable gland	U.I. Lapp GmbH	SKINTOP K-M40X1,5 ATEX
Blanking element	U.I. Lapp GmbH	SKINDICHT BL-M40x1,5 ATEX

Norway

The following products were assessed in Norway:

Type of product	Brand	Type
Cable gland	PEPPER	A2LBF/20/M20 Brass
Cable gland	Hawke	501/421 | Ex d & Ex e |
Cable gland	TRANBERG	TEF D620
Cable gland	CMP	A2F

Sweden

The following products were assessed in Sweden:

Type of product	Brand	Type
Cable gland	Bimed Teknik Aletler San. ve Tic. A.S.	BMD EHIBM-MX2C (DS)
Cable gland	Cooper Crouse-Hinds GmbH Eaton Geag	GHG9601955R0023
Cable gland	Cooper Crouse-Hinds GmbH Eaton Geag	GHG9601955R0003
Cable gland	Crouse-Hinds by EATON – Cooper Capri S.A.S.	ADE-1F2 n°6
Cable Gland	Hummel AG	HSK-K-Ex-Active
Cable Gland	Wiska Hoppman GmbH	ESKE/1(S)(-L)-*(-RDE) 16

Annex B

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