

## REPORT

IB-11-8-115

about the testing of  
**Cable glands with pressure compensation of type DAE  
and a Pressure Compensating Plug of type DAE**

- Translation -

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## REPORT

### IB-11-8-115

#### about the testing of Cable glands with pressure compensation of type DAE and a Pressure Compensating Plug of type DAE

#### 1 Type of test

- Test of the protection against the ingress of dust and water according to DIN EN 60529: 2000, paragraphs 13 and 14
- Test of air permeability to equalize pressures at various pressure differences (relative pressures)

#### 2 Test item

Cable glands with pressure compensation, size M12x1.5 up to M20x1.5, type DAE  
Pressure Compensating Plug, size M40x1.5, type DAE

of Rabe-System-Technik und Vertriebs GmbH  
49125 Wallenhorst, GERMANY

RST- Article-No.	11087514	11087516	11087520	60087514	60087516	60087520	11087540
Enclosure- material	polyamide PA 6	polyamide PA 6	polyamide PA 6	brass /Ni plated	brass /Ni plated	brass /Ni plated	polyamide PA 6
colour	RAL 7035	RAL 7035	RAL 7035				RAL 7035
Connection thread size	M12 x1.5	M16 x1.5	M20 x1.5	M12 x1.5	M16 x1.5	M20 x1.5	M40 x1.5
Seal type	ring, flat	ring, flat	ring, flat	O-seal	O-seal	O-seal	ring, flat
Threadseal material	chloro- prene (CR)	chloro- prene (CR)	chloro- prene (CR)	perbunan (NBR)	perbunan (NBR)	perbunan (NBR)	chloro- prene (CR)
Clampseal range	4-8 mm	4-8 mm	6-12 mm	4-8 mm	4-8 mm	6-12 mm	---
Clampseal material	chloro- prene (CR)	chloro- prene (CR)	chloro- prene (CR)	chloro- prene (CR)	chloro- prene (CR)	chloro- prene (CR)	---
PM-No. (IBExU)	EXel 008- 12	EXel 009- 12	EXel 010- 12	EXel 011- 12	EXel 013- 12	EXel 014- 12	EXel 583- 11

### 3 Customer

Rabe-System-Technik GmbH  
Otto-Lilienthal-Straße 19  
49134 Wallenhorst  
GERMANY

### 4 Test documents

- enquiry/ order with letter of 18<sup>th</sup> October 2011 and 3<sup>rd</sup> January 2012
- order confirmation with letter Ri/Leh 243/12 of 10<sup>th</sup> January 2012
- extension of order with email of 10<sup>th</sup> February 2012
- DIN EN 60529:2000
- preliminary datasheet „DAE-Cable gland“, RST-catalogue sheet no. 41
- preliminary datasheet „DAE Polyamid M40“, RST- catalogue sheet no. 39
- test samples of cable glands (IBExU PM-No. EXel 008/12...011/12, 013/12, 014/12)
- test samples of pressure compensating plug (IBExU PM-No. EXel 583/12)

The test items delivered to IBExU on 20<sup>th</sup> October 2011 and on 5<sup>th</sup> January 2012.

### 5 Execution of the tests and results

The tests were carried out from 12<sup>th</sup> January until 10<sup>th</sup> February 2012.

The cable glands with pressure compensation of type DAE, M12x1.5 up to M20x1.5, consist of PA6/RAL7035 and brass/ nickel plated, were equipped with mandrels. The outer diameters of the mandrels corresponded with the smallest intended diameters of the cable glands. The sealing between cable gland and mandrel realised by clampseal consists of chloropren (CR).

The connection thread by enclosure of cable glands sealed with ringtype flat gasket consists of chloroprene (CR) or sealed with O-seal consists of perbunan (NBR) by manufacturer.

The enclosure of pressure compensating plugs type DAE M40x1.5 consists of PA6/RAL7035, the connection thread sealed with ringtype flat gasket consists of chloropren (CR) by manufacturer.

Test samples of each type were mounted at empty control boxes for tests. The pressure compensating plugs had to mount separate at control box because of high air permeability.

The following limitations of torque were tested as the minimum for cable glands to be sealed between cable, replaced by mandrel, and enclosures:

PM-No. (IBExU)	article (description)	article (item)	minimum of torque	remark
EXel 008-12	DAE PA6 M12x1.5	11087514	1.0 Nm	
EXel 009-12	DAE PA6 M16x1.5	11087516	1.0 Nm	
EXel 010-12	DAE PA6 M20x1.5	11087520	2.5 Nm	
EXel 011-12	DAE Ms M12x1.5	60087514	3.0 Nm	
EXel 013-12	DAE Ms M16x1.5	60087516	3.0 Nm	
EXel 014-12	DAE Ms M20x1.5	60087520	3.0 Nm	
EXel 583-11	DAE Pressure Compensating Plug PA6 M40x1.5	11087540	approx. 2 Nm	using tools not provided

With a little bit stronger screwing of the connection threads it was diagnosed the fact that partially the seals are pressed out and surfaced between enclosure of cable glands and control boxes. That can be reason of leakages, loosening and deficit the protection against dust and/ or fluids.

That may be the case in priority of cable glands type DAE PA6 M16x1.5 (no. 11087516) and DAE Ms M12x1.5 (no. 60087514).

## 5.1 Test of the dust tightness IP 6X according to EN 60529, paragraphs 13.4 and 13.6

In accordance with the specifications of EN 60529, paragraphs 13.4 and 13.6 this configuration was tested for the compliance with the degree of protection IP 6X (dust-tight) in an appropriate dust chamber.

### 5.1.1 Test cable glands type DAE M12...20

The test parameters were:

Test apparatus:	dust chamber according to EN 60529
Produced underpressure:	≤ 2 kPa
Enclosure volume:	2.8 dm <sup>3</sup>
Sucked air quantity:	79.3 l
Test time duration:	8 h
Result of visual inspection:	no ingress of dust

Test result: **IP 6X fulfilled**

## 5.1.2 Test pressure compensating plug type DAE M40

The test parameters were:

Test apparatus:	dust chamber according to EN 60529
Produced underpressure:	≤ 2 kPa
Enclosure volume:	0.05 dm <sup>3</sup>
Sucked air quantity:	6.3 l
Test time duration:	2 h
Result of visual inspection:	no ingress of dust

Test result: **IP 6X fulfilled**

## 5.2 Test of the protection against powerful water jets IP X6 according to EN 60529, paragraph 14.2.6 und paragraph 14.3

After that the test equipment with cable glands and pressure compensation plugs was tested for the compliance with the degree of protection IP X6 (protection against powerful water jets) in accordance with the specifications of DIN EN 60529, paragraph 14.2.6. The dust depositions at the membranes were removed before.

The test parameters were:

Test apparatus:	Water jet hose nozzle 12.5 mm
Water flow rate:	100 l/min ± 5 %
Temperature difference:	≤ 5 K
Distance nozzle-enclosure:	2.5 ... 3.0 m
Test time duration:	3 min
Result of visual inspection:	no ingress of water

Test result: **IP X6 fulfilled**

## 5.3 Test of the protection against the effects of temporary immersion IP X7 according to EN 60529, paragraph 14.2.7 and paragraph 14.3

New test samples each type equipped with mandrels and mounted at control boxes were tested for the compliance with the degree of protection IP X7 (protection against the effects of temporary immersion) in accordance with the specifications of DIN EN 60529, paragraph 14.2.7.

The test parameters were:

Test apparatus:	Water basin
Temperature difference:	≤ 5 K
Depth of immersion:	1000 mm
Test time duration:	30 min
Result of visual inspection:	no ingress of water

Test result: **IP X7 fulfilled**

#### 5.4 Test of air permeability to equalize pressures

For the inquiry of a max. pressure difference which can be still look practically because of having no information about special application terms for these cable glands and pressure compensation plugs the following considerations were done to get a value of highest pressure difference for test:

- a) statistically upraised max. barometric variation in Germany, duration 24 hours
- b) max. ambient temperature variation in Germany, duration 24 hours
- c) possibly usage in the civil aviation, allowed min. cabin altitude of 2,438 m and rate of descent up to -300 ... -610 m/min for passenger aircrafts

The max. air pressure difference results by static water level (height above sea level) and the cabin pressure inside aircraft which is limited by administration.

The cable glands with pressure compensation and the pressure compensation plug were tested on air permeability at various relative pressures (pressure differences). Therefore the respective test sample was screwed in an empty pressure vessel for over-pressurization. The pressure vessel was supplied with an overpressure of more than 300 mbar rel., subsequent the pressure loss in the pressure vessel was measured with a differential pressure sensor type GMH 3180 (PM 0463).

Test apparatus:	pressure vessel
Enclosure volume:	25.4 l
Ambient temperature:	19 °C
atmospheric pressure (ambient):	984 mbar
temperature difference (compressed air):	≤ 5 K
Max. pressure difference:	300 mbar
Test duration:	pressure compensation ( $\Delta p \leq 1$ mbar)

The following quantities of air in dependence of the relative air pressure in the test enclosure were evaluated:

PM-No. (IBExU)	article (description)	article (item)	Test of air permeability		
			300 mbar rel.	200 mbar rel.	100 mbar rel.
EXel 008-12	DAE PA6 M12x1.5	11087514	6.9 l/min	3.9 l/min	1.8 l/min
EXel 009-12	DAE PA6 M16x1.5	11087516	12.6 l/min	7.1 l/min	3.4 l/min
EXel 010-12	DAE PA6 M20x1.5	11087520	19.9 l/min	11.0 l/min	4.7 l/min
EXel 011-12	DAE Ms M12x1.5	60087514	8.2 l/min	4.4 l/min	2.0 l/min
EXel 013-12	DAE Ms M16x1.5	60087516	9.3 l/min	4.9 l/min	2.4 l/min
EXel 014-12	DAE Ms M20x1.5	60087520	17.1 l/min	9.6 l/min	4.1 l/min
EXel 583-11	DAE Pressure Compensating Plug PA6 M40x1.5	11087540	75 l/min	75 l/min	43 l/min

## 6 Summary

The cable glands with pressure compensation type DAE M12 up to M20 and the pressure compensating plug type DAE M40 mentioned in 2 fulfil the requirements for the protection against dust, degree of protection IP 6X, as well as the requirements for the protection against powerful water jets, degree of protection IP X6 and against the effects of temporary immersion, degree of protection IP X7, according to DIN EN 60529.

## 7 Safety instructions

For the fulfilment of the demands and the maintenance of the degrees of protection IP66 and IPX7 must observe and check the correct mounting especially seat and placement of seal between thread and case.