

# DESIGN VERIFICATION TEST REPORT

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**Test Item** 6 and 14 slot Schroff AdvancedTCA Systems

**Identification** 14 Slot ATCA 11990-604  
6 Slot ATCA 11990-202 and 11596-160

**Test Order** Mechanical test on transport packaging

**Reported by** Jochen Mueller

**Date** 20.05.2015

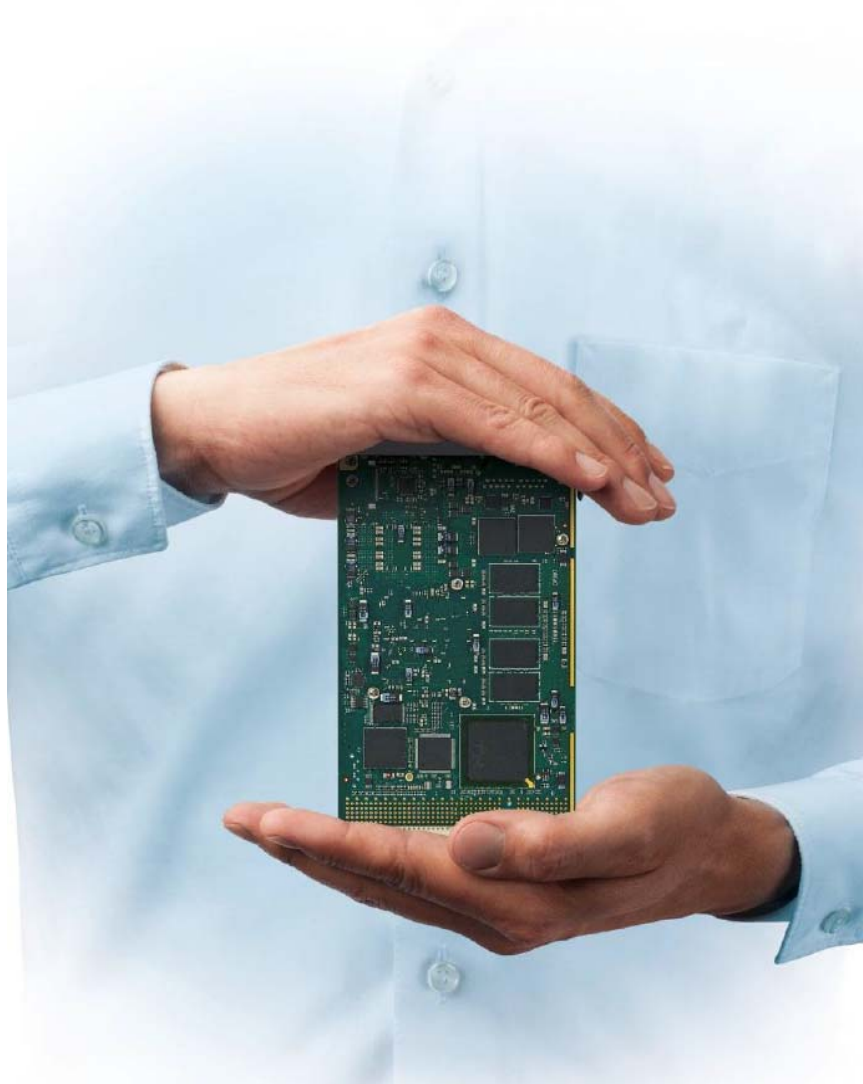
**Signature**



**Jochen Mueller**  
Project Management Systems

Schroff GmbH  
Langenalber Str. 96 - 100  
75334 Straubenhardt, Germany  
Office +49.7082.794.494  
Fax +49.7082.794.505 Mobile  
+49.160.3635449  
[jochen.mueller@nvent.com](mailto:jochen.mueller@nvent.com)

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Test report for

## Mechanical test on packaging 6 & 14 slot

335271-100 R1.1



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### 1 General information

|                |                          |                   |                   |
|----------------|--------------------------|-------------------|-------------------|
| Customer       | Schroff GmbH             | Test engineer     | Ben Tjoeng        |
| Contact person | Jochen Müller            |                   | Otto van den Berg |
| Reference      | -                        | Date of test      | 11-05-2015        |
| Email or tel.  | jochen.mueller@nvent.com | Project caxa code | 335271-100        |
|                |                          | Test standards    | ISTA 1D           |

#### 1.1 Document history

| Release     | Date       | Author            | Changes                                   |
|-------------|------------|-------------------|-------------------------------------------|
| Release 1   | 20-05-2015 | Otto van den Berg | -                                         |
| Release 1.1 | 22-05-2015 | Otto van den Berg | Pictures changed, small errors corrected. |
| Release 1.2 | 27-05-2015 | Otto van den Berg | Pictures added.                           |

#### 1.2 Unit description (product in packaging)

| Customer part nr | Test ID | Product | Materials                                         | Weight | Dimensions     |
|------------------|---------|---------|---------------------------------------------------|--------|----------------|
| 11990-604        | 1       | 14-Slot | Corrugated top on wooden pallet, PE foam buffers. | 52kg   | 900x600x900 mm |
| 11990-202        | 2       | 6-Slot  |                                                   | 34kg   | 900x600x500 mm |
| 11596-160        | 3       | 6-Slot  |                                                   | 27kg   | 900x600x550 mm |

### 2 Introduction

Mechanical tests with random vibration-, drop- and compression tests are performed according test standard ISTA 1D. Engineers of Pentair are present during testing and inspection.

#### 2.1 Product & packaging pictures



1. 11990-604 (14-Slot)



2. 11990-160 (6-Slot)



3. 11596-202 (6-Slot)

#### 2.2 Inspection

Before the test, the product is visually inspected from the outside and the packaging is checked on fitment. After the all tests, the product is again checked visually on possible damage and the state of the packaging. Final inspection and functional tests should be done by the end-customer, Pentair.

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### 3 Goal

The goal of this test is to see whether the packaging protects the product sufficiently during transport.

### 4 Testing

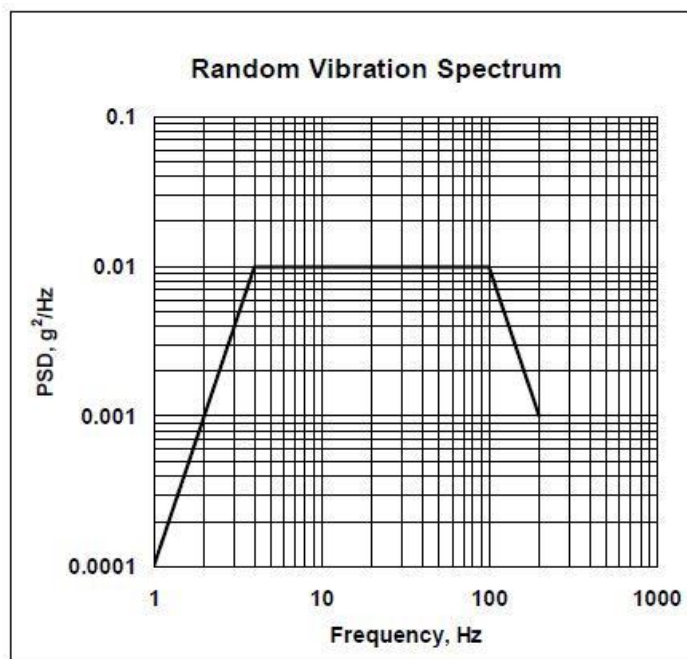
The packed products are tested at ambient temperature and relative humidity.

#### 4.1 Vibration test equipment

| Test Equipment              | Serialnumber | Type        | Test setting |                           | Severity   | Remarks          |
|-----------------------------|--------------|-------------|--------------|---------------------------|------------|------------------|
| D.L. Electro Dynamic Shaker | D1108163     | ES70LS3-550 | 1.0-4.0Hz    | 0.0001 g <sup>2</sup> /Hz | 1 axis     | Random vibration |
|                             |              |             | 4.0-100Hz    | 0.01 g <sup>2</sup> /Hz   | Surface 3  |                  |
|                             |              |             | 100-200Hz    | 0.001 g <sup>2</sup> /Hz  | 30min/axis |                  |

#### 4.2 Test setup vibration test

Plates are installed to keep the packages on the table. The three packages are tested simultaneously.



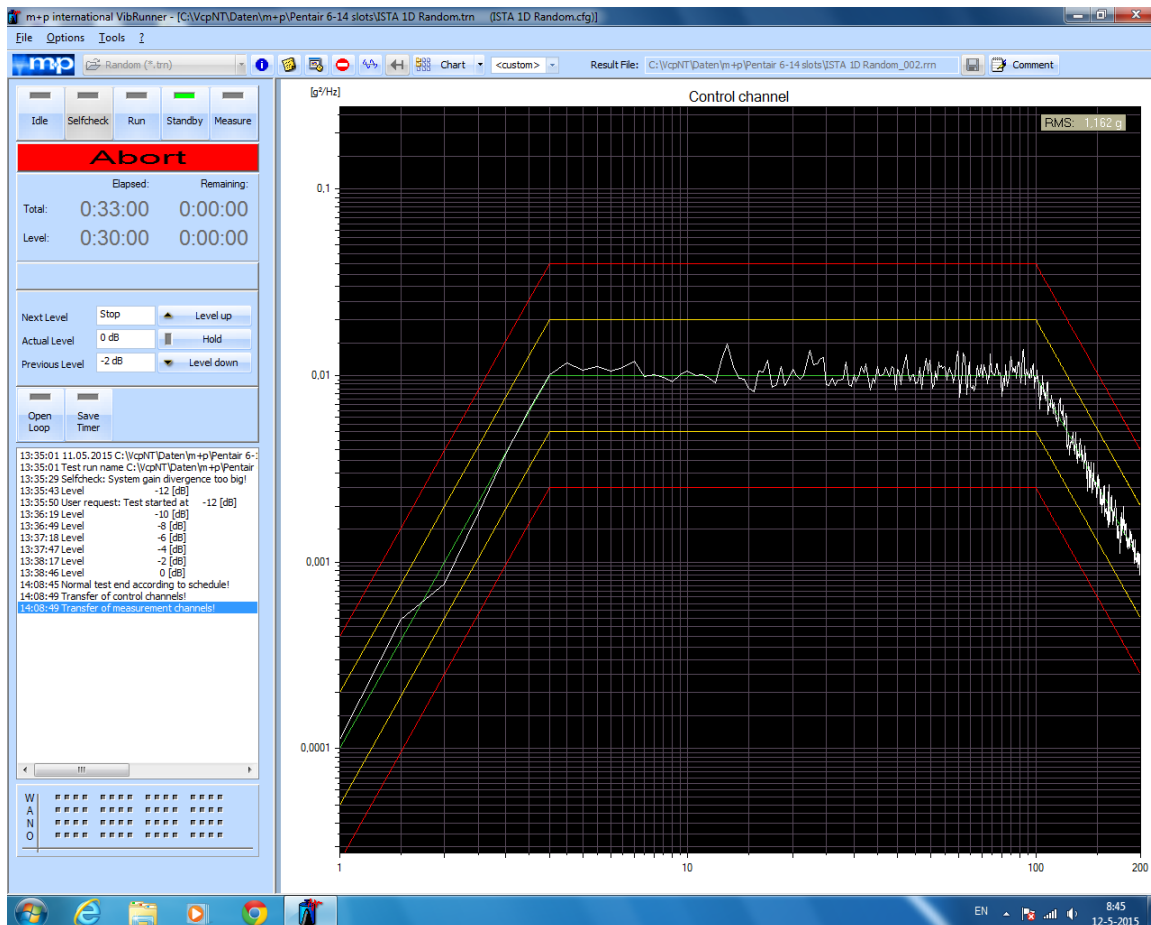
Vibration profile



Shaker

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### 4.3 Test results



Random vibration test

### 4.4 Rotational Drop test equipment

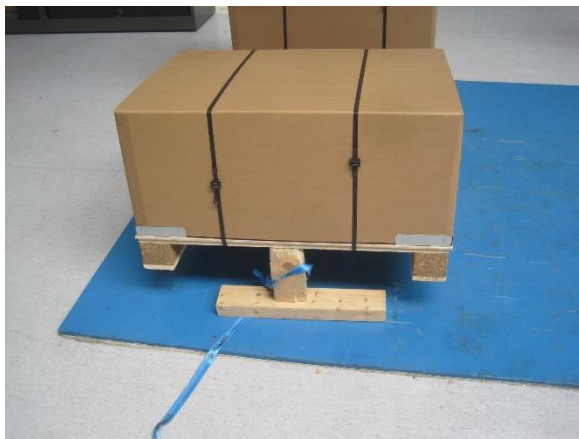
| Test Equipment                         | Serialnr | Type | Test setting       | Sequence                | Remarks |
|----------------------------------------|----------|------|--------------------|-------------------------|---------|
| Wooden blocks of 100 and 200 mm, Strap |          |      | Drop height 200 mm | Edge 2-3, 4-3, 5-3, 6-3 |         |

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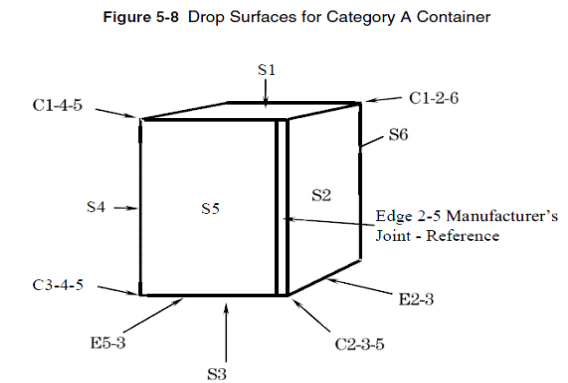
### 4.5 Test setup drop test



Drop test on an edge of the 14 slot package nr1



Drop test on an edge of 6-slot package nr 3



Drop test on an edge of 6-slot package nr2

### 4.6 Test results

No remarks.

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### 4.7 Compression test equipment

| Test Equipment | Serial number | Type    | Test setting     |
|----------------|---------------|---------|------------------|
| Jinan Ripu     | 24416         | WBZ-100 | Compression test |



Compression on 14 slot package nr1



Compression on 6 slot package nr2



Compression on 6 slot package nr 3

### 4.8 Compression load calculation

The compression load is calculated and tested according ISTA 1D using the Apply and Release test method as agreed.

$$\text{Test load} = (1300 + (W_t \times 9,8) + (530 \times (L + W))) \times 1.4 \quad [\text{N}]$$

$$W_t = \text{weight} \quad [\text{kg}]$$

$$L = \text{Length} \quad [\text{m}]$$

$$W = \text{Width} \quad [\text{m}]$$

$$9.8 = \text{gravitational acceleration} \quad [-]$$

$$1.4 = \text{compensating factor for time of compression} \quad [-]$$

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Calculated test load.

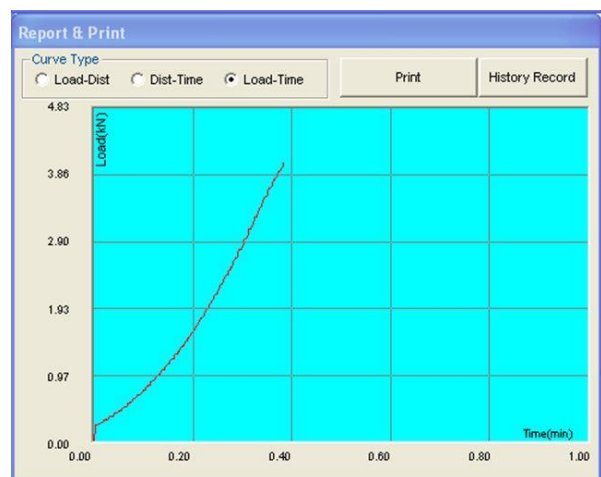
| Tested Equipment | Weight     | Test load | Remarks                                                   |
|------------------|------------|-----------|-----------------------------------------------------------|
| 6-slot           | 35 kg (*)  | 3.4 kN    | (*) The max. weight until customer                        |
|                  | 65 kg (*)  | 3.9 kN    | (*) The max. weight customer can add for further shipment |
| 14-slot          | 65 kg (*)  | 3.9 kN    | (*) The max. weight until customer                        |
|                  | 135 kg (*) | 4.8 kN    | (*) The max. weight customer can add for further shipment |

### 4.9 Test results

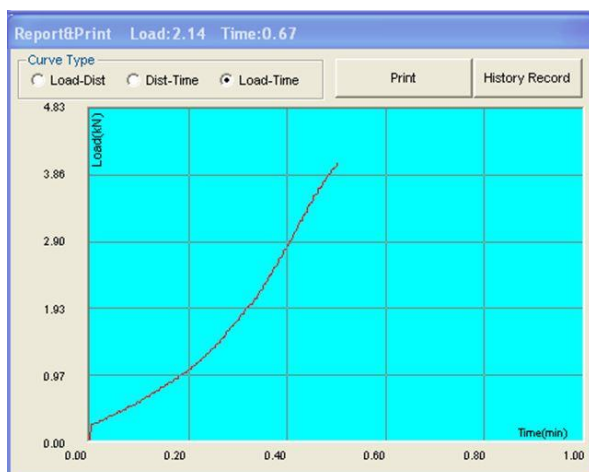
**6-slot 35 kg: 11990-202: passed**



**6-slot 65 kg: 11990-202: passed**



**6-slot 35 kg: 11596-160: passed**

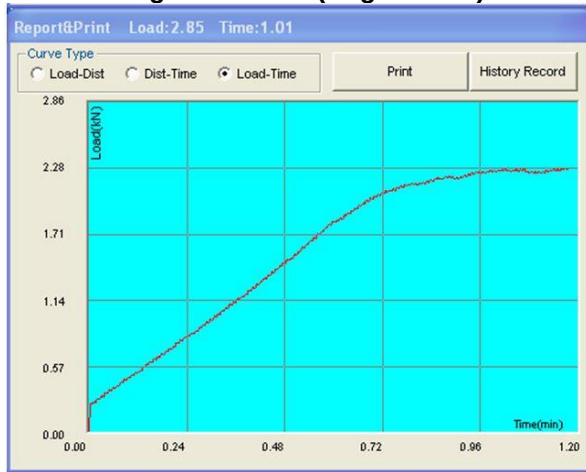


**6-slot 65 kg: 11596-160: passed**



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### 14-slot 65 kg: 11990-604 (original box)



**The packaging failed, 3.9 kN is required.**

The design includes a horizontal rill-line in the sides and vertical splits at the top corners to vary the height of the packaging.

The packaging bends at the creased line before reaching the required value of 3.9 kN.

A new cardboard top, without the crease-line is produced and tested as planned.

### Re-design box for 14-Slot.

As the original box is made higher by using the creased lines in the top flaps, failed during the compression test, a new higher box is made without creased lines in the vertical faces.

A new compression test is done to see whether the new box meets the required load.

The result is positive.



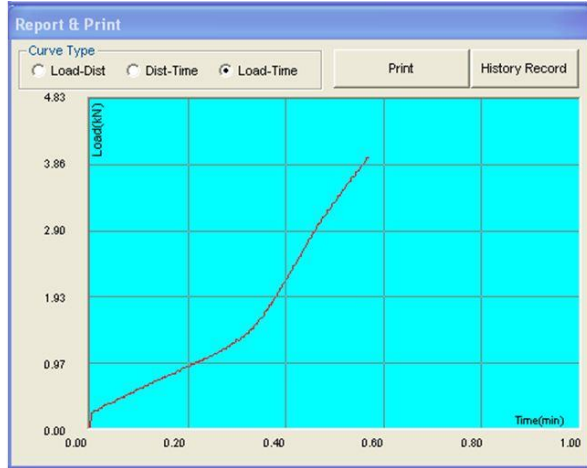
*Original box 14-Slot*



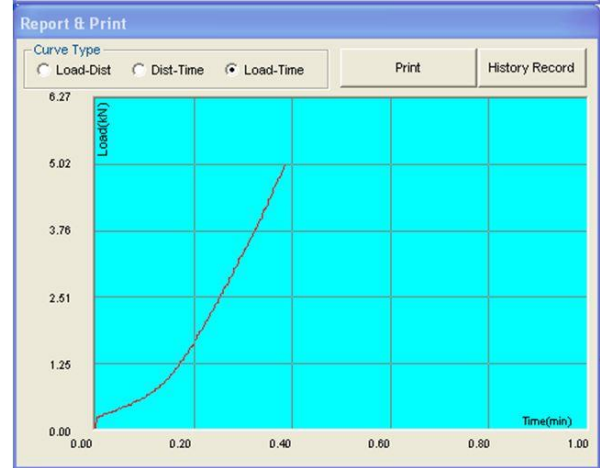
*Re-design box 14-Slot*

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### 14-slot 65 kg 11990-604 re-design box passed

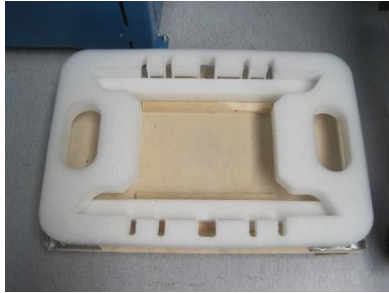


### 14-slot 135 kg 11990-604 redesign box passed



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### 5 Visual inspection after mechanical tests.



#### 5.1 Comments

No visible damage to the products  
Functional test and final check should be done by Pentair.

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### 6 Preliminary Conclusion

The 6-Slot packages (test ID 2 and 3) passed the test.

The 14-Slot package (test ID 1) **failed with the original box during compression test.**

The 14-Slot package **passed the test with re-design box.**

**Date** 20-05-2015

**Author** Otto van den Berg Ben Tjoeng

**Signature**

