

## **Customer Test Report on NOVUX™ SEC-100 aerial wall terminal**

This test report details the results of optical, mechanical, and environmental tests carried out on NOVUX™ SEC-100 aerial wall terminal.

Testing is done according to:

- RUD 5580 C – Performance specification of NOVUX SEC-100 aerial wall terminal and cable clip

An overview table gives summarized results. Detailed test results and sample descriptions are described further in this document.

### **Conclusions**

All performed tests were done according to the above-mentioned specification and were completed with positive results

The product is designed to operate in outdoor, aerial, non-weather protected locations as described in the following standards:

- ETSI EN 300 019-2-4 T4.1 Stationary use at non-weather protected locations
- IEC 61753-1 Category A - free breathing terminal

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## 1 Test results overview

Detailed results are given further in section 2 – 7.

### 1.1 Overview sealing performance results

Section	Test Name	Number of samples	Result
3.1	Assembly / disassembly closures	4	Pass
3.2	Cable retention wall terminal box	4	Pass
3.3	Cable bending	4	Pass
3.4	Cable torsion	4	Pass
3.5	Impact	8	Pass
3.6	Change of temperature wall terminal	4	Pass
3.7	Salt mist	4	Pass

### 1.2 Overview optical performance results

Section	Test Name	Number of samples	Result
5.1	Cable retention	1	Pass
5.2	Cable bending	1	Pass
5.3	Cable torsion	1	Pass
5.4	Reconfiguration 1	2	Pass
5.5	Reconfiguration 2	2	Pass
5.6	Shock	2	Pass
5.7	Vibration	2	Pass
5.8	Change of temperature	2	Pass

### 1.3 Overview material performance results

Section	Test Name	Number of samples	Result
6.1	Resistance to solvents and contaminating fluids	6 samples black	Pass
		6 samples grey	Pass
6.2	UV resistance of outer polymer materials	3 samples black	Pass
		3 samples grey	Pass
6.3	Fungus resistance (Mold growth)	4 samples black	Pass
		4 samples grey	Pass

### 1.4 Overview storage and transportation performance results

Section	Test Name	Number of samples	Result
7.1	Cold	4	Pass
7.2	Dry heat	4	Pass
7.3	Damp heat (steady state)	4	Pass

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**2 Sealing performance pass / fail criteria**

**2.1 Protection against ingress of dust IP5x**

General

Product	NOVUX™ SEC 100 aerial wall terminal
Date of testing	November 2022

Method and conditions	Test standards followed	Requirements
Dust type: Talcum powder Dust density: 2 kg/m <sup>3</sup> Pressure: No pressure differences Duration: 8 h	IEC 60529	Ingress of dust in the terminal shall not cause functional problems like preventing access to or handling of fibers and components, impossible to clean connectors and adapters. The IP5x requirements is not required for the cable protection clip.

Results

Number of samples:	See test samples of tests in sections 3	Pass
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## 2.2 Protection against ingress of water IPx5

### General

Product	NOVUX™ SEC 100 aerial wall terminal
Date of testing	November 2022

Method and conditions	Test standards followed	Requirements
Spray medium: Tap water at ambient temperature Internal Ø nozzle: 6.3 mm Flow rate: 12.5 l/minute ± 5% Water pressure: Adjusted to get specified flow rate Core of water stream: Diameter 40 mm at 2.5 m distance. Distance nozzle/sample: Between 2.5 m and 3 m Sample position: Wall mounted in a position according to the installation instructions, 1.5 meters above ground. Locations: All practicable accessible sides: Duration: 1 minute / m2 of the terminal surface, but in total at least 3 minutes 1 minute on cable protection clip	IEC 60529	Water sprays against the terminal from any practicable direction shall not cause accumulation of water exceeding 1% of the inner volume of the terminal. No ingress of water allowed in the cable protection clip.

### Results

Number of samples:	See test samples of tests in sections 3.	Pass
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**2.3 Visual examination**

**General**

Product	NOVUX™ SEC 100 aerial wall terminal
Date of testing	November 2022

Method and conditions		Test method followed	Requirements
Examination of product with naked eye.	Inspection with the naked eye for flaws, defects, permanent deformation, cracks, or impurities that could impair functionality.	IEC 61300-3-1	No defects which would adversely affect product performance

**Results**

Number of samples:	See test samples of tests in sections 3.	Pass
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## 3 Detailed test results for sealing performance

### 3.1 Assembly/disassembly of terminal

#### General

Product	NOVUX™ SEC 100 aerial wall terminal
Date of testing	November 2022

Method and conditions	Test method followed	Requirements
Number re-entries: 5 times Aging between each re-entry: At least one temperature cycle Temperature cycle: (-40 ±2) °C to (+65±2) °C Dwell time: 4 h Transition: 1 °C/minute	IEC 61300-2-33	Visual examination (see 2.3) Protection against ingress of dust (IP5x) (see 2.1) Protection against ingress of water (IPx5) (see 2.2) No dust test required for clip

#### Results

Number of samples: 4	Pass
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### 3.2 Cable retention for terminal

#### General

Product	NOVUX™ SEC 100 aerial wall terminal
Date of testing	November 2022

Method and conditions	Test method followed	Requirements
Test temperatures: (-15 ± 2) °C and (+45 ± 2) °C Force: Ø cable (mm) x 10 N/mm for feeder cables 25 N for drop cables Rate: Load smoothly, applied in 15 s Duration: Feeder cable: 1 h Drop cable: 1 minute	IEC 61300-2-4	Visual examination (See 2.3) Protection against ingress of dust (IP5x) (see 2.1) Protection against ingress of water (IPx5) (see 2.2)

#### Results

Number of samples: 4	Pass
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### 3.3 Cable bending (only drop cables of terminal)

#### General

Product	NOVUX™ SEC 100 aerial wall terminal
Date of testing	November 2022

Method and conditions	Test method followed	Requirements
Test temperatures: $(-15 \pm 2) \text{ }^\circ\text{C}$ and $(+45 \pm 2) \text{ }^\circ\text{C}$ Bending angle: $-30^\circ$ and $+30^\circ$ in random direction  Duration at each extreme position: 5 minutes Point of application: 400 mm from end of cable seal Number of cycles: 5 cycles per cable and per test temperature in random directions, unless not possible by physical constraints or cable design.	IEC 61300-2-37	Visual examination (see 2.3) Protection against ingress of dust (IP5x) (see 2.1) Protection against ingress of water (IPx5) (see 2.2)

#### Results

Number of samples: 4	Pass
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### 3.4 Cable torsion (only drop cables of terminal)

#### General

Product	NOVUX™ SEC 100 aerial wall terminal
Date of testing	November 2022

Method and conditions	Test method followed	Requirements
Test temperature: $(-15 \pm 2) \text{ }^\circ\text{C}$ and $(+45 \pm 2) \text{ }^\circ\text{C}$ Torsion angle: $-90^\circ$ and $+90^\circ$ Point of application: 400 mm from end of cable seal Duration at each extreme position: 5 minutes Tensile load: None Number of cycles: 5 per cable per test temperature	IEC 61300-2-5	Visual examination (See 2.3) Protection against ingress of dust (IP5x) (see 2.1) Protection against ingress of water (IPx5) (see 2.2)

#### Results

Number of samples: 4	Pass
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### 3.5 Impact of terminal

#### General

Product	NOVUX™ SEC 100 aerial wall terminal
Date of testing	November 2022

Method and conditions	Test method followed	Requirements
Test temperatures: $(-15 \pm 2) ^\circ\text{C}$ and $(+45 \pm 2) ^\circ\text{C}$ Impact tool: Steel ball Mass: 1 kg Drop height: 0.2 m Location: In the middle on front side Number of impacts: 1	IEC 61300-2-12 Method B	Visual examination (see 2.3) Protection against ingress of dust (IP5x) (see 2.1) Protection against ingress of water (IPx5) (see 2.2)

#### Results

Number of samples: 16	Pass
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### 3.6 Change of temperature for terminal

#### General

Product	NOVUX™ SEC 100 aerial wall terminal
Date of testing	November 2022

Method and conditions	Test method followed	Requirements
Lowest temperature: $(-40 \pm 2) ^\circ\text{C}$ Highest temperature: $(+65 \pm 2) ^\circ\text{C}$ Dwell time: 4 h Transition: $1^\circ\text{C} / \text{minute}$ Number of cycles: 12	IEC 61300-2-22	Visual examination (see 2.3) Protection against ingress of dust (IP5x) (see 2.1) Protection against ingress of water (IPx5) (see 2.2)

#### Results

Number of samples: 4	Pass
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### 3.7 Salt mist for terminal

#### General

Product	NOVUX™ SEC 100 aerial wall terminal
Date of testing	November 2022

Method and conditions	Test method followed	Requirements
Temperature: (+35 ± 2) °C Salt solution: 5 % NaCl in water (pH between 6,5 and 7,2) Duration: 5 days Test sample: Closed box	IEC 61300-2-26	Visual examination (see 2.3) no corrosion of metal parts, color change due to passivation is allowed.

#### Results

Number of samples: 4	Pass
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## 4 Optical performance pass / fail criteria

### 4.1 Change in attenuation (for climatic test)

#### General

Product	NOVUX™ SEC 100 aerial wall terminal
Date of testing	July 2022

Method and conditions	Test method followed	Requirements
Source wavelength: 1310 nm, 1550 nm and 1625 nm Sampling period: At least every 10 minutes	IEC 61300-3-3	For each incoming fiber (Note 1): Splice only: $\delta \leq 0.2$ dB during test $\delta \leq 0.1$ dB after test Splice and patch (1 connection): $\delta \leq 0.3$ dB during test $\delta \leq 0.2$ dB after test If other passive optical components are part of the optical path, the above-mentioned change in attenuation values should be increased with the maximum allowed change in attenuation value specified during and after test for this passive optical component. For wavelength selective components the test wavelength might have to be changed to the operating wavelength(s) of the component(s). For example: Splice, 1x4 splitter and patch (1 connection): $\delta \leq 0.6$ dB during test $\delta \leq 0.5$ dB after test

#### Notes:

- The change in attenuation  $\delta$  refers to the  $\pm$  deviation from the original value of the transmitted power at the start of the test and are based on the use of ITU-T G.657 fibers.
- An "incoming fiber" is defined as a part of an optical circuit containing the fiber entering the product, spliced, or connected to a fiber leaving the product.
- An optical circuit contains several (typically 10, unless fewer fibers are available) live "incoming fibers". Light will sequentially flow through all the "incoming fibers" by "daisy chaining" the live incoming fibers.

#### Results

Number of samples:	See test samples of tests in sections 5.	Pass
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## 4.2 Transient loss (for mechanical tests)

### General

Product	NOVUX™ SEC 100 aerial wall terminal
Date of testing	July 2022

Method and conditions	Test method followed	Requirements
Source wavelength: 1550 nm and 1625 nm Sampling period: At least 0.25 ms	IEC 61300-3-28	For each circuit with live incoming fibers $\delta \leq 0.5$ dB during test $\delta \leq 0.1$ dB after test (for splice only) $\delta \leq 0.2$ dB after test (for splice and patch) $\delta \leq 0.3$ dB after test (for connectorized splitter)

#### Notes:

- The change in attenuation  $\delta$  refers to the +/- deviation from the original value of the transmitter power at the start of the test and are based on the use of ITU-T G.657 fibers
- An "incoming fiber" is defined as a part of an optical circuit containing the fiber entering the product, spliced, or connected to a fiber leaving the product.
- An optical circuit contains several (typical 10 unless fewer fibers are available) live "incoming fibers". Light will sequentially flow through all the "incoming fibers" by "daisy chaining" the live incoming fibers.

### Results

Number of samples:	See test samples of tests in sections 5.	Pass
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**4.3 Visual examination**

**General**

Product	NOVUX™ SEC 100 aerial wall terminal
Date of testing	July 2022

Method and conditions		Test method followed	Requirements
Examination of product with naked eye.	Inspection with the naked eye for flaws, defects, cracks, or impurities that could impair functionality.	IEC 61300-3-1	No defects which would adversely affect product performance

**Results**

Number of samples:	See test samples of tests in sections 5.	Pass
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## 5 Detailed test results for optical performance

### 5.1 Cable retention

#### General

Product	NOVUX™ SEC 100 aerial wall terminal
Date of testing	November 2022

Method and conditions	Test method followed	Requirements
Test temperature: (+23 ± 5) °C Force: $\varnothing_{\text{cable}}$ (mm) x 10 N/mm for feeder cable 25 N for drop cable Rate: Load smoothly applied in 15 s Duration: Feeder cable: 1 h Drop cable: 1 minute	IEC 61300-2-4	Visual examination (see 4.3) Transient loss (see 4.2)

#### Results

Number of samples: 1	Pass
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### 5.2 Cable bending

#### General

Product	NOVUX™ SEC 100 aerial wall terminal
Date of testing	November 2022

Method and conditions	Test method followed	Requirements
Test temperature: (+23 ± 5) °C Bending angles: From 0° to - 90° to +90° to 0° (= 1 cycle) Duration at each extreme position: 5 minutes Point of application: 400 mm from end of cable seal Number of cycles: 5 cycles per cable in random directions, unless not possible by physical constraints or cable design.	IEC 61300-2-37	Visual examination (see 4.3) Transient loss (see 4.2)

#### Results

Number of samples: 1	Pass
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### 5.3 Cable torsion

#### General

Product	NOVUX™ SEC 100 aerial wall terminal
Date of testing	November 2022

Method and conditions	Test method followed	Requirements
Test temperature: (+23 ± 5) °C Torsion angle: From 0° to - 90° to +90° to 0° (= 1 cycle) Point of application: 400 mm from end of seal Duration at each extreme position: 5 min Tensile load: none Number of cycles: 5 per cable	IEC 61300-2-5	Visual examination (see 4.3) Transient loss (see 4.2)

#### Results

Number of samples: 1	Pass
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### 5.4 Reconfiguration 1

#### General

Product	NOVUX™ SEC 100 aerial wall terminal
Date of testing	September 2022

Method and conditions	Test method followed	Requirements
Following handling operations are done on the terminal: <ol style="list-style-type: none"> <li>1. Open terminal and get access to fiber management system</li> <li>2. Hinge all trays between extreme positions</li> <li>3. Secure fiber management system and close box</li> <li>4. Repeat steps 1 to 3 for at least 50x</li> </ol>	IEC 61300-2-33	Visual examination (see 4.3) Transient loss (see 4.2)

#### Results

Number of samples: 2	Pass
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## 5.5 Reconfiguration 2

### General

Product	NOVUX™ SEC 100 aerial wall terminal
Date of testing	November 2022

Method and conditions	Test method followed	Requirements
Following handling operations are done on the terminal: <ol style="list-style-type: none"> <li>1. Open terminal and get access to fiber management system</li> <li>2. Open cable clip, cut non-active fiber bundle, pull back into terminal and close cable clip</li> <li>3. Add new drop cable and splice/connect it.</li> <li>4. Secure fiber management system and close box</li> </ol>	IEC 61300-2-33	Transient loss after test in active circuit (see 4.2)

### Results

Number of samples: 2	Pass
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## 5.6 Shock

### General

Product	NOVUX™ SEC 100 aerial wall terminal
Date of testing	September 2022

Method and conditions	Test method followed	Requirements
Wave form: Half sine Acceleration: 150 m/s <sup>2</sup> Duration: 11 milliseconds Number of shocks: In total 18 shocks Axes: 3 shocks per direction of each axis 3 mutually perpendicular	IEC 61300-2-9	Visual examination (4.3) Transient loss (see 4.2)

### Results

Number of samples: 2	Pass
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## 5.7 Vibration

### General

Product	NOVUX™ SEC 100 aerial wall terminal
Date of testing	September 2022

Method and conditions	Test method followed	Requirements
Sweep range: From 5 Hz to 500 Hz to 5 Hz (= 1 cycle) Frequency change: 1 octave/minute Crossover freq.: 9 Hz - below 9 Hz: Amplitude 3.5 mm - above 9 Hz: 10 m/s <sup>2</sup> (~ 1 g) Axes: 3 mutually perpendicular Duration: 10 cycles/axis	IEC 61300-2-1	Visual examination (see 4.3) Transient loss (see 4.2)

### Results

Number of samples: 2	Pass
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## 5.8 Change of temperature

### General

Product	NOVUX™ SEC 100 aerial wall terminal
Date of testing	November 2022

Method and conditions	Test method followed	Requirements
Lowest temperature: (-40 ± 2)°C Highest temperature: (+65 ± 2)°C Dwell time: 4 h Transition time: 1 °C / minute Number of cycles: 12	IEC 61300-2-22	Visual examination (see 4.3) Change in attenuation for climatic test (see 4.1)

### Results

Number of samples: 2	Pass
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## 6 Detailed test results for material performance

### 6.1 Resistance to solvents and contaminating fluids

#### General

Product	NOVUX™ SEC 100 aerial wall terminal
Date of testing	January 2016

Method and conditions	Test method followed	Requirements
Test temperature: (+23 ± 5) °C Media: pH2 (HCL) pH12 (NaOH) Test time: 5 days	IEC 61300-2-34	Visual examination (see 2.3) No swelling, no cracking of polymer materials

#### Results

Number of samples:	6 samples Black	Pass
	6 samples Grey	Pass

### 6.2 UV resistance of outer polymeric materials

#### General

Product	NOVUX™ SEC 100 aerial wall terminal
Date of testing	February 2016

Method and conditions	Test method followed	Requirements
UV source: Lamp type 1A Fluorescent lamps (UVA 340 nm) Exposure cycles: Cycle 1: Alternating UV and condensation cycle UV: 8 h at (+60 ± 3) °C, UV-light Condensation: 4 h at (+50 ± 3) °C; dark Exposure time: Minimum 2160 h	ISO 4892-3 ASTM G.154	Visual examination (see 2.3) Reduction in mechanical properties (tensile strength and elongation at yield) shall be less than 20%

#### Results

Number of samples:	3 samples Black	Pass
	3 samples Grey	Pass

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**6.3 Fungus resistance (Mold growth)**

**General**

Product	NOVUX™ SEC 100 aerial wall terminal
Date of testing	March 2016

Method and conditions	Test method followed	Requirements
Strains: 2 mixed spore suspensions according to ISO846 and ASTM G21  Inoculation conditions: Test severity 1 Temperature: (29 ± 1) °C Relative humidity: ≥ 90% RH Time: 28 days	ISO 846 or IEC 60068-2-10 or ASTM G.21	Visual examination (see 2.3) When a rating 0 is obtained, the material is considered fungus resistant and no further testing is required. When a rating of 1 or 2 is obtained, the effect of mould growth shall be evaluated by measuring a representative performance property (e.g. tensile strength at yield and elongation at yield for thermoplastic polymers, a compression set, a Shore A hardness for elastic materials, or any other test which checks a relevant property) both before and after exposure of the material samples. The average change in mechanical characteristics of the tested material samples shall be less than 20 %. A rating of more than 2 is not allowed.

**Results**

Number of samples:	4 samples Black	Pass
	4 samples Grey	Pass

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## 7 Detailed test results for storage and transport performance

### 7.1 Cold

#### General

Product	NOVUX™ SEC 100 aerial wall terminal
Date of testing	November 2022

Method and conditions	Test method followed	Requirements
Temperature: (-40 ± 2) °C Duration: 96 h	IEC 61300-2-17	Visual examination (see 2.3) No defects which would adversely affect product performance or functionality after installation

#### Results

Number of samples:	4	Pass
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### 7.2 Dry heat

#### General

Product	NOVUX™ SEC 100 aerial wall terminal
Date of testing	November 2022

Method and conditions	Test method followed	Requirements
Temperature: (+70 ± 2) °C Humidity: Uncontrolled Duration: 96 h	IEC 61300-2-18	Visual examination (see 2.3) No defects which would adversely affect product performance or functionality after installation

#### Results

Number of samples:	4	Pass
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### 7.3 Damp heat (steady state)

#### General

Product	NOVUX™ SEC 100 aerial wall terminal
Date of testing	November 2022

Method and conditions	Test method followed	Requirements
Temperature: (+40 ± 2) °C Humidity: (+93 ± 3) % RH Duration: 96 h	IEC 61300-2-19	Visual examination (See 2.3) No defects which would adversely affect product performance or functionality after installation

#### Results

Number of samples:	4	Pass
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## 8 Test sample description

### 8.1 Sealing performance test samples

#### Photo of samples



#### Used cables in the test samples:

Location	PRD Requirements	Cable data sheet file name ULIMS folder	Cable name / info Cable description / dimensions	Strength member dia(mm)	Aramid	Cable type	Fiber type
5A2		<a href="#">Datasheet cables\CDS-1301 Ø7.pdf</a>	Draka Ø 7		No	Loose tube single fiber	G652D
20A3		<a href="#">Datasheet cables\P03317AMA Ø6.pdf</a>	760239869 Ø 6	Ø1.5	Yes	Loose tube single fiber	G657A1
22A2		<a href="#">Datasheet cables\ET2558-10.0-CABO OPTICO CFOA-AS80 - COMPACTO (2) Ø 8.pdf</a>	Furukawa Ø8.2		Yes	Loose tube single fiber	G652D
21A1		<a href="#">Datasheet cables\UND1533 Distribution Conduite 02 à 288 Fo Ø 12.pdf</a>	Acome Ø 12		No	Loose tube single fiber	G652D
Lab		<a href="#">Datasheet cables\CTO134 RICO2F Ø 3.pdf</a>	Tratos Ø 3		Yes	Loose tube single fiber	G657A2

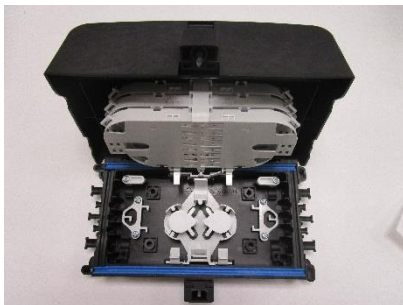
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## 8.2 Optical performance test samples

Property	Sample – Splice variant	Sample – Patch variant
<b>Sample ID.</b>	<b>1, 3</b>	<b>2, 4</b>
Description	Facade closure Splice panel SEC100 (high cover - 3 splice tray).	Facade closure Patch panel SEC100 (low cover - 1 splice tray) with 4pcs of the SC adapter in patch panel.
<b>MID</b>	760254487	760254488 (for grey color)
Splitter	-	NOVUX- SP- 104NNSOSE 860658246 711617400864
Adapter type	-	SCA, LCA
Used Cable	<b>Drop cable</b> - Dual Jacket - COMMSCOPE GB 760241223 HW 26/02/2019 L1084 1F0 G657-A2 Ohc FRC ORANGE 2113 M	
	<b>Feeder cable 48F:</b> COMMSCOPE GB F.0 CABLE 760239868 48x9/125 G5657A1 ULSZH	
	<b>Feeder cable 24F:</b> COMMSCOPE RETRACTABLE FACADE 24 F G657A1 LSZH	

### Photos of samples

Sample High-cover Splice-Black



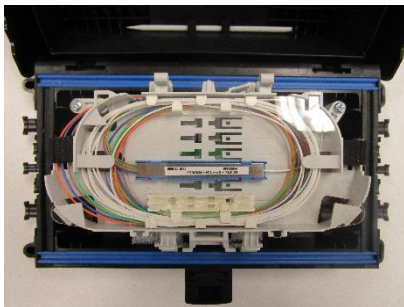


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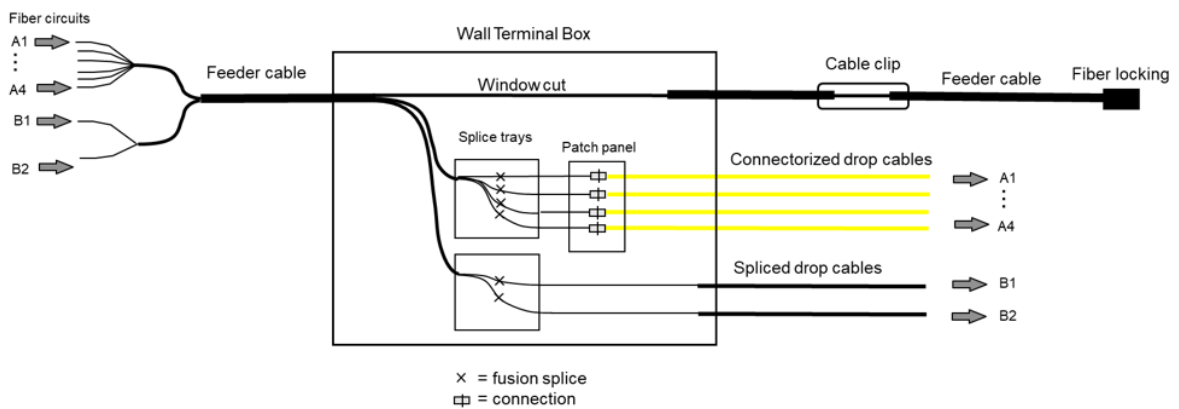
Sample High-cover Splice-Grey



Sample Low-cover Patch-Black



### Optical test sample configuration



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## 9 Test set-ups

### 9.1 Sealing performance testing

Protection against ingress of dust IP5x



Protection against ingress of water IP5x



Assembly/ disassembly



Cable retention



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## Cable bending



## Cable torsion



## Impact



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## Change of temperature



## Salt mist



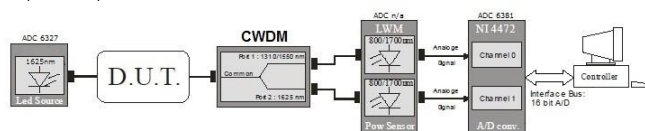
## 9.2 Optical performance testing

### Test set-up retention

#### Mechanical part



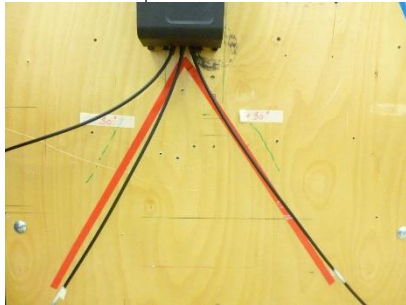
#### Optical part



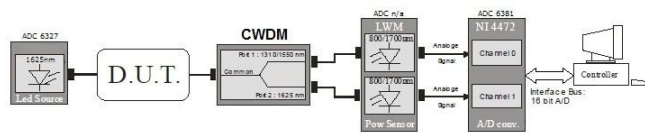
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## Test set-up bending

Mechanical part

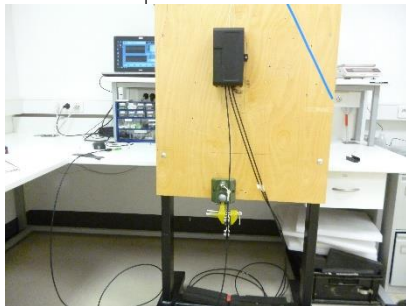


Optical part

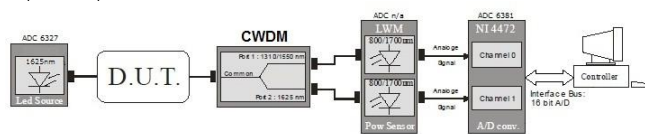


## Test set-up torsion

Mechanical part



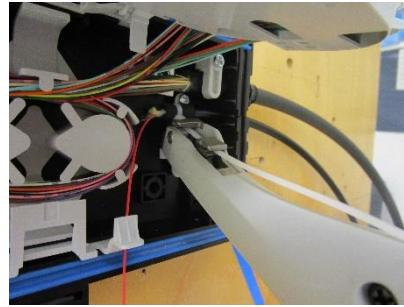
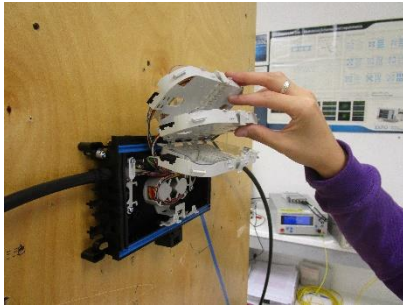
Optical part



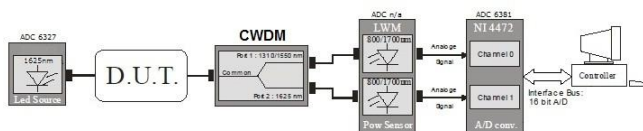
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## Test set-up Reconfiguration 1&2

### Mechanical part

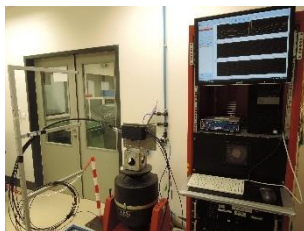


### Optical part

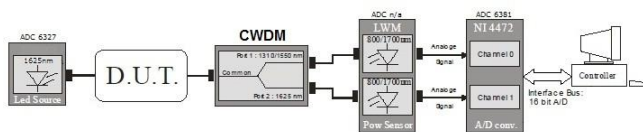


## Test set-up vibration & shock

### Mechanical part



### Optical part



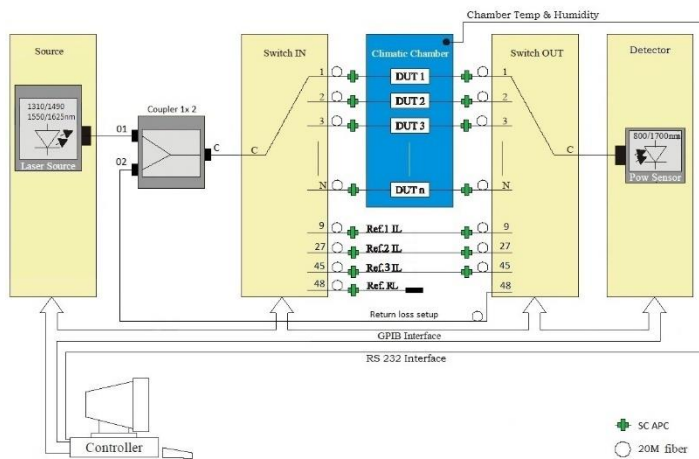
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## Test set-up change of temperature

### Environmental part



### Optical part



## 9.3 Storage and transport test set up

### Test set-up Cold



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## Test set-up Dry heat



## Test set-up damp heat (steady state)





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## **10 Equipment and calibration**

All equipment used for the testing was within calibration period.  
Detailed information can be provided on request.

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## 12 Contact information

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