

2015_024 Hoods with Conec SnapLock Mechanism

Prüfbericht // Test report

Nr. // No. // 2015 // 024 //

Qualification for Hoods with Conec SnapLock mechanism

Prüfobjekte 16-001750; 16-001760; 16-001770; 16-001780; 16-001790
Test Samples 16-001810; 16-001820; 16-001830; 16-001840; 16-001850

Ort der Prüfung Conec Elektronische Bauelemente GmbH, Lippstadt
Location of test

Zeitraum der Prüfung 03/2015 – 09/2015
Period of Test

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Performed by R&D IO / Embedded

Verantwortlich Joerg Kuehle
Responsible Manager R&D IO / Embedded

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1 Description

Hoods and connectors with Conec SnapLock mechanism have been tested as per following test groups:

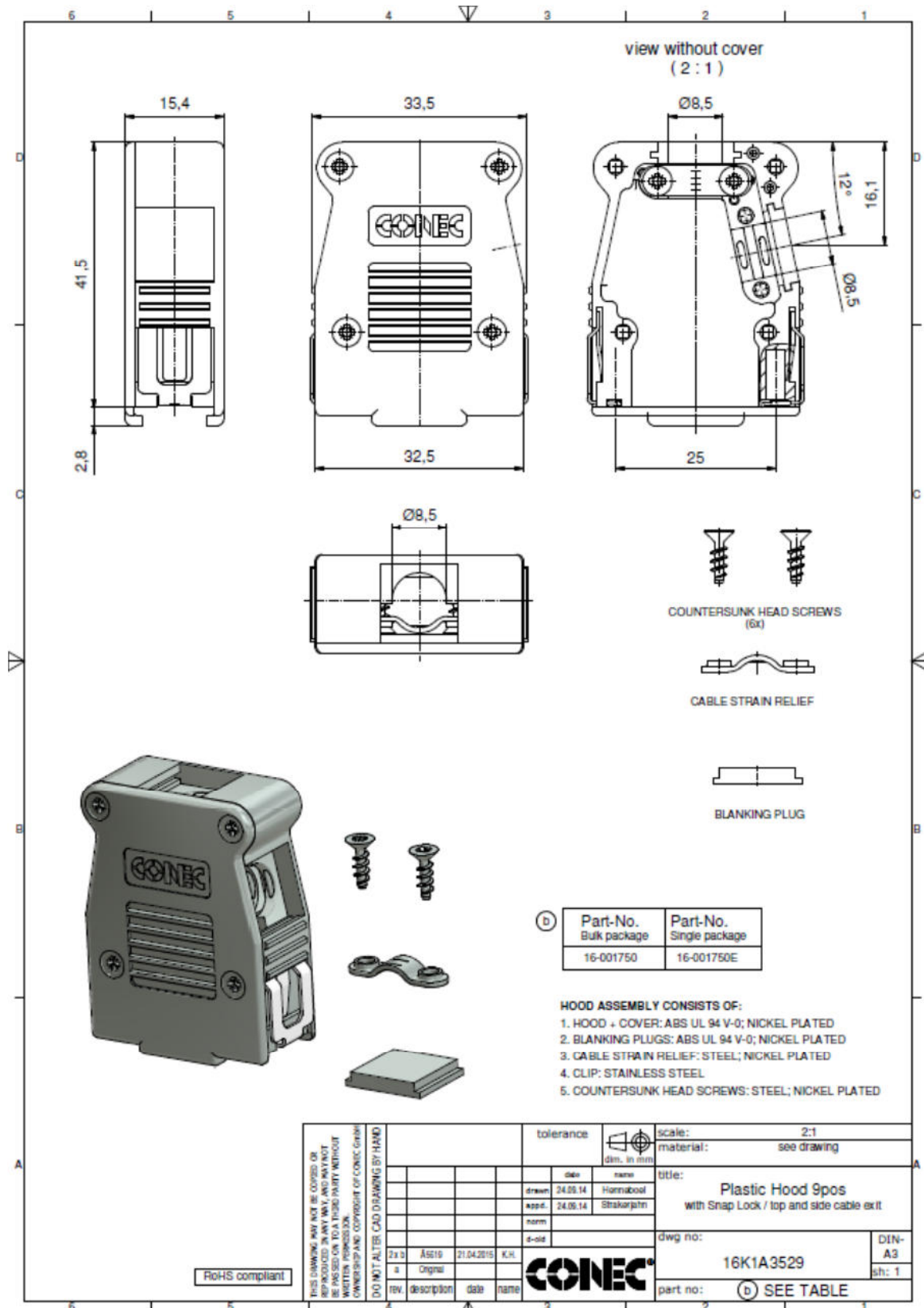
- Test group A (Temperature tests)
- Test group B (Vibration / Shock)
- Test group C (Mechanical strength of Conec SnapLock mechanism; initial and after 500 mating cycles)
- Test group D (Climatic sequence)

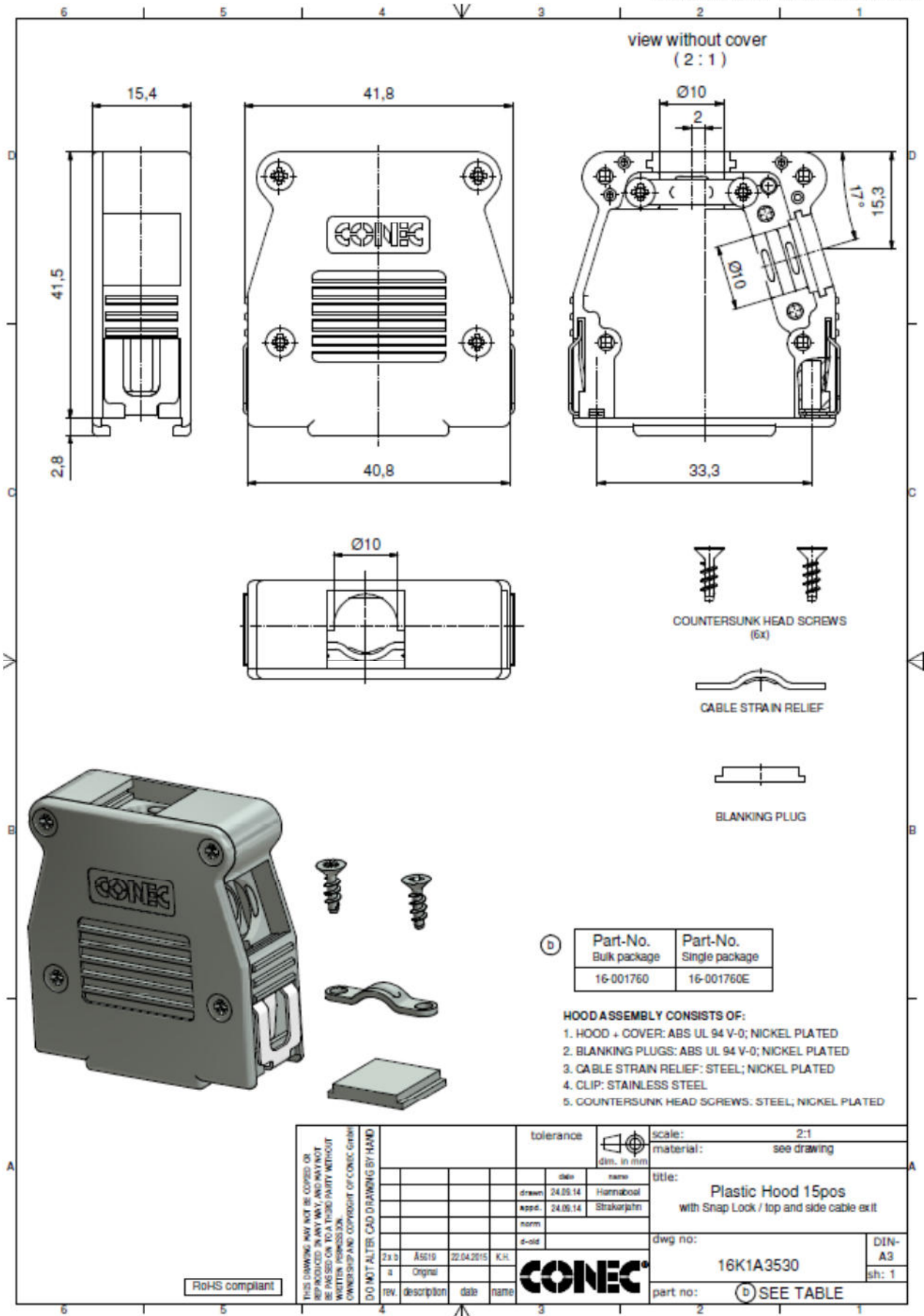
2 Summary

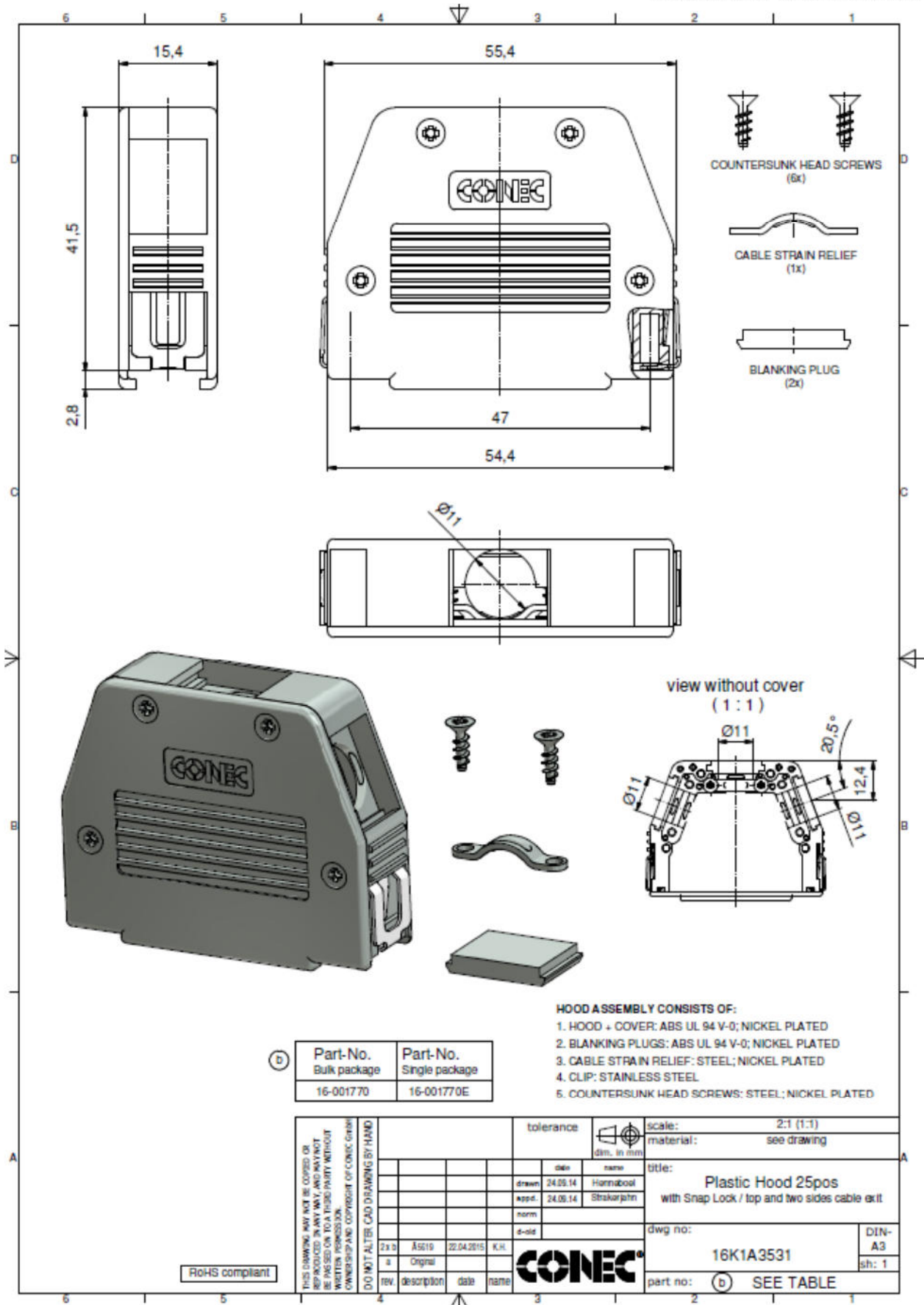
- All temperature tests were passed without any damage or deformation. The vibration / shock test passed at hoods with Conec SnapLock mechanism mated to connectors with integrated Conec SnapLock bolt
- The mechanical strength of the Conec SnapLock mechanism is >550 N after initial mating and even after 500 mating and locking cycles.
- The climatic sequence was passed without any damage or deformation.

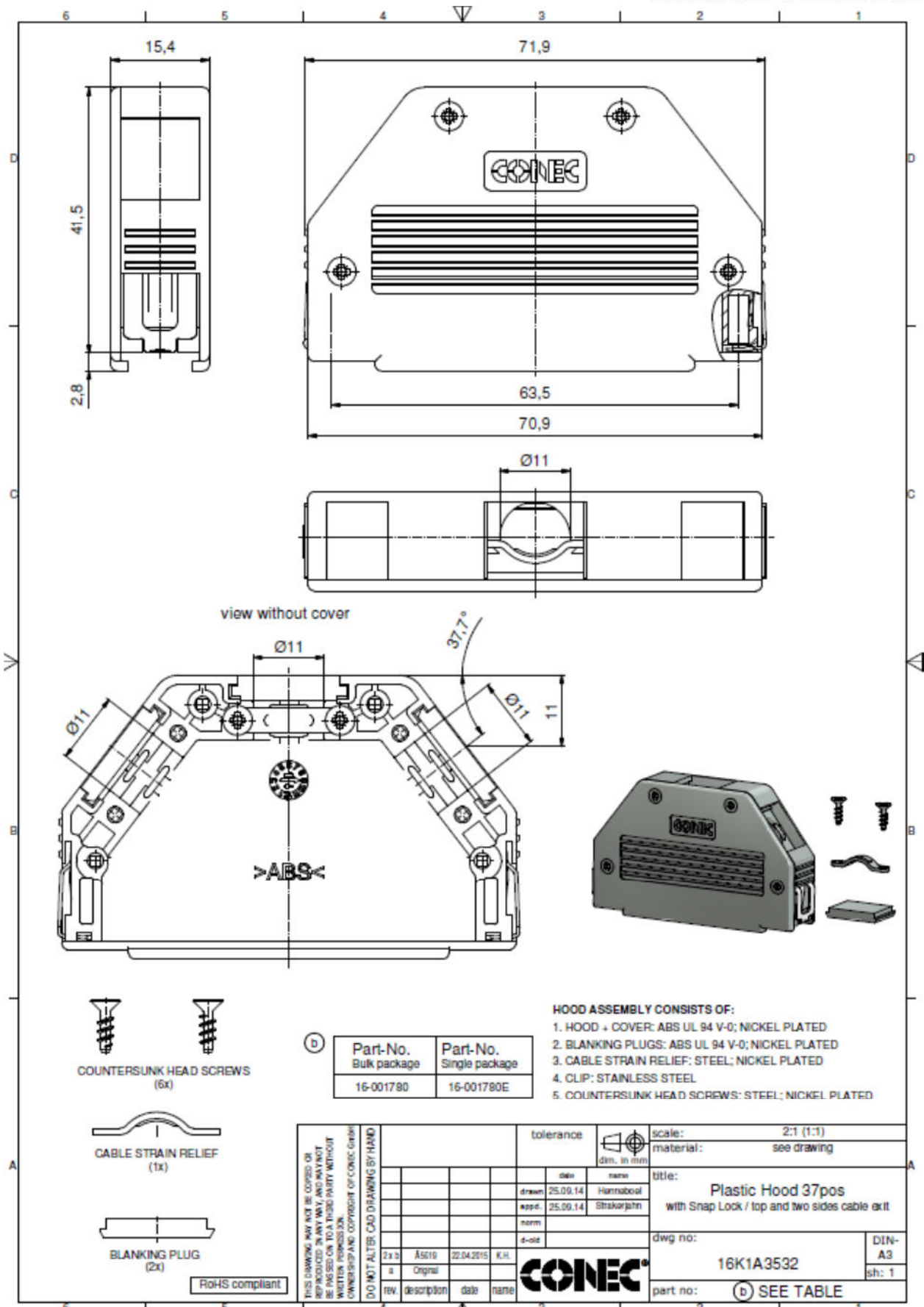
3 Drawings of test samples

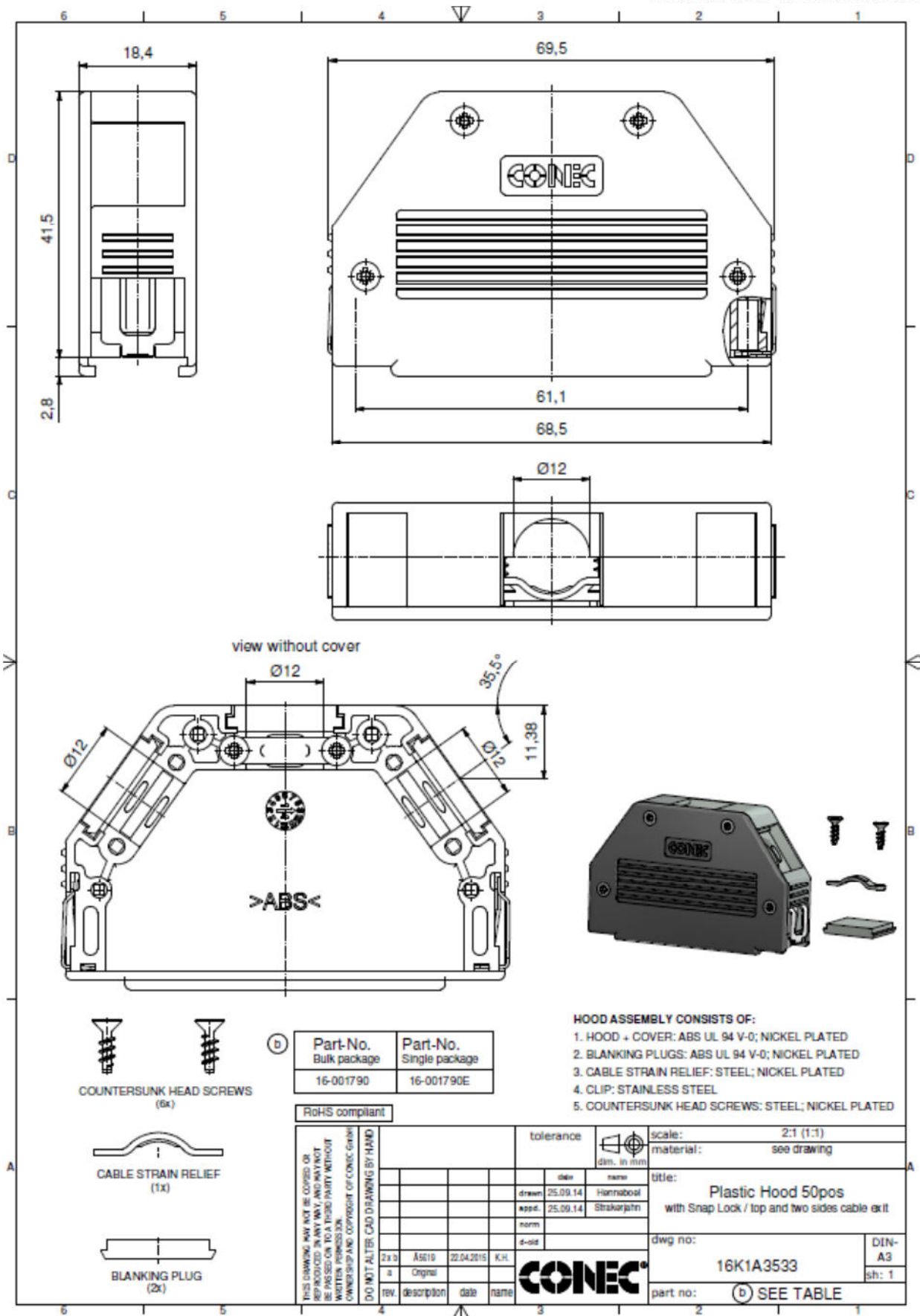
3.1 Metallized plastic hoods



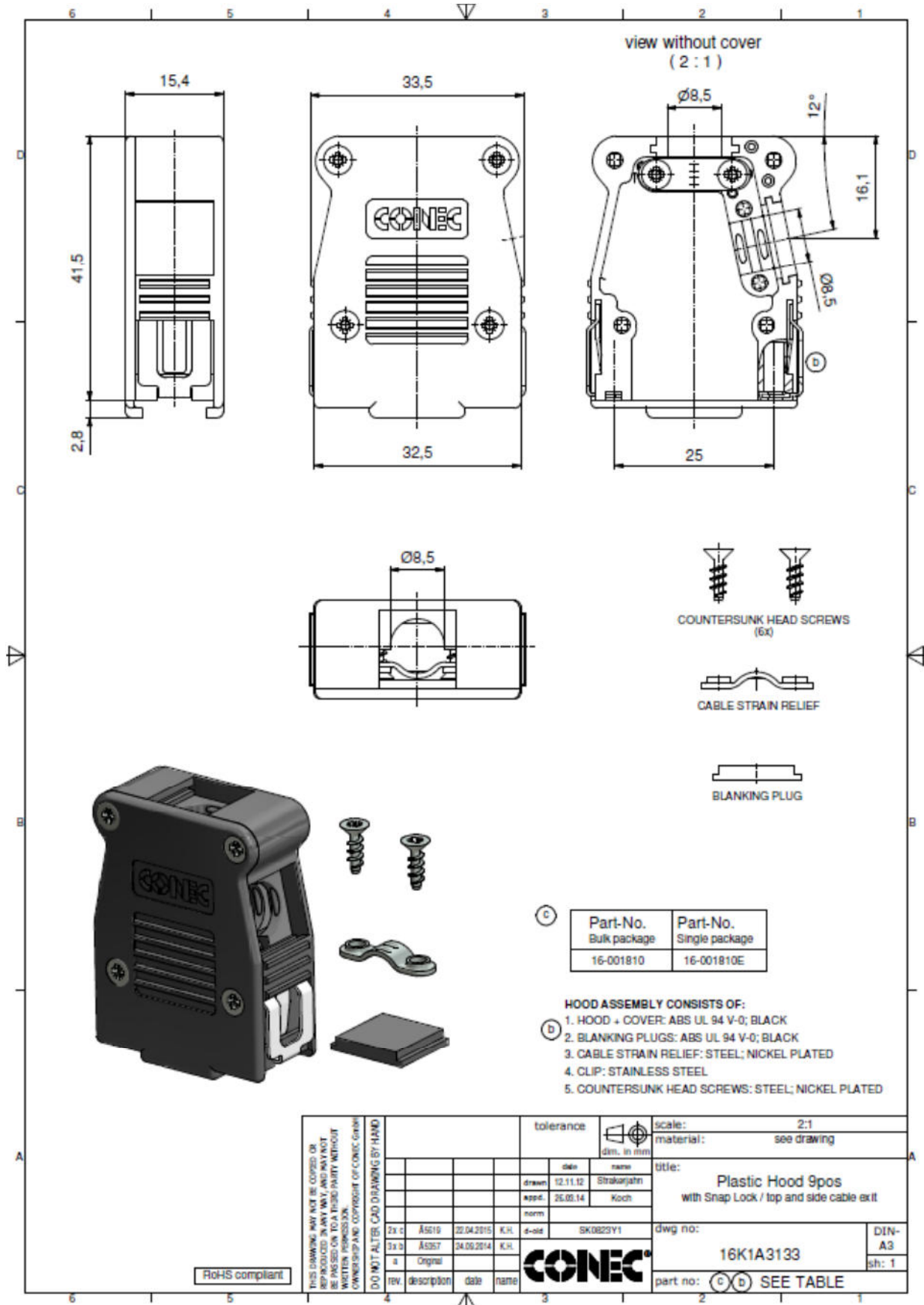


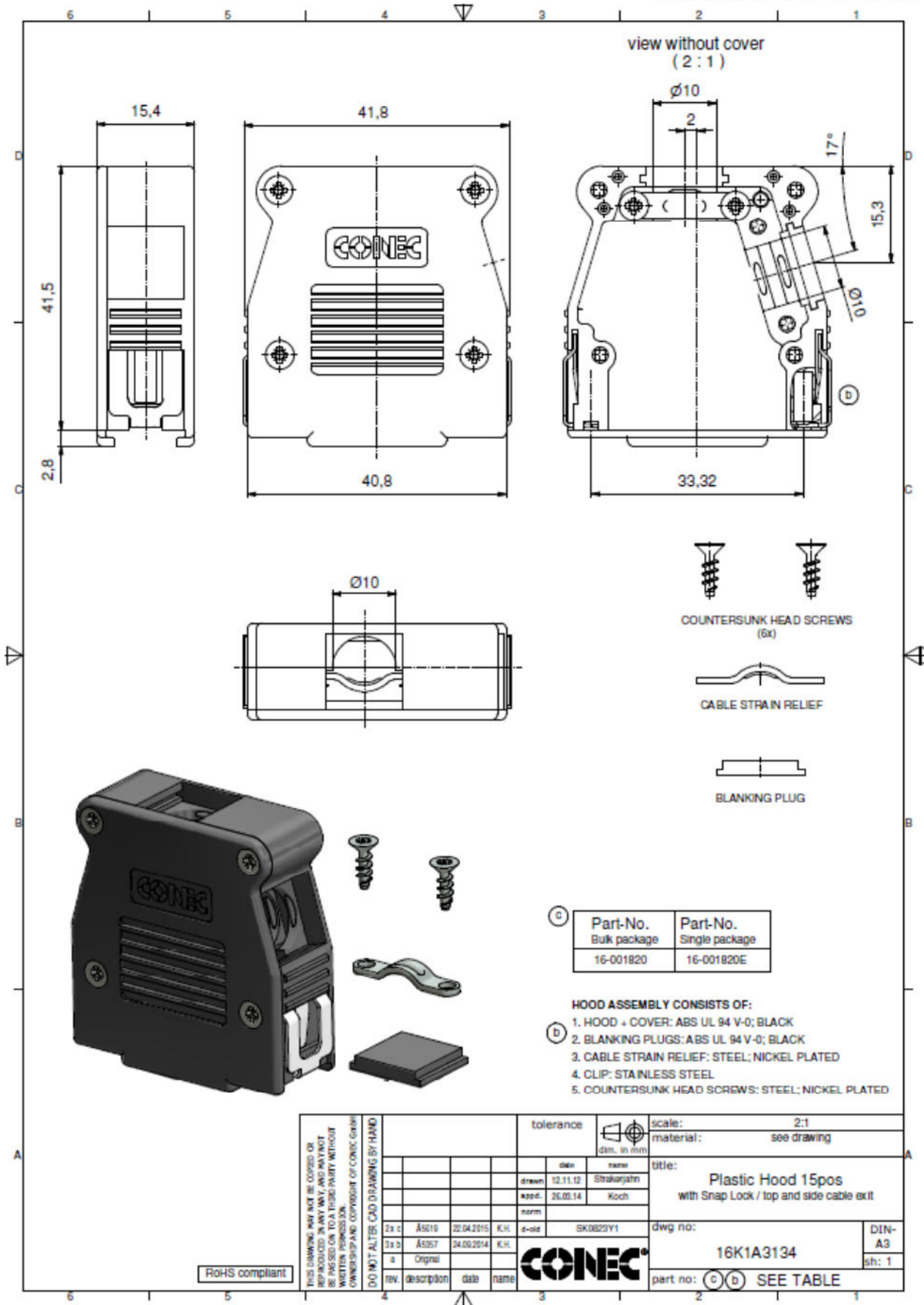


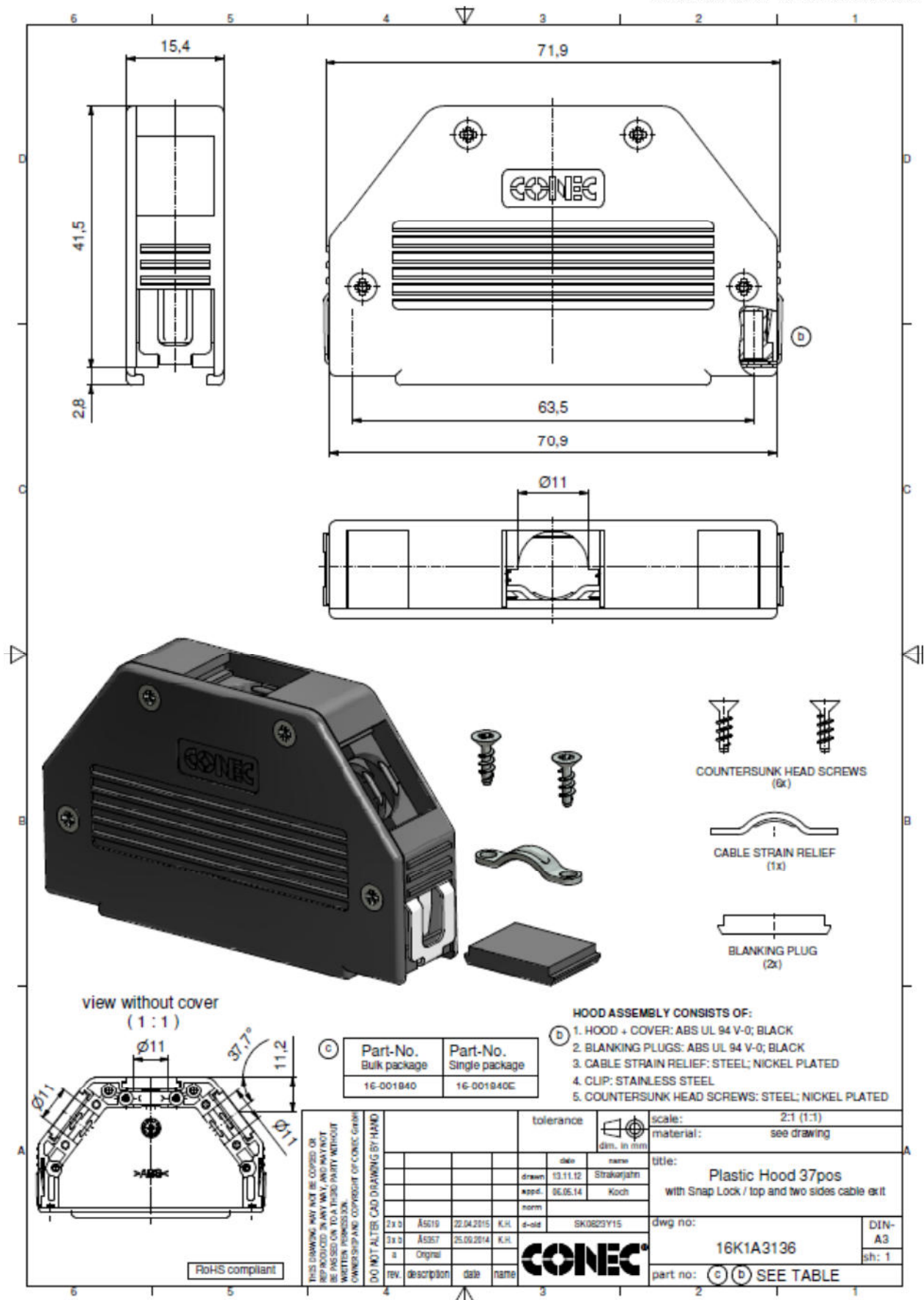


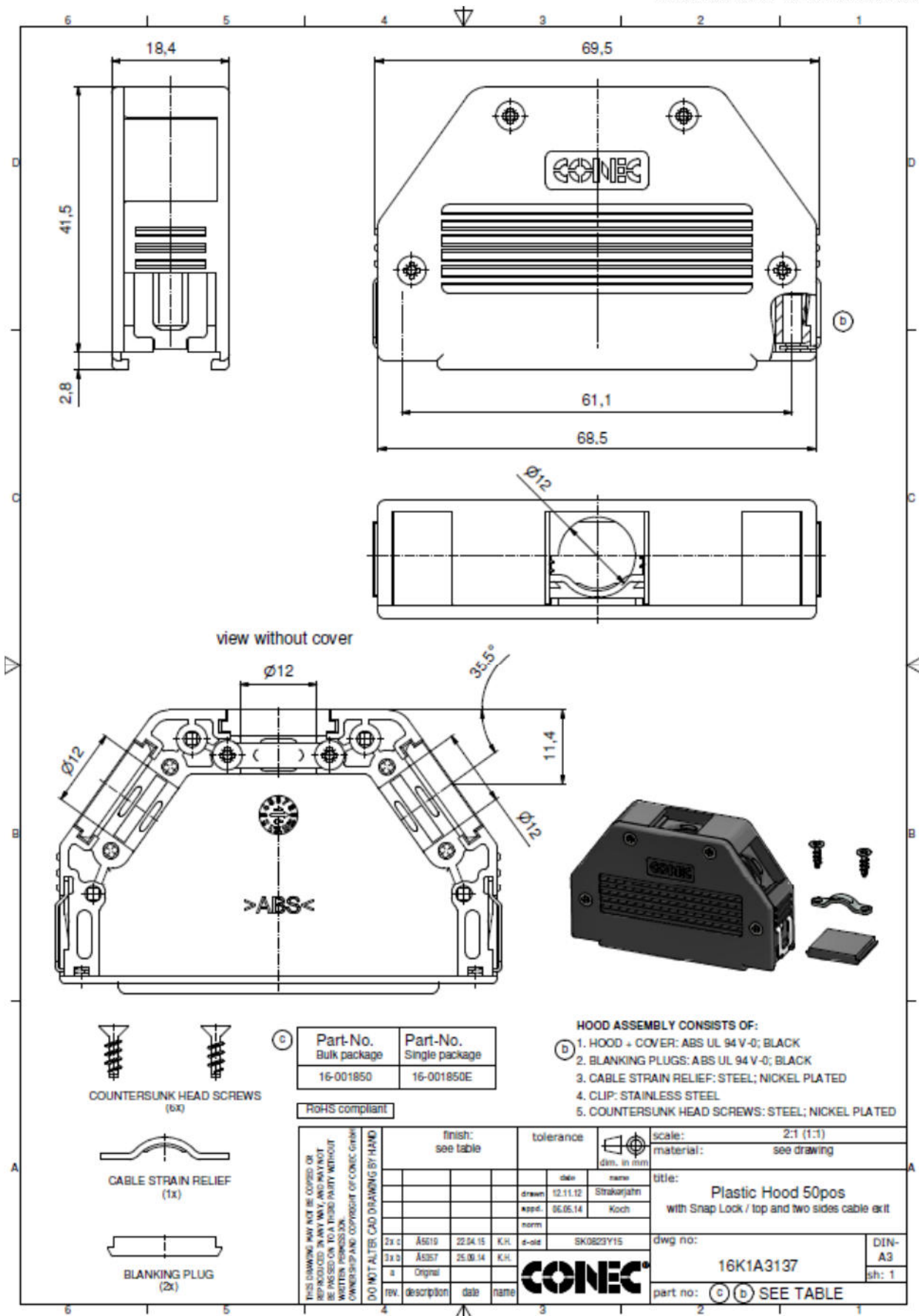


3.2 Black plastic hoods



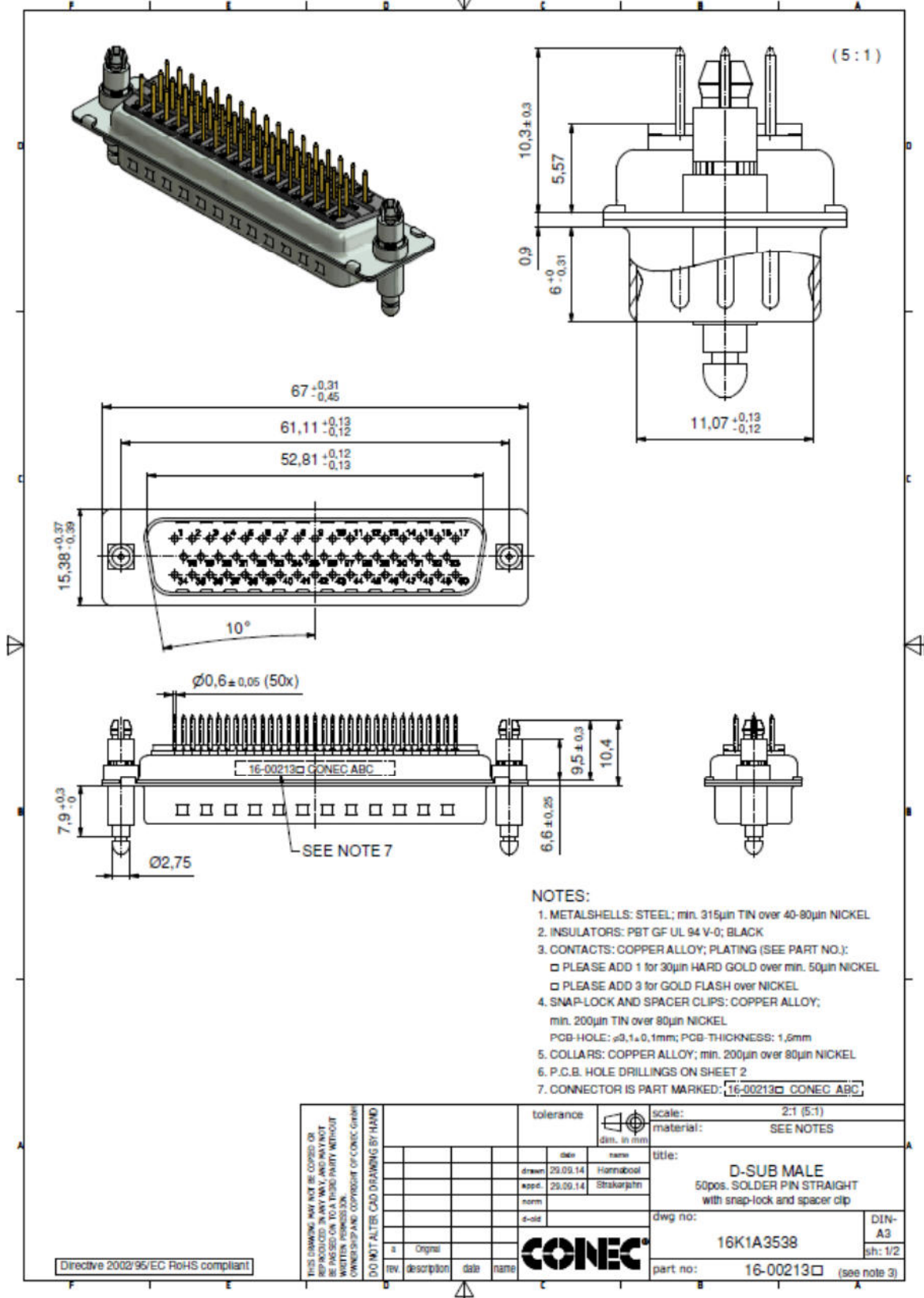






3.3 Example of a mating connector with locking bolts

These connectors are used in different shell sizes as mating connectors for the Conec SnapLock hoods. They are standard D-Sub connectors equipped with Conec SnapLock bolts.



4 Test group A (temperature tests)

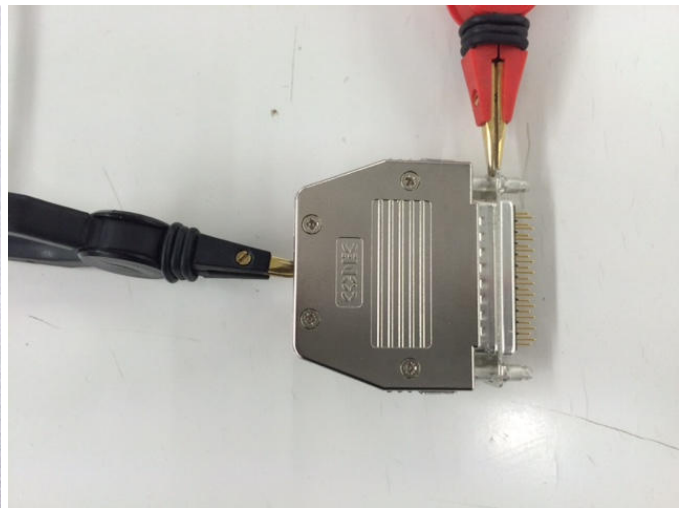
4.1 Test arrangement

A standard D-Sub connector has been mounted in each hood and the assembled hood has been mated to a standard D-Sub connector equipped with the mounting option for use with a Conec SnapLock hood. The temperature tests were performed to verify, if the hoods will be damaged or deformed during temperature endurance.

Additionally the electrical continuity of the metallized hoods to the connector shells has been tested in mated condition initially and after each test.



Assembled hood mated to connector



Measurement of electrical resistance

4.2 Visual examination

Specification: IEC 60512, Test No. 1a

- Unassembled hoods
- There shall be no defect that would impair normal operation

Test result:

- No damage could be observed

4.3 Dimensional examinations

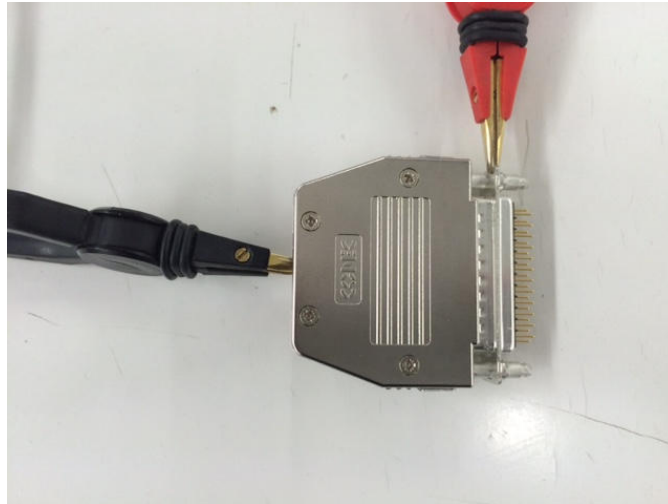
Specification: Product drawings

Test result:

- All hoods have been verified per CONEC first article approval. Within this, all dimensions of the product drawing have been verified.
- All dimensions are according to the specification

4.4 Electrical continuity of metalized hoods (initial)

Measurement between Hood and connector:



Specification: For electrical continuity, the electrical resistance between hood and shell should be <math><30\text{m}\Omega</math>

Test equipment:

- Miliohmmeter BURSTER Resistomat 2318

Test result:

| Part No | Sample | Electrical Resistance / $\text{m}\Omega$ |
|-----------|--------|--|
| 16-001750 | A1 | 4.5 |
| | A2 | 3.5 |
| 16-001760 | A3 | 5.5 |
| | A4 | 7.5 |
| 16-001770 | A5 | 5.5 |
| | A6 | 6.0 |
| 16-001780 | A7 | 4.5 |
| | A8 | 5.0 |
| 16-001790 | A9 | 6.5 |
| | A10 | 4.5 |

- The electrical continuity is ensured

4.5 Endurance at high temperature

Specification:

- Assembled hoods mated to mating connector
- 1000 h at 85°C
- No damage or deformation at exposed samples
- The electrical resistance between hood and shell should be <30 mΩ for the samples with metalized hoods

Test equipment:

- Climatic chamber FEUTRON KPK 200
- Miliohmmeter BURSTER Resistomat 2318

Test result:

| Part No | Sample | Damage or deformation Y / N | Electrical Resistance / mΩ |
|-----------|--------|--------------------------------|-------------------------------|
| 16-001750 | A1 | N | 6.0 |
| | A2 | N | 4.5 |
| 16-001760 | A3 | N | 5.0 |
| | A4 | N | 7.0 |
| 16-001770 | A5 | N | 9.5 |
| | A6 | N | 8.0 |
| 16-001780 | A7 | N | 7.0 |
| | A8 | N | 5.0 |
| 16-001790 | A9 | N | 7.5 |
| | A10 | N | 5.5 |
| 16-001810 | A11 | N | N.A. |
| | A12 | N | N.A. |
| 16-001820 | A13 | N | N.A. |
| | A14 | N | N.A. |
| 16-001830 | A15 | N | N.A. |
| | A16 | N | N.A. |
| 16-001840 | A17 | N | N.A. |
| | A18 | N | N.A. |
| 16-001850 | A19 | N | N.A. |
| | A20 | N | N.A. |

- The electrical continuity is ensured by the metalized hoods
- No damage or deformation occurs at high temperature

4.6 Rapid change of temperature

Specification:

- Assembled hoods mated to mating connector
- Low temperature: -35 °C
- High temperature: 85 °C
- 1 cycle = 30 min at low temperature + 30 min at high temperature
- 5 cycles
- No damage or deformation at exposed samples
- The electrical resistance between hood and shell should be <30 mΩ for the samples with metalized hoods

Test equipment:

- Climatic chamber FEUTRON KPK 200
- Miliohmmeter BURSTER Resistomat 2318

Test result:

| Part No | Sample | Damage or deformation Y / N | Electrical Resistance / mΩ |
|-----------|--------|--------------------------------|-------------------------------|
| 16-001750 | A1 | N | 6.5 |
| | A2 | N | 5.0 |
| 16-001760 | A3 | N | 6.0 |
| | A4 | N | 6.5 |
| 16-001770 | A5 | N | 8.5 |
| | A6 | N | 7.5 |
| 16-001780 | A7 | N | 8.0 |
| | A8 | N | 9.0 |
| 16-001790 | A9 | N | 7.0 |
| | A10 | N | 6.5 |
| 16-001810 | A11 | N | N.A. |
| | A12 | N | N.A. |
| 16-001820 | A13 | N | N.A. |
| | A14 | N | N.A. |
| 16-001830 | A15 | N | N.A. |
| | A16 | N | N.A. |
| 16-001840 | A17 | N | N.A. |
| | A18 | N | N.A. |
| 16-001850 | A19 | N | N.A. |
| | A20 | N | N.A. |

- The electrical continuity is ensured by the metalized hoods
- No damage or deformation occurs

4.7 Visual examination

Specification: IEC 60512, Test No. 1a

- Assembled hoods mated to mating connector + hoods after being unmated again
- There shall be no defect that would impair normal operation

Test result:

- No damage could be observed

5 Test group B (Vibration / Shock)

5.1 Test arrangement

A standard D-Sub connector has been mounted in each hood and the assembled hood has been mated to a standard D-Sub connector equipped with the mounting option for Conec SnapLock.



5.2 Visual examination

Specification: IEC 60512, Test No. 1a

- Unassembled hoods
- There shall be no defect that would impair normal operation

Test result:

- No damage could be observed

5.3 Vibration

Specification:

- Frequency: 10 – 2000 Hz
- Amplitude: 1.5 mm
- Acceleration: 20 g
- 3 axis
- 12 h total
- 20 min / sweep
- 12 sweeps / axis
- Current: 100 mA
- No contact disturbance > 1 μ s

Test result:

- See next pages
- No contact disturbances detected

Test Report

Client: CONEC® Elektronische Bauelemente GmbH
Ostenfeldmark 16
59557 Lippstadt
Germany

Order-No.: 15.0162
Date of order: 2015-04-15
Date of receipt of the samples: 2015-04-15

Your order: Delivery Order from 2015-04-15
Our Offer 155-A815-15-0023

Purpose of the test: Information test
Vibration and Shock

Test item: **D-Sub Hood with SnapLock mated to Connector with integrated SnapLock bolt**
Group with 4 samples:
mounting circuit board and wired

Quantity: sample 1-4

Test specification: according to customer specification

Test instruments ¹⁾: 83 (multimeter Fluke 189)
113 (oscilloscope Fluke PM 3382A)
600 (control unit vibrationView I/O Box)
601 (accelerometer M353B18; 9,85 mV)

Date of test:
from: 2015-04-22
to: 2015-04-24

Test procedure and test results: See the following pages.
The tests were passed.

Distribution:
Client: 1x
LQZ: 1x

Pages of Test report: 12
Annex: 0

Hermsdorf, 2015-04-28



i. A. Torke
Technical manager



Torke
Tester

| Procedure | Rating |
|---|--------------------------------|
| 1. Vibration frequency F = 10 Hz – 2000 Hz amplitude 1,5 mm acceleration a= 20 g 3 axis; (12 h total) 20 min/sweep 12 sweeps/axis current: 100 mA | OK |
| Contact disturbances detect 1 µs max. | no contact disturbances |
| 2. Shock half-sine peak sawtooth: a = 50 g nominal duration: 11 ms 3 Shocks / axis and direction (18 Shocks) current: 100 mA | OK |
| Contact disturbances detect 1 µs max. | no contact disturbances |

Vibration and Shock curves

Client :Conec Elektronische Bauelemente

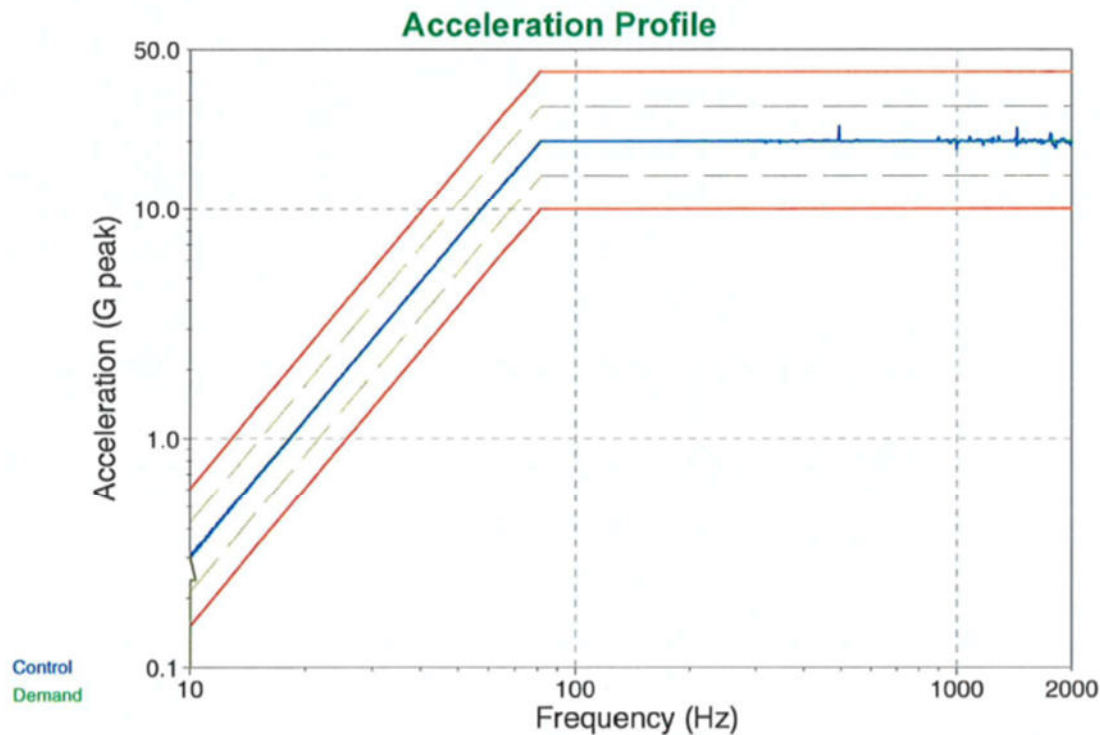
Annex : **Vibration x-axis**

Sensorik :

| Channel Name | Units | Sensitivity | Typ |
|--------------|-------|-------------|----------|
| Control | G | 9.85 mV/G | LW155968 |

Profile

| | | | |
|------------|--------|------------|--------|
| 10 Hz | 1.5 mm | 81.3888 Hz | 1.5 mm |
| 81.3888 Hz | 20 G | 2000 Hz | 20 G |



Client :Conec Elektronische Bauelemente

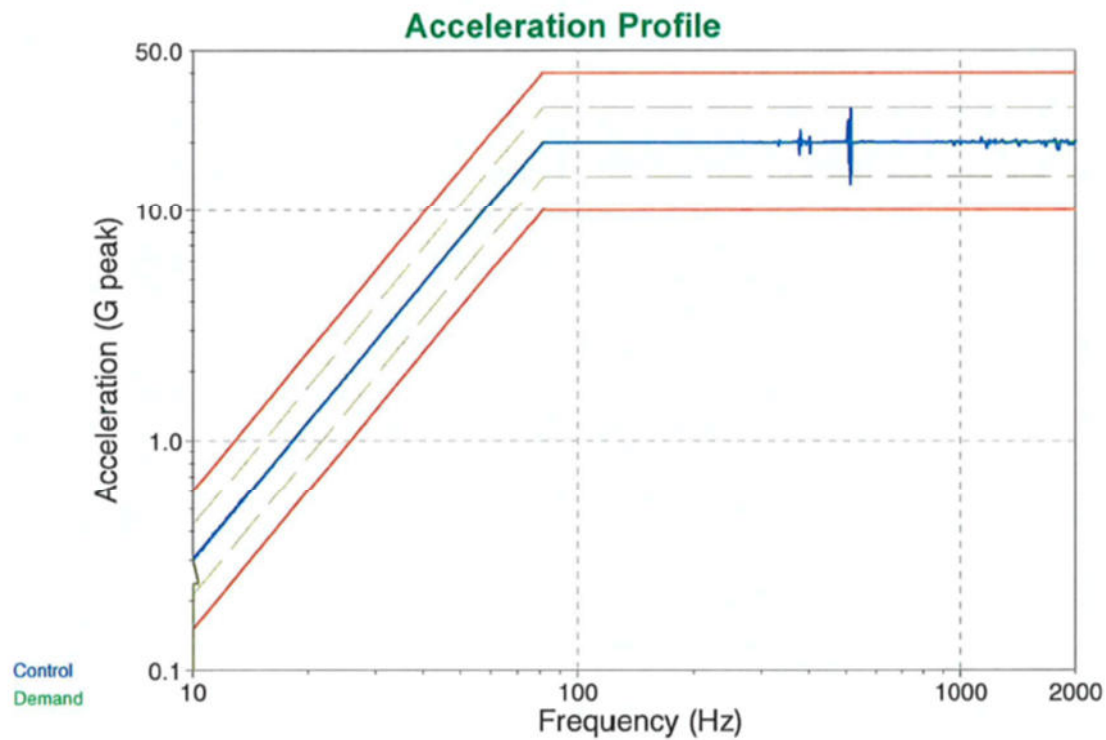
Annex : **Vibration y-axis**

Sensorik :

| Channel Name | Units | Sensitivity | Typ |
|--------------|-------|-------------|----------|
| Control | G | 9.85 mV/G | LW155968 |

Profile

| | | | |
|------------|--------|------------|--------|
| 10 Hz | 1.5 mm | 81.3888 Hz | 1.5 mm |
| 81.3888 Hz | 20 G | 2000 Hz | 20 G |



Client :Conec Elektronische Bauelemente

Annex : **Vibration z-axis**

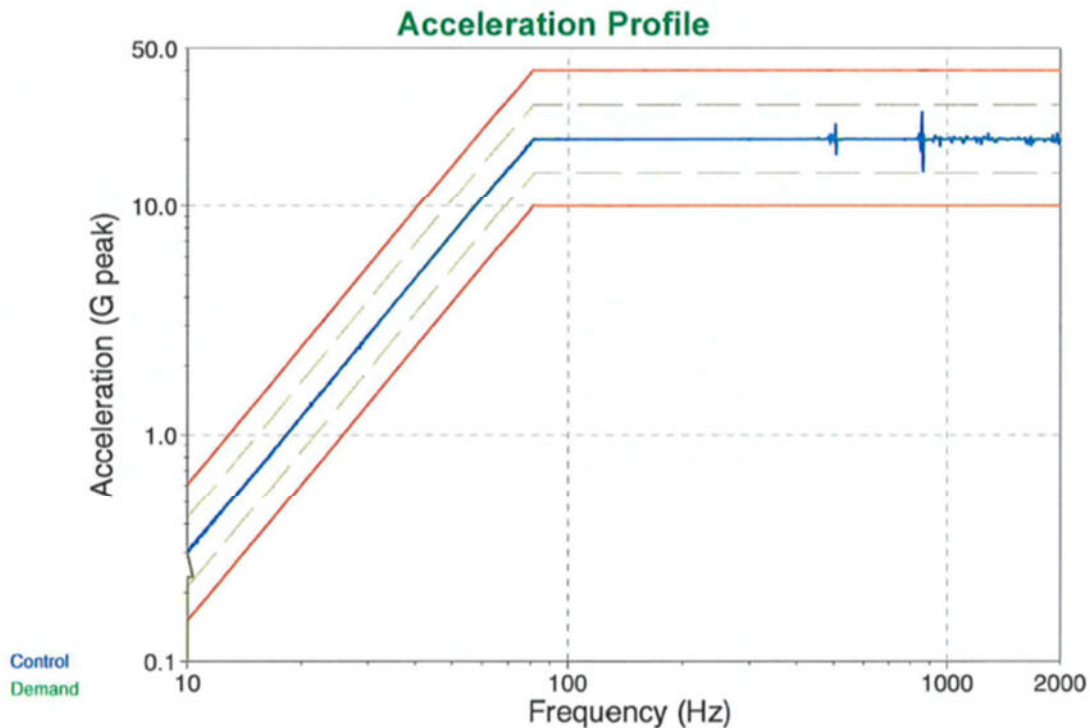
Sensorik :

| Channel Name | Units | Sensitivity | Typ |
|--------------|-------|-------------|----------|
| Control | G | 9.85 mV/G | LW155968 |

P

Profile

| | | | |
|------------|--------|------------|--------|
| 10 Hz | 1.5 mm | 81.3888 Hz | 1.5 mm |
| 81.3888 Hz | 20 G | 2000 Hz | 20 G |



Client :Conec Elektronische Bauelemente

Annex : **Shock positive; x-axis**

Sensorik :

| Channel Name | Units | Sensitivity | Typ |
|--------------|-------|-------------|----------|
| Control | G | 9.85 mV/G | LW155968 |

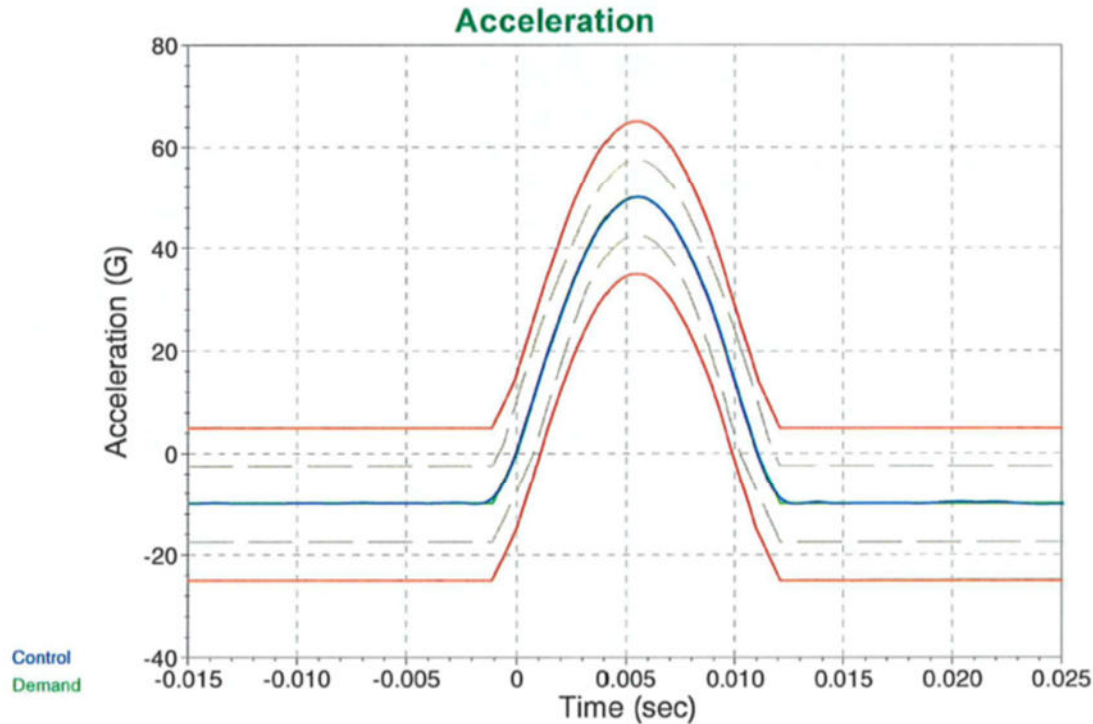
Profile

Test Profile:

- 11 ms Half Sine Pulse with amplitude 50 G (Positive)
- Pre-pulse amplitude: 20 % of the peak acceleration
- Post-pulse amplitude: 20 % of the peak acceleration
- False
- Control channels: control

Test level schedule:

| | Pulses | Level |
|----|--------|-------|
| 1) | 3 | 100 % |



Client :Conec Elektronische Bauelemente

Annex : **Shock negative; x-axis**

Sensorik :

| Channel Name | Units | Sensitivity | Typ |
|--------------|-------|-------------|----------|
| Control | G | 9.85 mV/G | LW155968 |

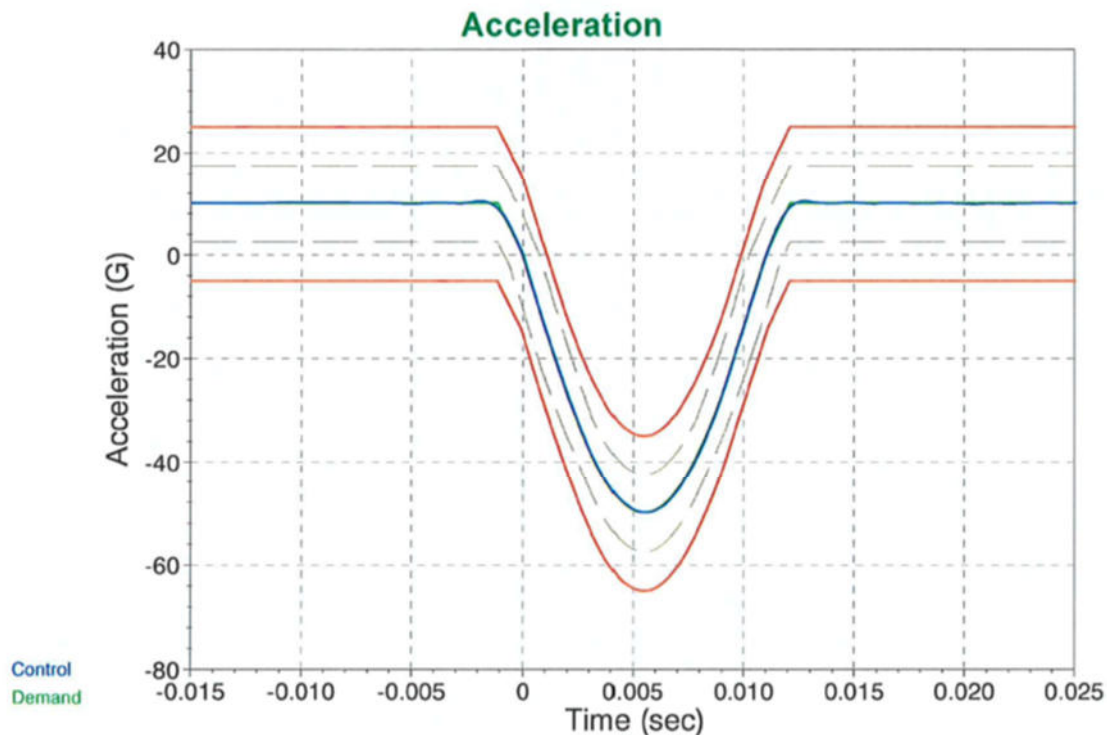
Profile

Test Profile:

11 ms Half Sine Pulse with amplitude 50 G (Negative)
Pre-pulse amplitude: 20 % of the peak acceleration
Post-pulse amplitude: 20 % of the peak acceleration
False
Control channels: control

Test level schedule:

| | Pulses | Level |
|----|--------|---------|
| 1) | 3 | * 100 % |



Client :Conec Elektronische Bauelemente

Annex : **Shock positive; y-axis**

Sensorik :

| Channel Name | Units | Sensitivity | Typ |
|--------------|-------|-------------|----------|
| Control | G | 9.85 mV/G | LW155968 |

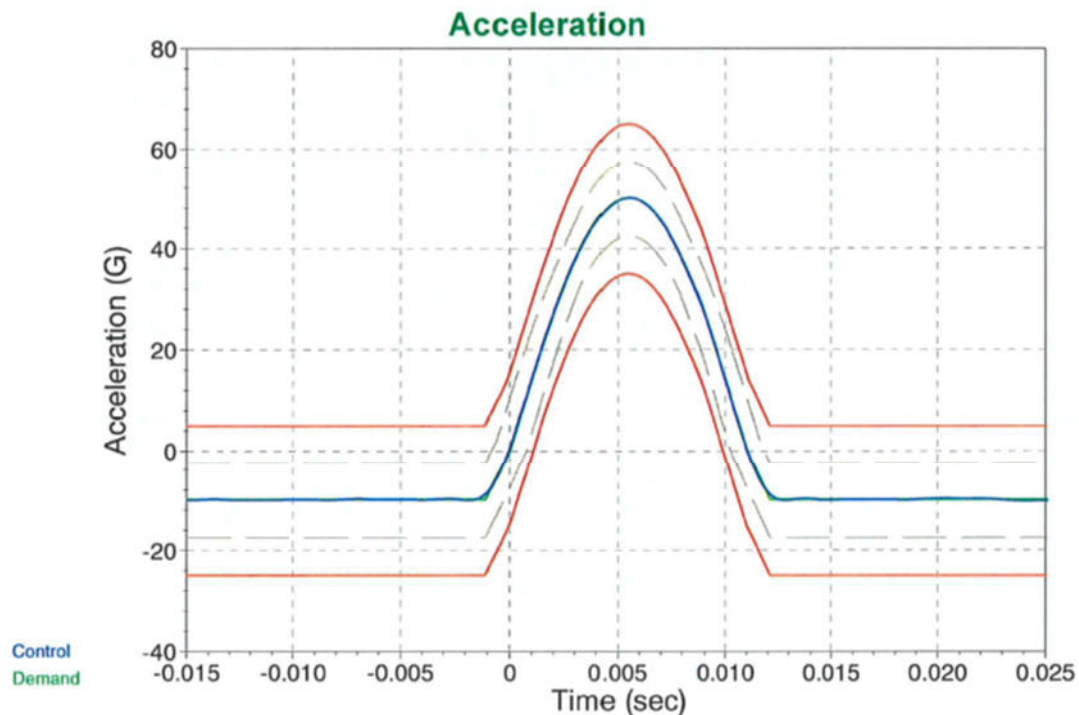
Profile

Test Profile:

11 ms Half Sine Pulse with amplitude 50 G (Positive)
Pre-pulse amplitude: 20 % of the peak acceleration
Post-pulse amplitude: 20 % of the peak acceleration
False
Control channels: control

Test level schedule:

| | Pulses | Level |
|----|--------|-------|
| 1) | 3 | 100 % |



Client :Conec Elektronische Bauelemente

Annex : **Shock negative; y-axis**

Sensorik :

| Channel Name | Units | Sensitivity | Typ |
|--------------|-------|-------------|----------|
| Control | G | 9.85 mV/G | LW155968 |

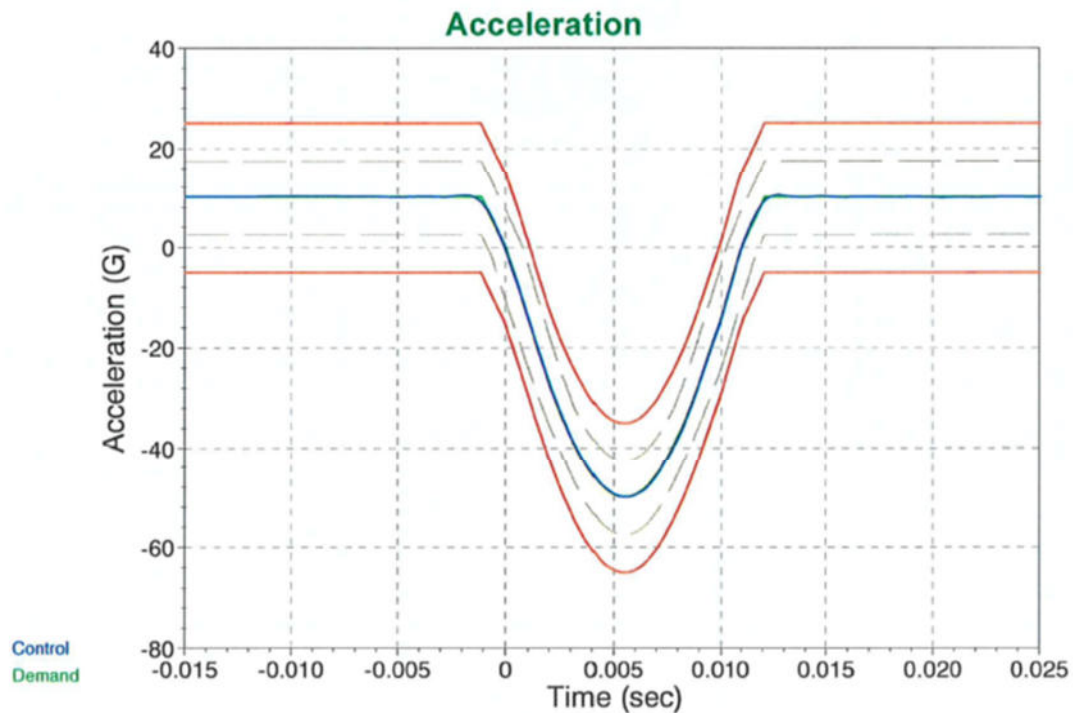
Profile

Test Profile:

11 ms Half Sine Pulse with amplitude 50 G (Negative)
 Pre-pulse amplitude: 20 % of the peak acceleration
 Post-pulse amplitude: 20 % of the peak acceleration
 False
 Control channels: control

Test level schedule:

| | Pulses | Level |
|----|--------|---------|
| 1) | 3 | * 100 % |



Client :Conec Elektronische Bauelemente

Annex : **Shock positive; z-axis**

Sensorik :

| Channel Name | Units | Sensitivity | Typ |
|--------------|-------|-------------|----------|
| Control | G | 9.85 mV/G | LW155968 |

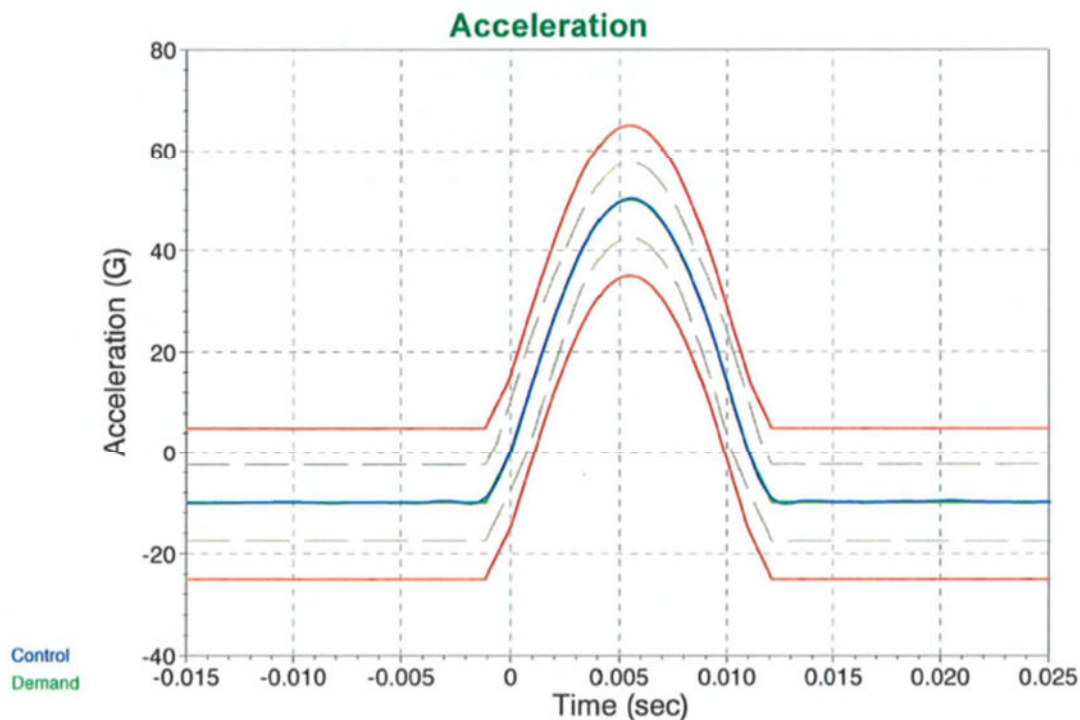
Profile

Test Profile:

11 ms Half Sine Pulse with amplitude 50 G (Positive)
Pre-pulse amplitude: 20 % of the peak acceleration
Post-pulse amplitude: 20 % of the peak acceleration
False
Control channels: control

Test level schedule:

| | Pulses | Level |
|----|--------|-------|
| 1) | 3 | 100 % |



Client :Conec Elektronische Bauelemente

Annex : **Shock negative; z-axis**

Sensorik :

| Channel Name | Units | Sensitivity | Typ |
|--------------|-------|-------------|----------|
| Control | G | 9.85 mV/G | LW155968 |

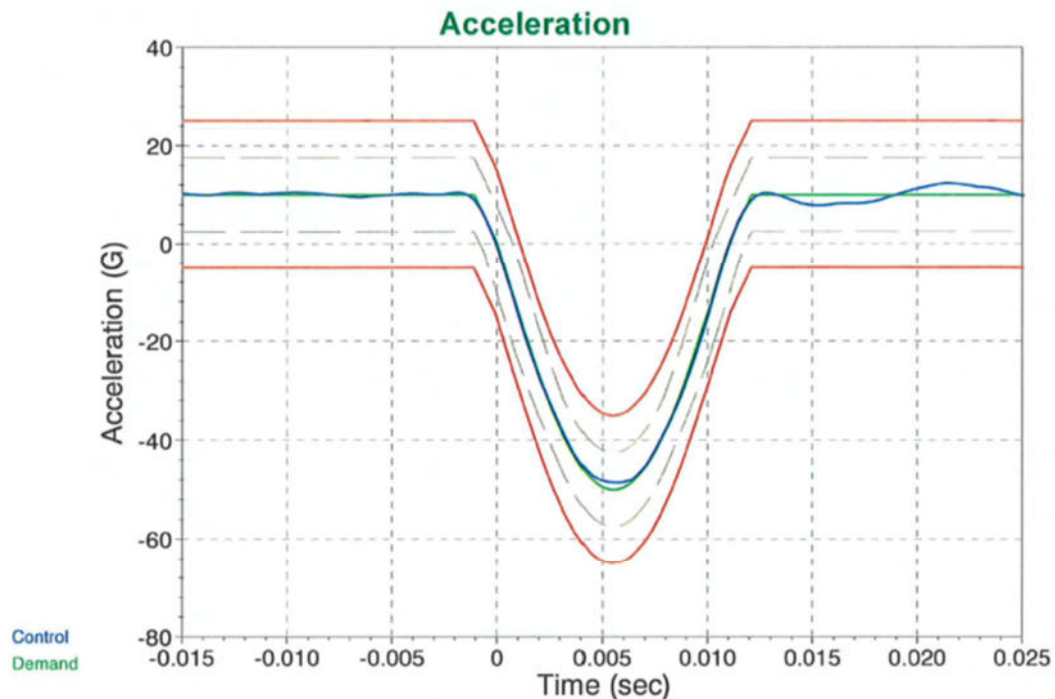
Profile

Test Profile:

11 ms Half Sine Pulse with amplitude 50 G (Negative)
Pre-pulse amplitude: 20 % of the peak acceleration
Post-pulse amplitude: 20 % of the peak acceleration
False
Control channels: control

Test level schedule:

| | Pulses | Level |
|----|--------|---------|
| 1) | 3 | * 100 % |



- End of the Test Report -

5.4 Visual examination

Specification: IEC 60512, Test No. 1a

- Hoods in assembled and disassembled (into single parts) condition
- There shall be no defect that would impair normal operation

Test result:

- No damage could be observed

6 Test group C (mechanical strength of Conec SnapLock mechanism; initial measurement and after 500 mating cycles)

6.1 Test arrangement

A standard D-Sub connector has been mounted in each hood and the assembled hood has been mated to a standard D-Sub connector equipped with the mounting option for Conec SnapLock hood 500 times manually.

After performing the mating cycles, the mechanical strength of the Conec SnapLock mechanism has been tested by pulling the hood from the fixed connector.

Test sample version 1: Hood to connector connection



Test sample version 2: Hood to hood connection



6.2 Mechanical strength of Conec SnapLock mechanism

6.2.1 Test arrangement

A standard D-Sub connector has been mounted in each hood and the assembled hood has been mated to a standard D-Sub connector equipped with the mounting option for Conec SnapLock hood.

Following tests have been made to evaluate the retention force of the Conec SnapLock mechanism:

- Retention force between mated and locked hood and D-Sub connector
- Retention force between mated hoods

Specification:

- Pull speed: 15 mm / min
- Pulled until
 - Conec SnapLock mechanism is loosened
 - Connectors damaged, deformed or pulled out of the hoods

Test equipment:

- Force measurement device TEST 108,5kN

Test result:

Test samples version 1: Hood to connector connection:

| Shell size | Conec SnapLock loosened Y/N at force (N) | Connectors deformed or pulled out of hood Y/N At force (N) |
|------------|--|--|
| 1 (9 pos) | N | Y (562 N) |
| 1 (9 pos) | N | Y (561 N) |
| 2 (15 pos) | N | Y (564 N) |
| 2 (15 pos) | N | Y (796 N) |
| 3 (25 pos) | N | Y (801 N) |
| 3 (25 pos) | N | Y (863 N) |
| 4 (37 pos) | N | Y (892 N) |
| 4 (37 pos) | N | Y (897 N) |
| 5 (50 pos) | N | Y (871 N) |
| 5 (50 pos) | N | Y (902 N) |

Test samples version 2: Hood to hood connection:

| Shell size | Conec SnapLock loosened Y/N at force (N) | Connectors deformed or pulled out of hood Y/N At force (N) |
|------------|--|--|
| 3 (25 pos) | N | Y (683 N) |
| 3 (25 pos) | N | Y (622 N) |

The minimum retention force of hood to PCB connector and hood to hood connection is >550 N

6.3 Mating cycles

Specification:

- Hood to connector mating
- Hood to hood mating
- 1 cycle = Mated manually to locked position, then unlocked and unmated
- 500 cycles each

Test equipment:

- Force measurement device TEST 108,5kN

Test result:

- For each hood size 500 mating cycles have been performed for a hood to connector connection and for a hood to hood connection.

6.4 Visual examination

Specification: IEC 60512, Test No. 1a

- Hoods and connectors
- There shall be no defect that would impair normal operation

Test result:

- No damage occurred

6.5 Mechanical strength of Conec SnapLock mechanism after 500 mating cycles

Specification:

- Tested with force measurement device: Test 108.5kN
- Pull speed: 15mm/min
- Pulled until
 - Conec SnapLock mechanism is loosened
 - Connectors damaged, deformed or pulled out of the hoods

Test equipment:

- Force measurement device TEST 108,5kN

Test result:

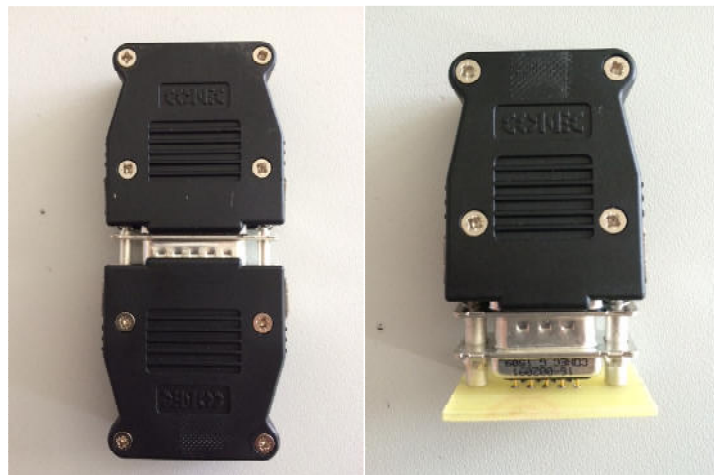
Test sample version 1: Hood to connector connection:

| Shell size | Conec SnapLock loosened Y/N at force (N) | Connectors deformed or pulled out of hood Y/N At force (N) |
|------------|--|--|
| 1 (9 pos) | N | Y (574 N) |
| 2 (15 pos) | N | Y (900 N) |
| 3 (25 pos) | N | Y (944 N) |
| 4 (37 pos) | N | Y (993 N) |
| 5 (50 pos) | N | Y (881 N) |

Test sample version 2: Hood to hood connection:

| Shell size | Conec SnapLock loosened Y/N at force (N) | Connectors deformed or pulled out of hood Y/N At force (N) |
|------------|--|--|
| 1 (9 pos) | N | Y (722 N) |
| 2 (15 pos) | N | Y (701 N) |
| 3 (25 pos) | N | Y (853 N) |
| 4 (37 pos) | N | Y (738 N) |
| 5 (50 pos) | N | Y (904 N) |

No Conec SnapLock connection could be loosened after 500 mating cycles. At each sample, a connector has been pulled out of the hood at forces > 550 N.



Connectors pulled out of the hood

7 Test group D (climatic sequence)

7.1 Test arrangement

A standard D-Sub connector has been mounted in each hood and the assembled hood has been mated to a standard D-Sub connector equipped with the mounting option for Conec SnapLock hoods.

The temperature tests are being performed to verify, if the hoods will be damaged or deformed during the climatic sequence endurance.

Additionally the electrical continuity of the metallized hoods to the connector shells has been tested initially and after the climatic sequence.

7.2 Visual examination

Specification: IEC 60512, Test No. 1a

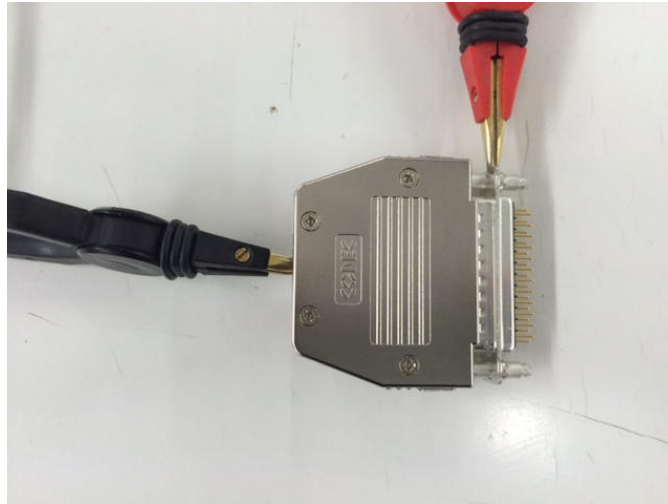
- Unassembled hoods (single parts)
- There shall be no defect that would impair normal operation

Test result:

- No damage could be observed

7.3 Electrical continuity of metallized hoods (initial)

Measurement between Hood and connector:



Specification: For electrical continuity, the electrical resistance between hood and shell should be <math><30 \text{ m}\Omega</math>

Test equipment:

- Miliohmmeter BURSTER Resistomat 2318

Test result:

| Part No | Sample | Electrical Resistance / $\text{m}\Omega$ |
|-----------|--------|--|
| 16-001750 | D1 | 4.5 |
| | D2 | 8.0 |
| 16-001760 | D3 | 4.5 |
| | D4 | 3.5 |
| 16-001770 | D5 | 6.0 |
| | D6 | 5.5 |
| 16-001780 | D7 | 6.5 |
| | D8 | 5.0 |
| 16-001790 | D9 | 7.0 |
| | D10 | 6.0 |

- The electrical continuity is ensured

7.4 Climatic sequence

Test equipment:

- Climatic chamber FEUTRON KPK 200

Specification: metallized and non metallized hood have passed through a climatic sequence specified as follows per IEC 60512, Test No. 11a

7.4.1 AP6.1 Dry Heat

Specification: IEC 60512, Test No. 11i

- Temperature: 85 °C
- Duration: 16 h

Test result:

- All samples have been thermal stressed as described above

7.4.2 AP6.2 Damp heat, cyclic, first cycle

Specification: IEC 60512, Test No. 11m

- Method Db
- Temperature: 55 °C
- Recovery time: 2 h
- There shall be no defect that would impair normal operation

Test result:

- All samples have been thermal stressed as described above and are within the specification

7.4.3 AP6.3 Cold

Specification: IEC 60512, Test No. 11j

- Temperature: -25 °C
- Duration: 2 h
- Recovery time: 2 h
- There shall be no defect that would impair normal operation

Test result:

- All samples have been thermal stressed as described above and are within the specification

7.4.4 AP6.4 Damp heat, cyclic, remaining cycles

Specification: IEC 60512, Test No. 11m

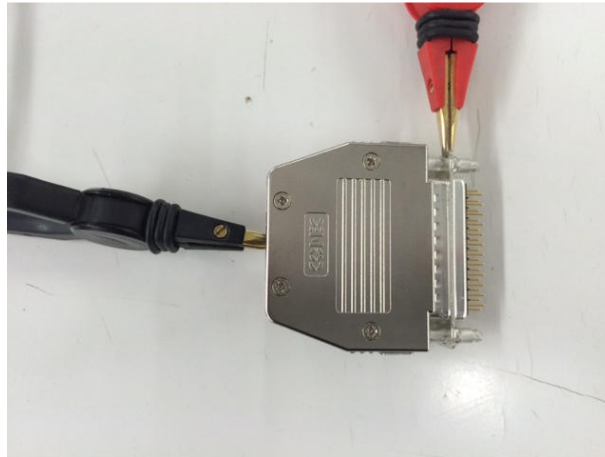
- Method Db
- Temperature: 55 °C
- 5 cycles
- Recovery time: 2 h
- There shall be no defect that would impair normal operation

Test result:

- All samples have been thermal stressed as described above and are within the specification

7.5 Electrical continuity of metallized hoods

Measurement between Hood and connector:



Specification: For electrical continuity, the electrical resistance between hood and shell should be <math><30 \text{ m}\Omega</math>

Test equipment:

- Miliohmmeter BURSTER Resistomat 2318

Test result:

| Part No | Sample | Damage or deformation Y / N | Electrical Resistance / $\text{m}\Omega$ |
|-----------|--------|--------------------------------|---|
| 16-001750 | D1 | N | 6.5 |
| | D2 | N | 7.5 |
| 16-001760 | D3 | N | 5.5 |
| | D4 | N | 8.5 |
| 16-001770 | D5 | N | 7.5 |
| | D6 | N | 8.5 |
| 16-001780 | D7 | N | 9.0 |
| | D8 | N | 10.0 |
| 16-001790 | D9 | N | 11.0 |
| | D10 | N | 9.5 |
| 16-001810 | D11 | N | N.A. |
| | D12 | N | N.A. |
| 16-001820 | D13 | N | N.A. |
| | D14 | N | N.A. |
| 16-001830 | D15 | N | N.A. |
| | D16 | N | N.A. |
| 16-001840 | D17 | N | N.A. |
| | D18 | N | N.A. |
| 16-001850 | D19 | N | N.A. |
| | D20 | N | N.A. |