



## Type Test Report Electrical Accessories and Hardware Reference Laboratory

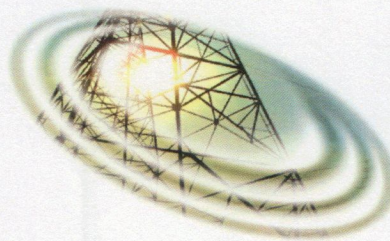
### Insulation Piercing Connector IPC1001

**Client:** Council for Assessment and Compliance with Electrical Industry Equipment  
Production Standards, Power Generation, Transmission & Distribution Company

**Manufacturer:** Electro Niroo Taban Control Company (NETCO).

**Test Standard:** EN 50483-4, EN 50483-5, EN 50483-6 (2009)

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Niroo Research Institute



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**Insulation Piercing Connector  
IPC1001**

Serial number: -

Reference Standards: EN 50483-4, EN 50483-5, EN 50483-6 (2009)

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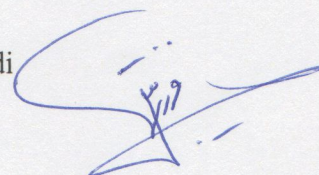
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**NRI**  
Niroo Research Institute

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**Multi-tap Insulation Piercing Connector  
IPC1001**

Serial number: -

Reference Standards: EN 50483-4, EN 50483-5, EN 50483-6

Tested by: M. Soltanloo

Approved by: A. Bajgholi

Tests witnessed by:

Date of issue: 2018/09/03

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Client: Council for Assessment and Compliance with Electrical Industry Equipment Production  
Standards, Power Generation, Transmission & Distribution Company

Manufacturer: Electro Niroo Taban Control Company (NETCO)

Request number: 97/27500/2689

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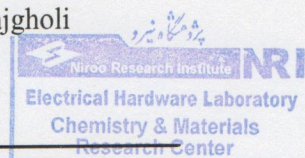
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Tested by: M. Soltanloo

Approved by: A. Bajgholi





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Niroo Research Institute



## 1. Summary of test results

Test	Test Type	Standard/Clause	Result
Visual examination	Type test	EN 50483-1	Passed
Test for mechanical damage to the main conductor	Type test	EN 50483-4 8.1.2.1	Passed
Branch cable pull-out test	Type test	EN 50483-4 8.1.2.2	Passed
Shear head function test	Type test	EN 50483-4 8.1.2.4	Passed
Low temperature impact test	Type test	EN 50483-4 8.1.2.5	Passed
Low temperature assembly test	Type test	EN 50483-4 8.1.4	Passed
Connector bolt tightening test	Type test	EN 50483-4 8.1.2.3	Passed
Dielectrical voltage test in air	Type test	EN 50483-4 8.1.3.1	Passed
Water Tightness test	Type test	EN 50483-4 8.1.3.2	Passed
Corrosion test	Type test	EN 50483-4 8.1.5.1 EN 50483-6	Passed
Climatic aging test	Type test	EN 50483-4 8.1.5.2 EN 50483-6	Passed
Electrical ageing test	Type test	EN 50483-4 8.1.6 EN 50483-5	Passed
Test for permanent marking	Type test	EN 50483-1	Passed

Insulation Piercing Connector IPC1001 of Electro Niroo Taban Control Company (NETCO) is approved according to EN 50483 standard.



## 2. Product Specifications

Name: Insulation Piercing Connector

Model: IPC1001



## 3. Technical Specifications

Branch Conductor Range: Cu 1.5-10 mm<sup>2</sup>

Main Conductor Range: Al 16-95 mm<sup>2</sup>

Features:

1 × Shear head nut

Weight:

Installation Torque: 10±1 N.m

Markings:

## 4. General Considerations

The customer has the right to officially announce their written objection to the test results or procedure within one month after the test report is issued. The tested samples will be stored at the laboratory for up to 6 months after testing.

Sampling was conducted by representatives of the Niroo Research Institute.



## 5. Test Methods and Results

### 5.1. Visual examination

The test was performed according to EN 50483-1, Annex A.

The connector was visually inspected for the bolts and nuts' coating, grease type, teeth thickness and coating, etc.

#### Acceptance Criteria:

The teeth thickness shall be at least 1.5 mm. The teeth shall be coated by Sn with Cu under layer. The grease must be silicone-based. The seal must be made of rubber and keep its form during several installations. The teeth and seal must be completely tight inside the connector.

#### Results:

The teeth thickness was 1.5 mm and the connector fulfilled other acceptance criteria.

#### Conclusion:

The connector passed the test.

### 5.2. Mechanical tests

#### 5.2.1. Test for mechanical damage to the main conductor

The test was performed according to EN 50483-4, clause 8.1.2.1. Two samples were tested in each of the following conductor combinations:

Main Conductor (mm <sup>2</sup> )	Branch Conductor (mm <sup>2</sup> )
95 Al (Max.)	10 Cu (Max.)
25 Al (Min.)	1.5 Cu (Min.)
25 Al (Min.)	10 Cu (Max.)

#### Acceptance Criteria:

The conductor shall maintain the test load for 60 s without breaking or any damage that would prevent the correct function of the cable.

#### Results:

The connector and the main conductor withstood the applied loads and no damage or failure were observed.

#### Conclusion:

The connector passed the test.



### 5.2.2. Branch cable pull-out test

The test was performed according to EN 50483-4, clause 8.1.2.2. Two samples were tested in each of the following conductor combinations:

Main Conductor (mm <sup>2</sup> )	Branch Conductor (mm <sup>2</sup> )
95 Al (Max.)	1.5 Cu (Min.)
25 Al (Min.)	1.5 Cu (Min.)

#### Acceptance Criteria:

Core slippage shall not exceed 3 mm.

The cores shall maintain the test load for 60 s without breaking or any damage that would prevent the correct function of the cable.

#### Results:

No slippage or damage was observed in the branch conductor under the test condition.

#### Conclusion:

The connector passed the test.

### 5.2.3. Shear head function test

The test was performed according to EN 50483-4, clause 8.1.2.4. Two samples were tested in each of the following conductor combinations.

Main Conductor (mm <sup>2</sup> )	Branch Conductor (mm <sup>2</sup> )	Shearing-off torque at the minimum temperature (N.m)	Shearing-off torque at the maximum temperature (N.m)
25 Al (Min.)	1.5 Cu (Min.)	10.2, 10.8, 11.0	9.2, 9.4, 10.3
95 Al (Max.)	10 Cu (Max.)	10.1, 10.5, 11.0	9.5, 9.8, 10.2

#### Acceptance Criteria:

For each of the test temperatures and cross-section combinations, the torque at which the shear head shears, shall be within the tolerances of the manufacturer's specified torque range (10±1 N.m).

#### Results:

For each of the test temperatures and cross-section combinations, the torque at which the shear head sheared was within the range 10±1 N.m.

#### Conclusion:

The connector passed the test.



#### 5.2.4. Low temperature impact test

The test was performed according to EN 50483-4, clause 8.1.2.5. Two samples were tested in each of the following conductor combinations:

Main Conductor (mm <sup>2</sup> )	Branch Conductor (mm <sup>2</sup> )
95 Al (Max.)	1.5 Cu (Min.)
95 Al (Max.)	10 Cu (Max.)

The connectors were installed in accordance with the manufacturer's instructions and in the manner for which they were designed.

#### Acceptance Criteria:

No damage shall occur which would affect the correct function of the connector.

#### Results:

No damage was observed in the samples after the test.

All samples fulfilled standard requirements.

#### Conclusion:

The connector passed the test.

#### 5.2.5. Connector bolt tightening test

The test was performed according to EN 50483-4, clause 8.1.2.3. Two samples were tested in each of the following conductor combinations. After setting up the test, the connectors were tightened to the standard torque.

Main Conductor (mm <sup>2</sup> )	Branch Conductor (mm <sup>2</sup> )
95 Al (Max.)	10 Cu (Max.)
25 Al (Min.)	1.5 Cu (Min.)
25 Al (Min.)	10 Cu (Max.)

#### Acceptance Criteria:

The connector shall be undamaged.

#### Results:

No damage was observed in the samples after the test.

#### Conclusion:

The connector passed the test.



### 5.3. Low temperature assembly test

The test was performed according to EN 50483-4, clause 8.1.4. Two connectors were tested in each of the following conductor combinations:

Main Conductor (mm <sup>2</sup> )	Branch Conductor (mm <sup>2</sup> )
95 Al (Max.)	10 Cu (Max.)
25 Al (Min.)	10 Cu (Max.)
95 Al (Max.)	1.5 Cu (Min.)

#### Acceptance Criteria:

Electrical continuity shall be achieved at a torque value less than, or equal to 70 % of the manufacturer's specified minimum installation torque.

#### Results:

Electrical continuity was achieved at a torque value less than to 70 % of the manufacturer's specified minimum installation torque in all conductor combinations.

All samples fulfilled standard requirements.

#### Conclusion:

The connector passed the test.

### 5.4. Dielectrical voltage test

#### 5.4.1. Dielectrical voltage test in air

The test was performed according to EN 50483-4, clause 8.1.3.1. Two connectors were tested in each of the conductor combinations shown in the following table.

#### Acceptance Criteria:

No flashover or breakdown shall occur.

The maximum leakage current shall be 10 mA.

#### Results:

Samples withstood the test voltage for 60 s without any breakout.

The measured leakage current in all samples was less than 10 mA.

All samples fulfilled standard requirements.

Cross Section (mm <sup>2</sup> )		Voltage test applied to	Earthing through	Rated voltage (kV)	Voltage application time (s)	Measured leakage current (mA)
Main Conductor	Branch Conductor					
25 Al (Min.)	1.5 Cu (Min.)	Main Conductor	Aluminum foil	4	60	0.1
95 Al (Max.)	1.5 Cu (Min.)	Main Conductor	Aluminum foil	4	60	0.1



#### Conclusion:

The connector passed the test.

### 5.5. Water tightness test

The test was performed according to EN 50483-4, clause 8.1.3.2. Two connectors were tested in each of the following conductor combinations:

Main Conductor (mm <sup>2</sup> )	Branch Conductor (mm <sup>2</sup> )
25 Al (Min.)	1.5 Cu (Min.)
25 Al (Min.)	10 Cu (Max.)

#### Acceptance Criteria:

No trace of water shall be observed at the end of the core.

#### Results:

No trace of water was observed at the end of the core. All samples fulfilled standard requirements.

#### Conclusion:

The connector passed the test.

### 5.6. Environmental tests

#### 5.6.1. Corrosion test

The test was performed according to EN 50483-4, clause 8.1.5.1 and EN 50483-6, clause 8.4. A connector installed on Al main conductor (25 mm<sup>2</sup> cross section area) and Cu branch conductor (1.5 mm<sup>2</sup> cross section area) was tested. The sample was exposed to 500 cycles of 2 h in the test environment. After the test, the sample was subjected to visual inspection.

#### Acceptance Criteria:

Visual inspection shall be carried out and there shall be no significant trace of red rust. The amount of corroded area should not be more than 10 % of the exposed surface area of the metallic parts.

The sample's identification marking shall be legible when examined with normal or corrected vision, without magnification.

No deterioration of the connector occur which would impair their normal function.

For a connector designed with a shear-head it shall be able to be removed with a torque below or equal to manufacturer's specified maximum torque.

#### Results:

The amount of observed red rust in the metallic parts was less than 10% of the exposed area.

The connector's identification marking was legible when examined with normal vision.

The connector was removed with a torque 5 N.m.

The sample fulfilled standard requirements.



**Conclusion:**

The connector passed the test.

**5.6.2. Climatic aging test**

The test was performed according to EN 50483-4, clause 8.1.5.2. A connector installed on Al main conductor (25 mm<sup>2</sup> cross section area) and Cu branch conductor (1.5 mm<sup>2</sup> cross section area) was tested. The sample was exposed to UV chamber for 6 cycles of 1 week. After completion of the test, the sample was removed from the chamber and subjected to visual inspection after 48 h.

**Acceptance Criteria:**

After the climatic ageing cycles and after a period of at least 24 h but not exceeding 72 h at the laboratory atmosphere:

Visual inspection shall be carried out to determine that there has been no degradation of the organic parts which could affect the normal function of the sample.

The connector's identification marking shall be legible when examined with normal or corrected vision, without magnification.

The connector shall meet the requirements of the dielectrical voltage test in air.

**Results:**

No degradation of the organic parts was observed.

The connector's identification marking was legible when examined with normal vision.

The connector met the requirements of the dielectrical voltage test in air.

The sample fulfilled standard requirements.

**Conclusion:**

The connector passed the test.

**5.6. Electrical ageing test**

The test was performed according to EN 50483-4, clause 8.1.6 and EN 50483-5. To prepare the test loop, the connectors were installed according to manufacturer's instructions on the following conductor combination:

Main Conductor (mm <sup>2</sup> )	Branch Conductor (mm <sup>2</sup> )
95 Al (Max.)	10 Cu (Max.)



### Acceptance Criteria:

Maximum standard values for the test parameters are shown in the following table.

Parameter	Maximum value
Initial scatter, $\delta$	0.3
Mean scatter, $\beta$	0.3
Assessment of resistance stability	15 %
Resistance factor ratio, $\lambda$	2.0
Temperature stability $\Delta\theta_j$	$\Delta\theta_j - 10 \leq \Delta\theta_j \leq \Delta\theta_j + 10$
Maximum temperature $\theta_j$ of each connector	$\theta_R$

### Results:

Results are shown in the following tables.  
All samples fulfilled standard requirements.

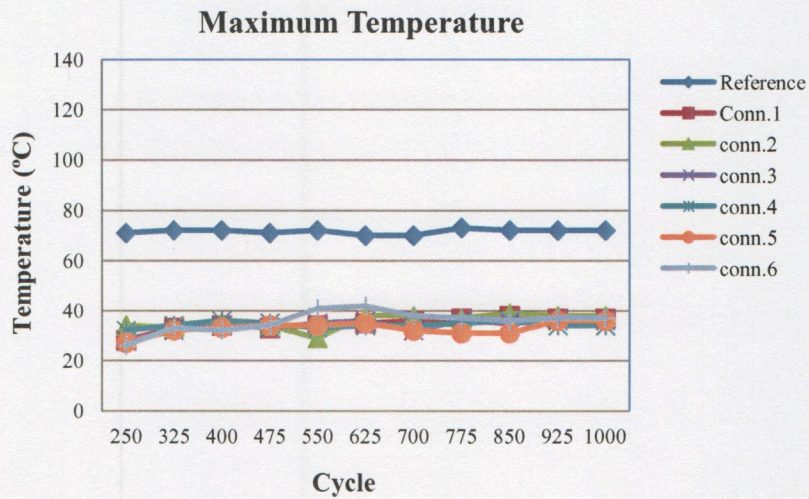
### Conclusion:

The connector passed the test.

Heating up the main conductor to reach the test temperature (90 °C)	Time (min)	10
	Current (A)	95
Holding the main conductor at the test temperature (90 °C)	Time (min)	10
	Current (A)	90
Measuring the temperature for the first time after the first 250 cycles and every 75 cycles afterwards:	Cooling time (min)	14
Measuring the resistance before and after the first 250 cycles, and every 75 cycles afterward	Cycle total time (min)	34

Parameter	Maximum Standard Value	Connector 1	Connector 2	Connector 3	Connector 4	Connector 5	Connector 6
Initial scatter, $\delta$	0.3	0.15					
Mean scatter, $\beta$	0.3	0.13					
Assessment of resistance stability	0.15	0.13	0.08	0.10	0.12	0.10	0.11
Maximum temperature $\theta_j$ of each connector (°C)	90	52	51	51	52	49	48
Resistance factor ratio, $\lambda$	2	1.10	0.95	1.03	1.10	1.03	1.06





### 5.7. Test for permanent marking

The test was performed according to EN 50483-1, clause 9.2.

#### Acceptance Criteria:

The marking shall remain clear and allow the accessory to be easily identified.

#### Results:

The marking remained clear and legible after the test.  
The sample fulfilled standard requirements.

#### Conclusion:

The connector passed the test.