



Korea Testing Certification

Duplicate

2018.03.30

Test Report

Report No. : T2018-02533

Company : ALPHAO Co., Ltd.

Representative : Young-Hwan LEE

Address : 2F 3-ho, 8 Ansantekom-gil, Sangnok-gu, Ansan-si, Gyeonggi-do, Republic of Korea

1. Product Name : Non-strip type Connector
- Type and Model : I-11 and 4 other models
2. Use of Report : for Quality Control
3. Date of Receipt : 2018. 02. 27.
4. Date of Test : 2018. 03. 02. - 2018. 03. 26.
5. Testing Method : Specification provided by the client
6. Test Results : See the annexed test result

Tested by : Gwanghoon OH

Approved by : Ki-Teak Son

1. This report is based on the test and analysis performed with the sample(s) submitted by the client.
Therefore, the report does not guarantee the quality of entire products.
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It is only used for the purpose of the quality test.
3. The copy of this report is invalid for use.
4. This report is the English version of No. T2018-02533.

2018. 03. 30.



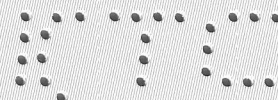
Korea Testing Certification

www.ktc.re.kr [15809] 22, Heungan-daero 27beon-gil, Gunpo-si, Gyeonggi-do

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서식P510-07 (Rev.3)

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Test Result

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1. Test sample information

- 1) Sample type : Non-strip type Connector
- 2) Model number : I-11 / I-22 / T-21 / T-31 / T-32, total 5 model
- 3) Rating : -
- 4) Manufacturer : Alphao Co., Ltd.
- 5) Number of sample : 5 connectors per each model, 3 sheets for glow wire & ball pressure test

2. Test item & applied standards

Test Code	Test item	Test method & criteria	Sample type
A	Conductor Resistance	KS C IEC 60228	connector & insulated wire
B	Glow Wire (750 ℃)	KS C IEC 60695-2-10	sheet
C	Ball Pressure (120 ℃)	KS C IEC 60695-10-2	sheet
D	Electric Strength	Specification provided by the client (refer to KS C IEC 60998-1 cl.13)	connector
E	Insulation Resistance	Specification provided by the client (refer to KS C IEC 60998-1 cl.13)	connector
F	Resistance to Ageing	Specification provided by the client (refer to KS C IEC 60320-1 cl.24.2)	connector
G	Temperature Rise	Specification provided by the client (refer to KS C IEC 60320-1 cl.22)	connector

3. Test(measuring) Equipment

Equipment	Equip. No.	Model	Maker	Test Code
Winding Resistance Meter	1900	WR50-2R	Raytech	A
Glow Wire Tester	1650	-	DK ENG	B
Ball Pressure Tester	5079	T10.02	PTL	C
Oven	843	WSIC-3002	WC science	C
Digital Dimension Measuring System	5365	EVS2020	3D-VISION	C
Puncture Tester	5348	7473	EXTECH	D



Test Result

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Equipment	Equip. No.	Model	Maker	Test Code
Insulation Resistance Tester	1599	SM8220	TOA	E
Multi Oven	4947	OF-02G-4C	JEIOTECH	F
T&H Chamber	4950	TH-KE-100	JEIOTECH	F
AC Variable Current Source	5496	DY-309	DYE	G
Temperature Recorder	5496-01	GL240	GRAPHTEC	G

4. Test Place : KTC Electric Power Technology Center Gunpo Lab.

5. Test Result

A. Conductor Resistance

1) Test method/condition and requirement

: Measure the d.c. resistance of the sample by such as wheatstone bridge method, and calculate the corrected resistance 20 ℃. and 1 km length by applying the following formula.

$$R_{20} = R_t \times k_t \times 1000 / L$$

- k_t : temperature correction factor from KS C IEC 60228:2015 Table A.1
- R_{20} : conductor resistance at 20 ℃ (Ω/km)
- R_t : measured conductor resistance (Ω)
- L : length of the cable (m)

2) Test result (unit: Ω/km)

Sample	Test result	
	Measured part	Measured value
I-11	Main wire only (22AWG only)	51.600
	Main wire + Connector (22AWG + I-11)	53.275
I-22	Main wire only (0.75 mm ² only)	25.626
	Main wire + Connector (0.75 mm ² + I-22)	26.902



Test Result

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Sample	Test result	
	Measured part	Measured value
T-21	Main wire + Connector (0.75 mm + T-21)	25.324
	Branch wire + Connector + Main wire (22AWG + T-21 + 0.75 mm)	39.888
T-31	Main wire + Connector (1.5 mm + T-31)	13.188
	Branch wire + Connector + Main wire (22AWG + T-31 + 1.5 mm)	33.088
T-32	Main wire + Connector (1.5 mm + T-32)	13.176
	Branch wire + Connector + Main wire (0.75 mm + T-32 + 1.5 mm)	20.452

* When in case of measurement which have connector included for measured part, the connector was located in the middle of total test length.

B. Glow Wire

1) Test method/condition and requirement

- a. Test temperature : (750±10) °C
- b. The parts surrounding the test specimen and the tissue paper placed below it shall be observed during 30 seconds after application of the glow-wire.
 - Flames or glowing combustion of the test specimen shall be extinguished within 30 seconds after removal of the glow wire.
 - There shall be no permanent ignition of the tissue paper.

2) Test Result

- a. There was no flames or glowing combustion on the test specimen during the test.
- b. There was no permanent ignition on the tissue paper.

C. Ball Pressure

1) Test method/condition and requirement

- a. Test temperature : (125±2) °C
- b. The surface of the sample is placed in the horizontal position and the hemispherical tip of the test equipment is pressed against the surface with a force of 20 N for 1 h.
 - The diameter of the impression caused by the ball shall not exceed 2 mm.



Test Result

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2) Test result (unit: mm)

Sample no.	#1	#2	#3	Remark
Measured value	1.10	0.84	0.83	Max. 1.10 mm

D. Electric Strength

1) Test method/condition and requirement

a. between Main wire & Cover

: No flashover or breakdown shall occur when applying a 2 000 V voltage of substantially sine-wave form, having a frequency of 60 Hz for 1 min.

b. between Branch wire & Cover

: No flashover or breakdown shall occur when applying a 2 000 V voltage of substantially sine-wave form, having a frequency of 60 Hz for 1 min.

2) Test result

Sample Testing part	I-11	I-22	T-21	T-31	T-32
Main wire	No F/O or B/D	No F/O or B/D	No F/O or B/D	No F/O or B/D	No F/O or B/D
Branch wire	-	-	No F/O or B/D	No F/O or B/D	No F/O or B/D

* F/O : Flashover, B/D : Breakdown

E. Insulation Resistance

1) Test method/condition and requirement

a. between Main wire & Cover : Insulation resistance when measured with d.c. voltage of 500 V applied, shall be more than 5 MΩ.

b. between Branch wire & Cover : Insulation resistance when measured with d.c. voltage of 500 V applied, shall be more than 5 MΩ.

2) Test result (unit: MΩ)



Test Result

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Sample Testing part	I-11	I-22	T-21	T-31	T-32
Main wire	$> 10^4$	$> 10^4$	$> 10^4$	$> 10^4$	$> 10^4$
Branch wire	-	-	$> 10^4$	$> 10^4$	$> 10^4$

F. Resistance to Ageing

1) Test method/condition and requirement

- Test samples are kept in the cabinet, which is maintained at a temperature of 70 ± 2 °C, for 168 h and continuously kept in the cabinet with humidity condition which of (50 ± 5) % R.H. for 96 h.
- A forefinger wrapped in a dry piece of rough cloth is pressed on the test sample with a force of 5 N.
- No traces of the cloth shall remain on the test sample and the material of the test sample shall not stick to the cloth.

2) Test result

Sample	I-11	I-22	T-21	T-31	T-32
Result	No damage or traces observed.	No damage or traces observed.	No damage or traces observed.	No damage or traces observed.	No damage or traces observed.

G. Temperature Rise

1) Test method/condition and requirement

- After connecting wire to each type of connector in accordance with the table below, apply specified test current for 1 h.

Sample Item	I-11	I-22	T-21	T-31	T-32
applied current	3 A	7 A	3 A	3 A	7 A
connected wire	AWG 22	AWG 18	AWG 22	AWG 22	AWG 18

- The temperature rise of cover shall not exceed 45 K.

2) Test result



Test Result

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Sample Item	I-11	I-22	T-21	T-31	T-32
Temperature (℃) - before the test	18.9	20.3	20.8	21.4	22.6
Temperature (℃) - after the test	21.0	25.6	22.2	22.6	25.3
Temperature rise (K)	2.1	5.3	1.4	1.2	2.7

7. Remarks

- 1) This test was performed with the sample and according to the test method provided by the client.
- 2) Environmental condition of this test is like below, according to IEC 60068-1, unless not particularly specified.
 - a. Temperature : (25 ± 10) °C
 - b. Humidity : (50 ± 25) % R.H.



Test Result

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- Photographs -



F1-1. I-11 connector



F1-2. I-21 connector



F1-3. T-21 connector



F1-4. T-31 connector



F1-5. T-32 connector

Figure1. Test Samples



Test Result

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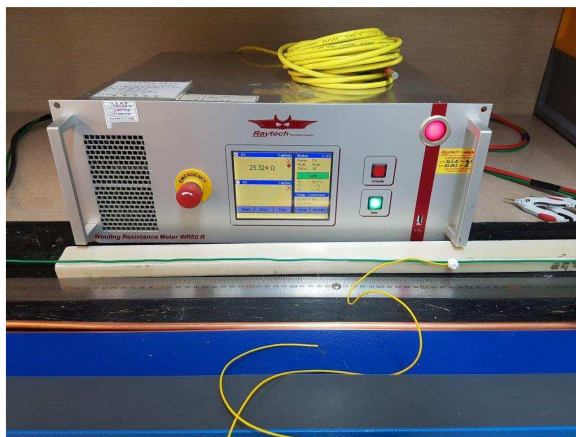
- Test Photographs -



F2-1. I-11 connector



F2-2. I-22 connector



F2-3. T-21 connector



F2-4. T-31 connector



F2-5. T-32 connector

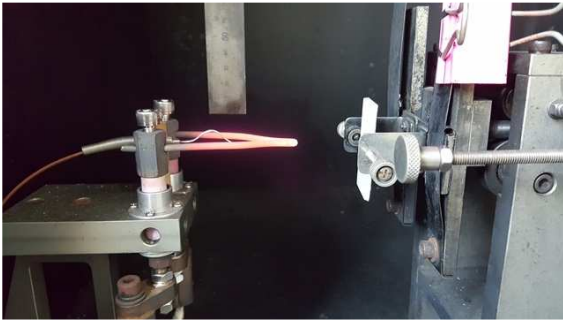
Figure2. Conductor Resistance



Test Result

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- Test Photographs -



F3-1. Glow wire test



F3-2. Test equipment for glow wire



F3-3. Ball Pressure test



F3-4. Test equipment for ball pressure



F3-5. Specimen Group 1 after test



F3-6. Specimen Group 2 after test



F3-6. Specimen Group 3 after test

Figure3. Glow Wire & Ball Pressure

< Specimen Group information >

1. Group 1 : Thickness approx. 3.0 mm
2. Group 2 : Thickness approx. 2.0 mm
3. Group 3 : Thickness approx. 1.5 mm

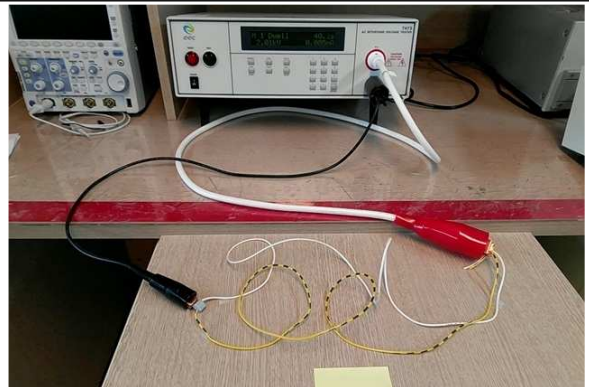
Test Result

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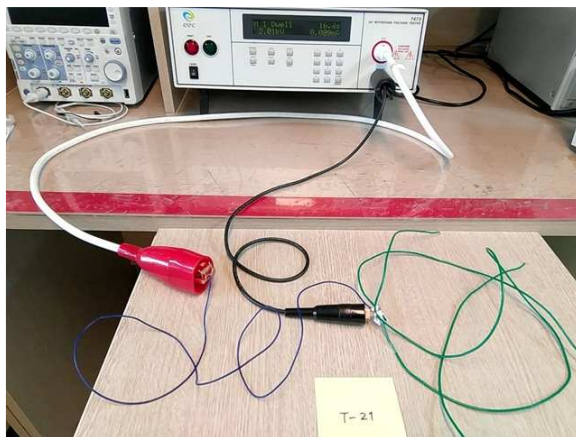
- Test Photographs -



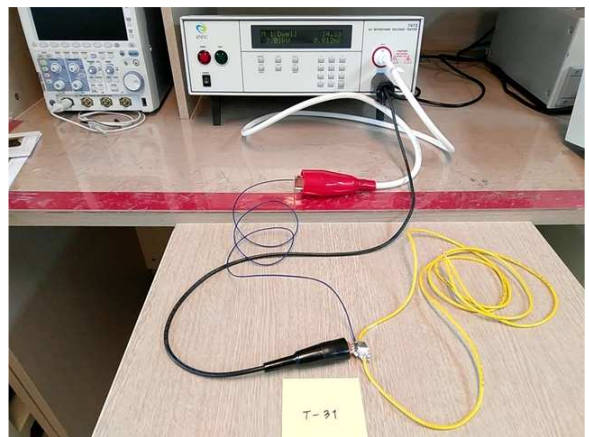
F4-1. I-11 connector (M/W-cover)



F4-2. I-21 connector (M/W-cover)



F4-3. T-21 connector (B/W-cover)



F4-4. T-31 connector (B/W-cover)



F4-5. T-32 connector (B/W-cover)

< Abbreviation >

- 1) M/W : Main wire
- 2) B/W : Branch wire

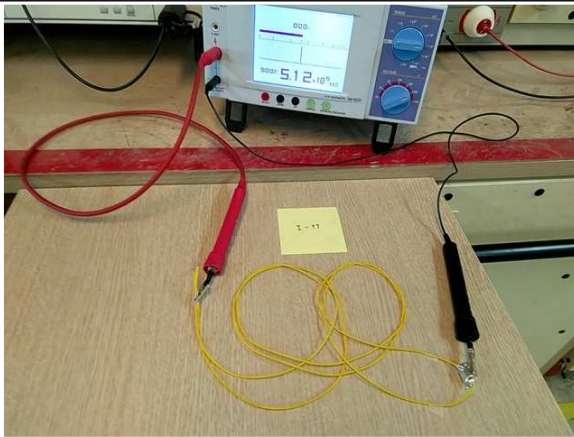
Figure4. Electric Strength



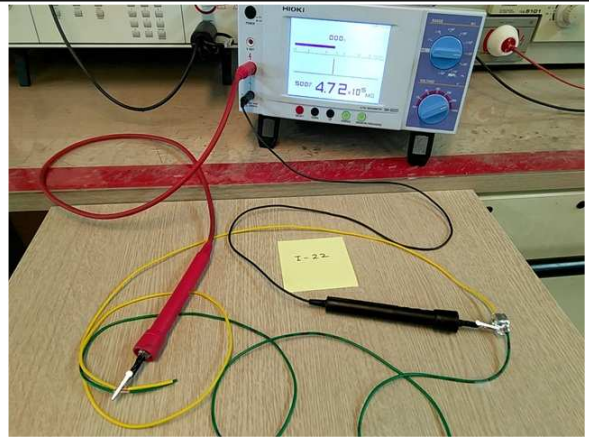
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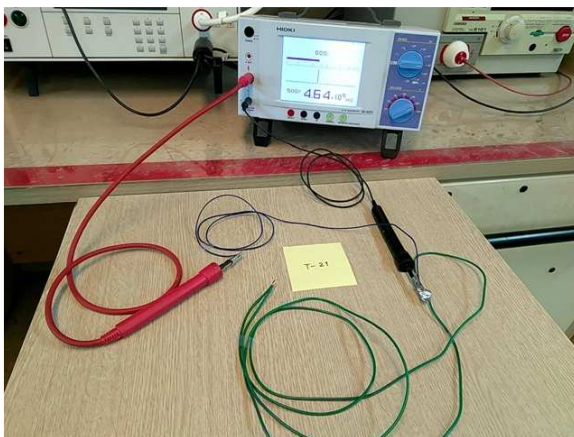
- Test Photographs -



F5-1. I-11 connector (M/W-cover)



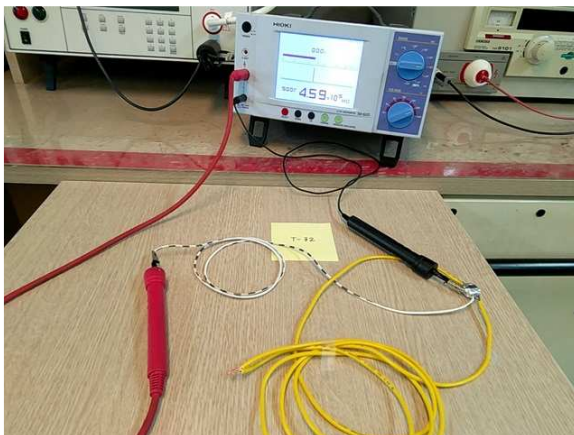
F5-2. I-21 connector (M/W-cover)



F5-3. T-21 connector (B/W-cover)



F5-4. T-31 connector (B/W-cover)



F5-5. T-32 connector (B/W-cover)

< Abbreviation >

- 1) M/W : Main wire
- 2) B/W : Branch wire

Figure5. Insulation Resistance



Test Result

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- Test Photographs -



F6-1. sample loading to oven



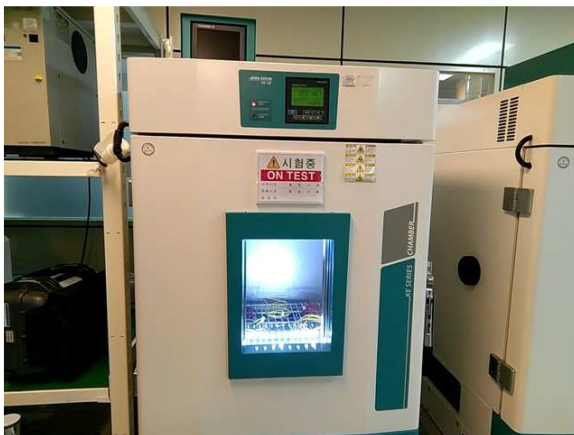
F6-2. ageing (70 °C×168 h)



F6-3. sample after ageing



F6-4. sample loading to T&H chamber



F6-5. Humidity treatment (50 % R.H.×96 h)



F6-6. sample after the test

Figure6. Resistance to Ageing



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- Test Photographs -



F7-1. I-11 connector



F7-2. I-21 connector



F7-3. T-21 connector



F7-4. T-31 connector



F7-5. T-32 connector



F7-6. Example of test graph (I-21 connector)

Figure7. Temperature Rise

- END -

