



## DYNAMIC D2970 Connector

### 1. SCOPE

#### 1.1. Content

This specification covers the requirements for product performance, test methods and quality assurance provisions of Dynamic D2970 Connector.

#### 1.2. Qualification

When tests are performed on the subject product line, procedures specified in Figure 1 shall be used. All inspections shall be performed using the applicable inspection plan and product drawing.

#### 1.3. Qualification Test Results

Successful qualification testing on the subject product line has not been completed. The Qualification Test Report number will be issued upon successful qualification testing.

### 2. APPLICABLE DOCUMENTS AND FORMS

The following documents and forms constitute a part of this specification to the extent specified herein. Unless otherwise indicated, the latest edition of the document applies.

#### 2.1. TE Documents

- 408-78171: Application Specification
- 501-78743: Qualification Test Report

#### 2.2. Industry Documents

- EN 61984: Connectors – Safety requirements and tests
- IEC 60068: Environmental testing
- IEC 60512: Connectors for electronic equipment – Test and measurements
- IEC 60664-1: Insulation coordination for equipment within low-voltage systems (Part 1)
- IEC 60999-1: Connecting devices - Electrical copper conductors –  
Safety requirements for screw-type and screwless-type clamping units
- UL1059: Standard for Safety for Terminal Blocks
- EIA364: Electrical Connector Performance Test Standards

### 3. REQUIREMENTS

#### 3.1. Design and Construction

Product shall be of the design, construction, materials and physical dimensions specified on the applicable product drawing.

#### 3.2. Ratings

- Operating temperature including temperature rising: -55°C~+105°C
- Assembling ambient temperature: -5°C~+45°C

- Voltage and Current (UL1059)

Voltage (Use Group B): 300V AC/DC

Voltage (Use Group D): 51-150V AC/DC 15A Max.

Voltage (Use Group D): 151-300V AC/DC 10A Max.

Δ 30°C

Number of energized contacts	Current(A)						
	AWG26 With ferrule	AWG 24	AWG 22	AWG 20	AWG 18	AWG 16	AWG 14
3	1	2	3	5	7	10	15
4	1	2	3	5	7	10	14

- Voltage and Current (IEC61984)

Voltage (Pollution Degree:2 , Protection Class:II ): 400V AC/DC

Voltage (Pollution Degree:2 , Protection Class:III ): 320V AC/DC

Voltage (Pollution Degree:3 , Protection Class:III ): 250V AC/DC

@Ambient 60°C(Δ 45°C)

Number of energized contacts	Current(A)							
	0.13SQ With ferrule	0.2 SQ	0.34 SQ	0.5 SQ	0.75 SQ	1.0 SQ	1.5 SQ	2.5 SQ
3	2	4	5	6	9	13.5	15	18
4	2	4	5	6	9	13.5	14.5	17

@Ambient 40°C(Δ 65°C)

Number of energized contacts	Current(A)							
	0.13SQ With ferrule	0.2 SQ	0.34 SQ	0.5 SQ	0.75 SQ	1.0 SQ	1.5 SQ	2.5 SQ
3	2	4	5	6	9	13.5	17.5	22
4	2	4	5	6	9	13.5	17.5	21

@Ambient 20°C(Δ 85°C)

Number of energized contacts	Current(A)							
	0.13SQ With ferrule	0.2 SQ	0.34 SQ	0.5 SQ	0.75 SQ	1.0 SQ	1.5 SQ	2.5 SQ
3	2	4	5	6	9	13.5	17.5	24
4	2	4	5	6	9	13.5	17.5	24

- Derating curve  
Derating factor 0.8  
Refer Figure 4

### 3.3. Test Requirements and Procedures Summary

Unless otherwise specified, all tests shall be performed at ambient environmental conditions.

No.	TEST DESCRIPTION	REQUIREMENT	PROCEDURE
3.3.1	Initial examination of product	Meets requirements of visual and product drawing.	Dimensional examination IEC 60512-1-1/-2, Test 1a and 1b
3.3.2	Final examination of product	Meets visual requirements.	Visual examination IEC 60512-1-1, Test 1a
<b>ELECTRICAL</b>			
3.3.3	Contact Resistance	Initial:10m $\Omega$ Max Final:20m $\Omega$ Max	Test current: 1A Measure points see Figure 2. IEC 60512-2-2 Test 2b
3.3.4	Temperature Rise Test	$\Delta T$ :30°CMax. (UL1059) $\Delta T$ :45/65/85°CMax. (IEC61984)	Length of test cable: 0.46m up to AWG16 1.22m over AWG14 Carry its rated current Measure points see Figure 2. IEC 60512-5-1 Test 5a
3.3.5	Dielectric Withstand Voltage Test	No flashover or breakdown of voltage Current leakage:0.5mA Max.	Mated specimen Test voltage r.m.s.2210V Duration 1minute IEC61984 7.3.12
3.3.6	Insulation Resistance	Not less than 100M $\Omega$	Mated specimen Test voltage 500V DC Time:60s IEC 60512-3-1 Test 3a Method B
<b>MECHANICAL</b>			
3.3.7	Durability of marking	Marking shall be still readable according to 6.2 of EN61984 (If marking made by impression, molding, pressing or engraving or the like are not subjected to this test)	Test piston: Size 1 Wet test with liquid: water Duration: 10 cycles Force:5N IEC 60068-2-70 Test Xb
3.3.8	Polarisation and coding	No damage likely to impair function	Load: 20N IEC 60512-13-5 Test 13e

3.3.9	Pull out force of terminations	No damage likely to impair function	Load: <table border="1" data-bbox="1081 233 1490 762"> <thead> <tr> <th colspan="2">UL1059</th> <th colspan="2">IEC60999-1</th> </tr> <tr> <th>AWG</th> <th>force [N]</th> <th>mm<sup>2</sup></th> <th>force [N]</th> </tr> </thead> <tbody> <tr> <td>26</td> <td>8.9</td> <td>0.2</td> <td>10</td> </tr> <tr> <td>24</td> <td>13.4</td> <td>0.34</td> <td>15</td> </tr> <tr> <td>22</td> <td>20</td> <td>0.5</td> <td>20</td> </tr> <tr> <td>20</td> <td>30</td> <td>0.75</td> <td>30</td> </tr> <tr> <td>18</td> <td>30</td> <td>1</td> <td>35</td> </tr> <tr> <td>16</td> <td>40</td> <td>1.5</td> <td>40</td> </tr> <tr> <td>14</td> <td>50</td> <td>2.5</td> <td>50</td> </tr> </tbody> </table> Duration: 1min UL1059/IEC60999-1	UL1059		IEC60999-1		AWG	force [N]	mm <sup>2</sup>	force [N]	26	8.9	0.2	10	24	13.4	0.34	15	22	20	0.5	20	20	30	0.75	30	18	30	1	35	16	40	1.5	40	14	50	2.5	50
UL1059		IEC60999-1																																					
AWG	force [N]	mm <sup>2</sup>	force [N]																																				
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16	40	1.5	40																																				
14	50	2.5	50																																				
3.3.10	Mechanical strength impact	Connector and internal insulation shall no damage to impair normal use. A reduction of clearance and creepage distance is not allowed.	Dropping height: - 750mm for specimens of mass≤ 250g - 500mm for specimens of mass>250g Dropping cycles:8 positions in 45° step, one cycles per position IEC 60512-7-2 Test 7b																																				
3.3.11	Mating and Un-mating force of full loaded connector	Mating force: 15N Max/position. Un-mating force:0.5N~15N/position.	The specified force shall be applied in axial direction with the speed of 20mm/min. Without Locking parts IEC 60512-13-1 Test 13a																																				
3.3.12	Mechanical Operation (Durability)	operation cycles without load Au:100cycles Sn:25cycles No damage likely to impair normal use 6.14.1 of EN 61984	Shall be engaged and disengaged by means of A) a device simulating normal operating conditions at the speed of approximately 50mm/min B) manual mating/un-mating 300 Max. cycle per hour IEC 60512-9-1 Test 9a																																				
3.3.14	Vibration	No damage likely to impair function No discontinuities greater than $t > 1\mu s$	Frequency:10-150Hz Sweep speed:1 octave/min Amplitude:0.35mm Acceleration:5g Duration 2.5hours in each or the three orthogonal axes Fixed wires at 70mm from connector IEC60512-6-4 Test 6d																																				

3.3.15	Shock	No damage likely to impair function No discontinuities greater than $t > 1\mu s$	Acceleration: $500m/s^2$ Duration: 11ms Total 18 shocks (three positive and three negative in each of the three orthogonal axes) Fixed wires at 70mm from connector IEC60512-6-3 Test 6c
3.3.16	Housing Locking Strength	No damage likely to impair function	Pull out force: 49N Pull to un-mating direction Duration: 15s IEC60512-15-6 Test 15f

**ENVIRONMENTAL**

3.3.17	Cold	No damage likely to impair function	Subject mated specimen to $-55^{\circ}C$ Duration time: 2h, Test Ab IEC 60512-11-10 Test 11j (IEC 60068-2-1)
3.3.18	Dry Heat	No damage likely to impair function	Subject mated specimen to $+105^{\circ}C$ Duration time: 168h Test Bb IEC 60512-11-9 Test 11i (IEC 60068-2-2)
3.3.19	Damp Heat, cyclic	No damage likely to impair function	Subject mated specimen to Min ambient temperature: $25^{\circ}C$ Max ambient temperature: $40^{\circ}C$ Number of cycles: 21 Duration time: 12h+12h Variant 1 IEC 60512-11-12 Test 11m
3.3.20	Rapid Change of temperature (Temperature Cycle)	No damage likely to impair function	Subject mated specimen to $T_a = -55 \pm 2^{\circ}C$ to $T_b = +105 \pm 2^{\circ}C$ , duration $t_1$ : 1h each extreme, 25 cycles IEC 60512-11-4 Test 11d (IEC 60068-2-14 Test Na)
3.3.21	Corrosion (Alternative)	No damage likely to impair function Per 6.21 of EN 61984	Test 1: Flowing mixed gas corrosion according to test 11g, method 1 or method 4 (Table 1) Duration time: 96h IEC 60512-11-7 Test 11g 7.3.14 of EN 61984
3.3.22	Salt Spray	No damage likely to impair function	Subject mated specimen to $5 \pm 1\%$ salt spray Duration time: 96h IEC 60512-11-6

3.3.23	Solderability	Wet solder coverage 95% Min	Dip depth: 2mm Used solder: Lead-free solder Solder temperature: $240 \pm 5^\circ\text{C}$ Immersion time: $3 \pm 0.5\text{s}$ IEC60512-12-1 Test12a
3.3.24	Resistance to Soldering Heat	No damage likely to impair function	Preheat: temperature $150\text{-}200^\circ\text{C}$ Time 60-180s Soldering: temperature $217^\circ\text{C}$ Time 60-150s Peak: temperature $260^\circ\text{C}$ Time 20-40s( $\pm 5^\circ\text{C}$ ) Cycles: 2 JEDEC J-STD-020
3.3.25	Glow Wire Test	Condition a) $T_E=0$ Or Condition b) $T_E \leq 60\text{s}$ and No burn of light tissue paper	Test temperature: $750^\circ\text{C}$ IEC60695-2-11

Figure 1


**NOTE**

Shall meet visual requirements, show no physical damage, and meet requirements of additional tests as specified in the Product Qualification and Requalification Test Sequence shown in Figure 3.

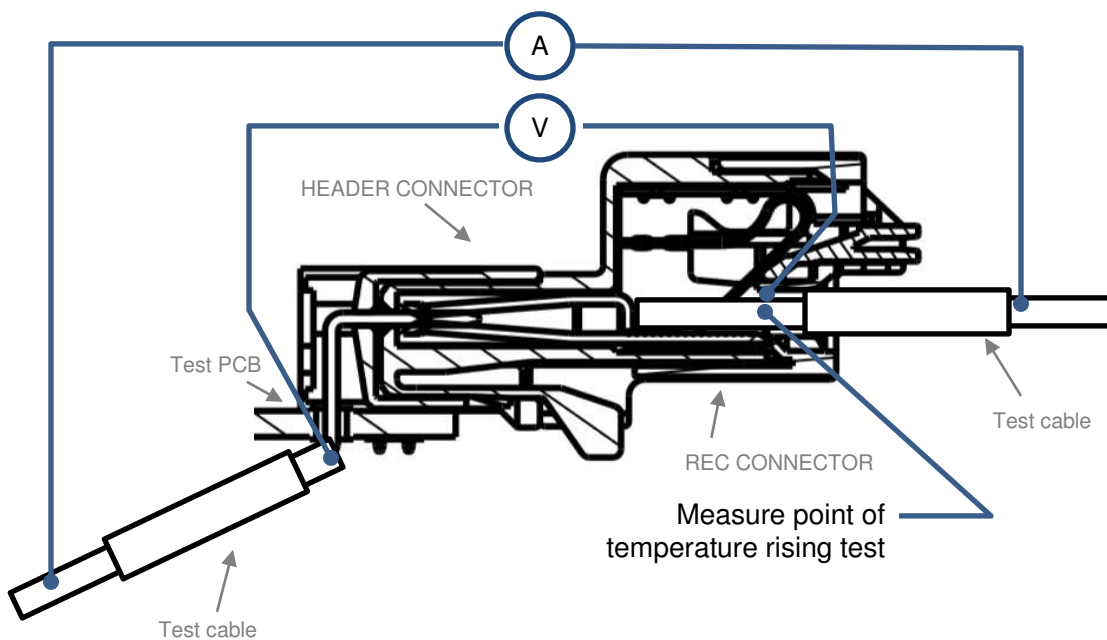


Figure 2

3.4. Product Qualification and Requalification Test Sequence

TEST OR EXAMINATION	TEST GROUP												
	1	2	3	4	5	6	7	8	9	10	11	12	
	TEST SEQUENCE (a)												
Initial examination of product	1	1	1	1	1	1	1	1	1	1	1	1	
Contact Resistance				2,6		2,6	2,5	2,5	2,4				
Temperature Rise Test					2								
Dielectric Withstand Voltage Test						7		6					
Insulation Resistance						8		7					
Durability of marking	2												
Polarisation and coding	3												
Pull out force of terminations			2										
Mechanical strength impact		2											
Mating and Un-mating force				3,5									
Mechanical Operation				4									
Vibration, Low Frequency							3						
Shock							4						
Housing Locking Strength	4												
Cold						3							
Dry Heat						4							
Damp Heat, cyclic								3					
Rapid Change of temperature								4					
Corrosion						5							
Salt Spray									3				
Solderability										2			
Resistance to Soldering Heat											2		
Glow Wire Test												2	
Final examination of product	5	3	3	7	3	9	6	8	5	3	3		

Figure 3



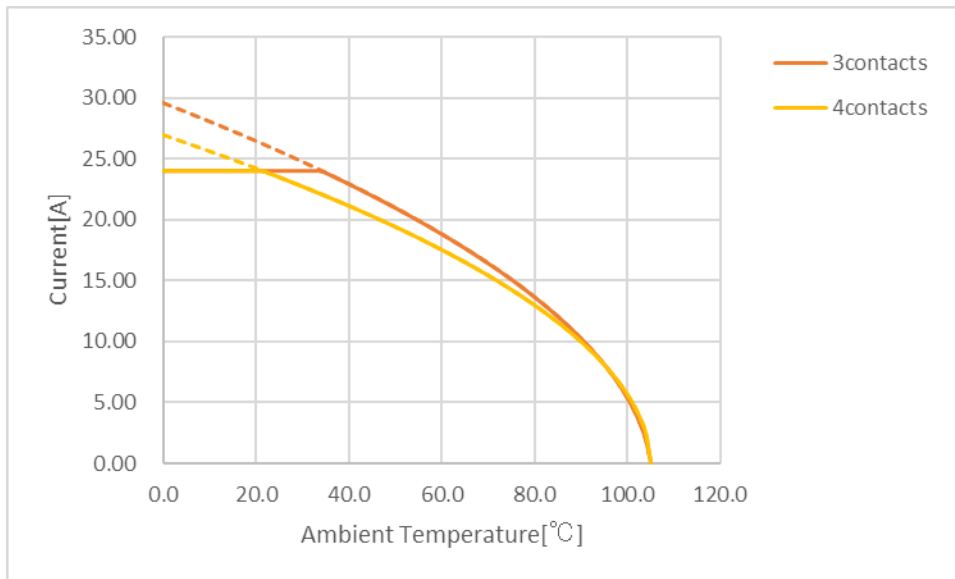
**NOTE**

(a) Numbers indicate sequence in which tests are performed.

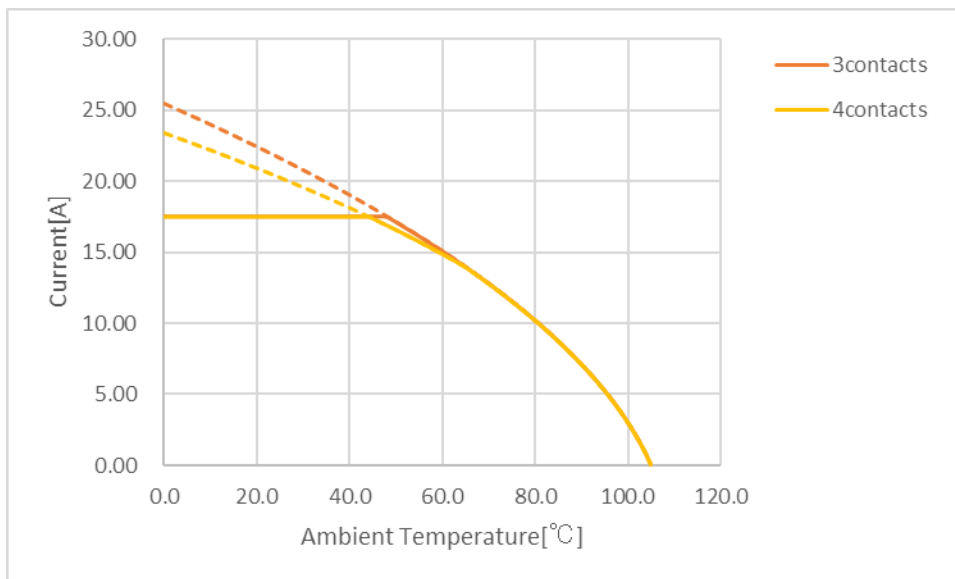


#### 4. DERATING CURVE

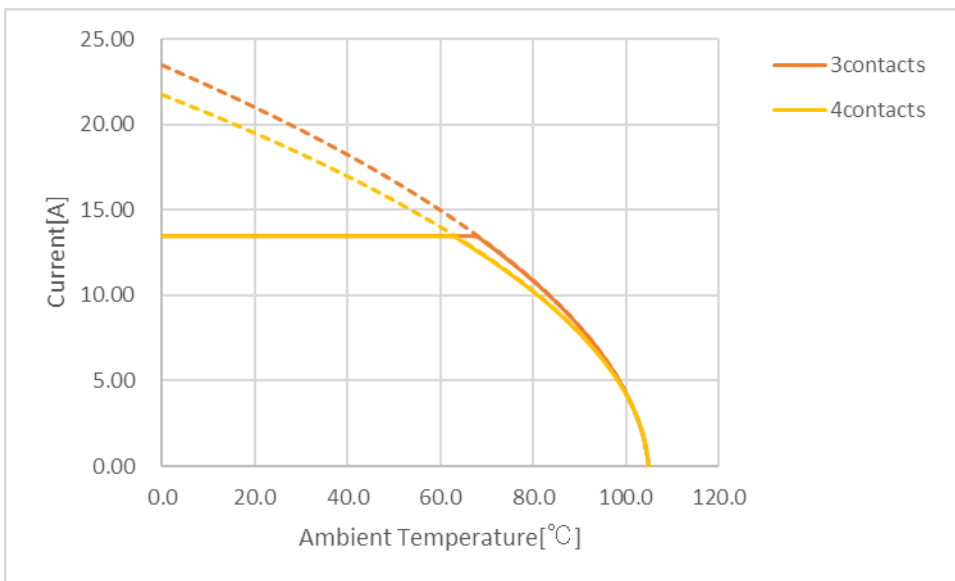
AWG14/2.5SQ



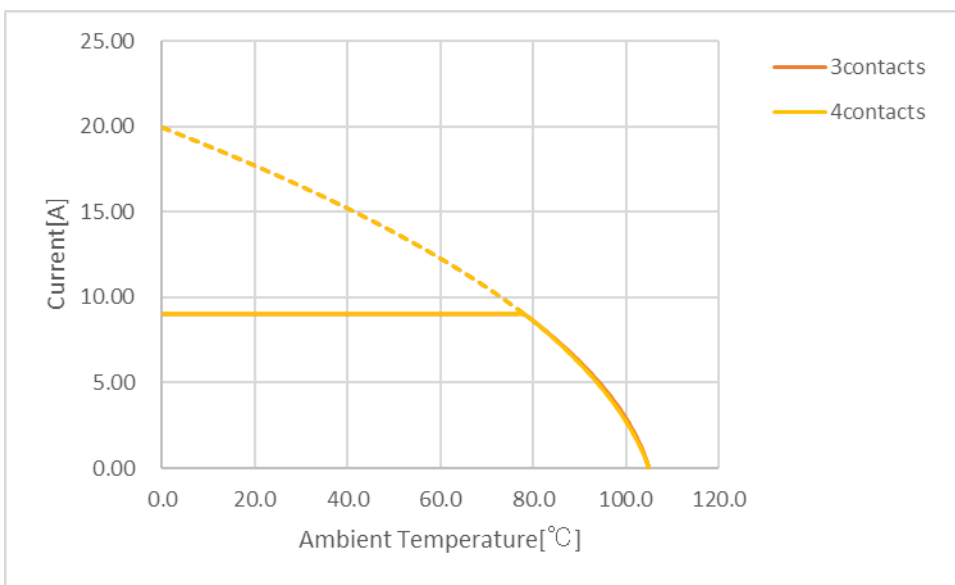
AWG16/1.5SQ



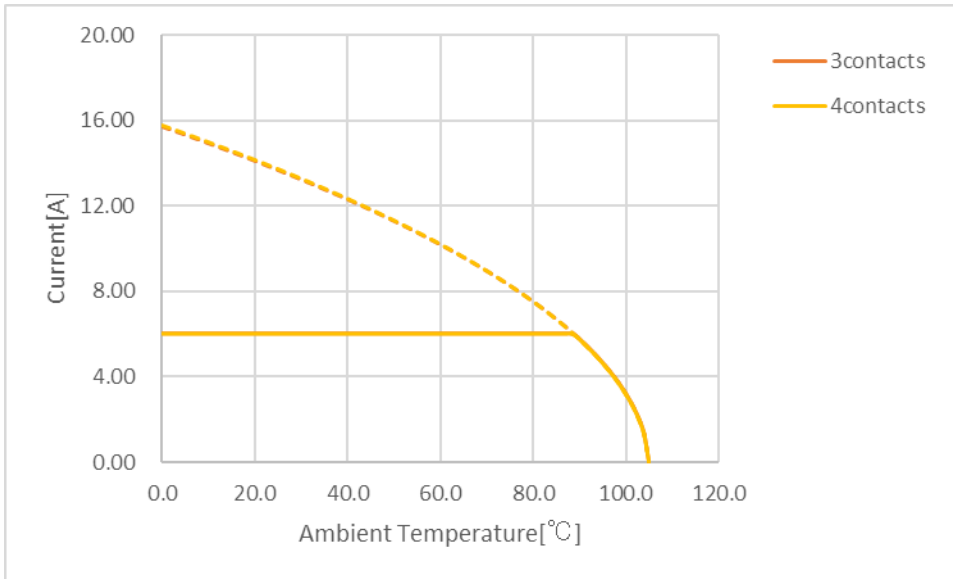
1.0SQ



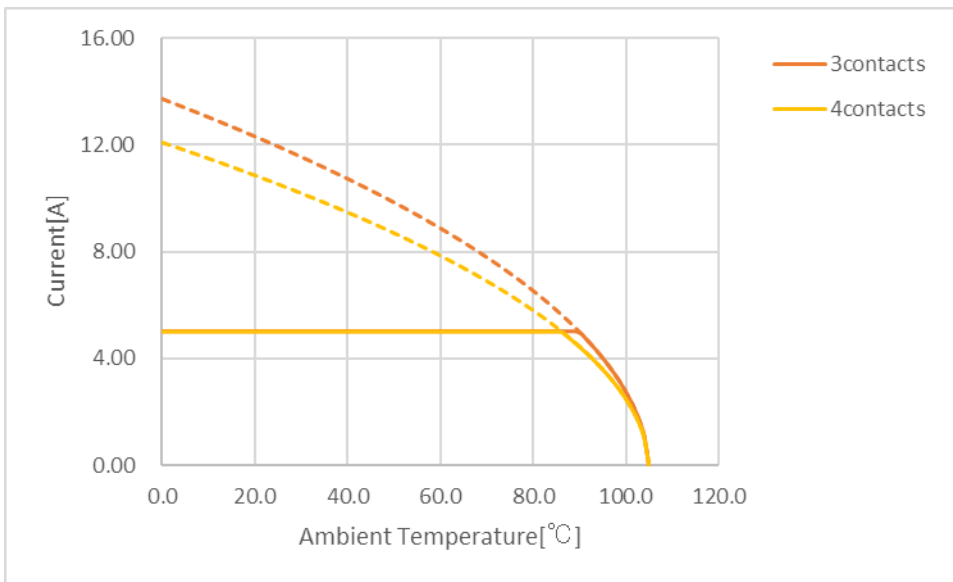
AWG18/0.75SQ



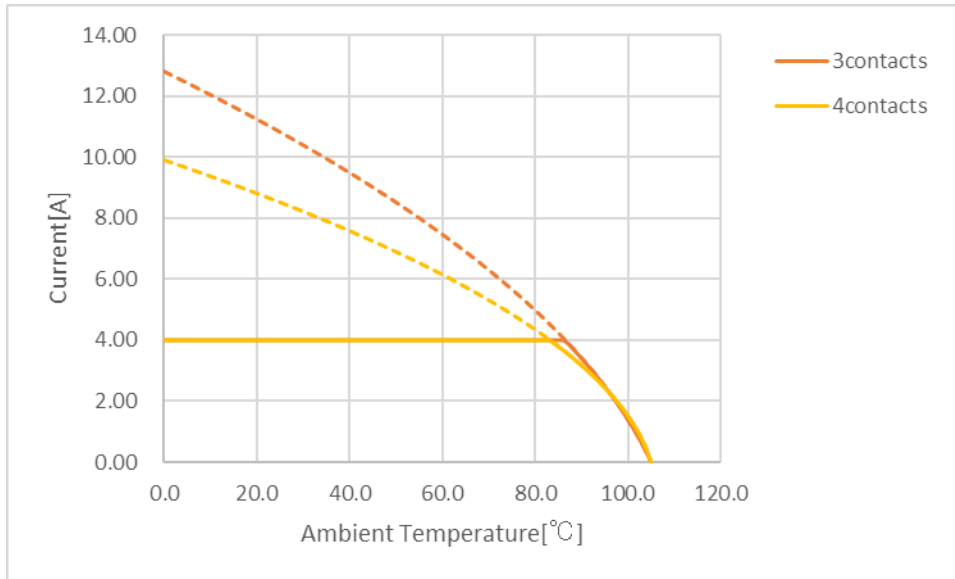
AWG20/0.5SQ



AWG22/0.34SQ



AWG24/0.2SQ



AWG26/0.13SQ

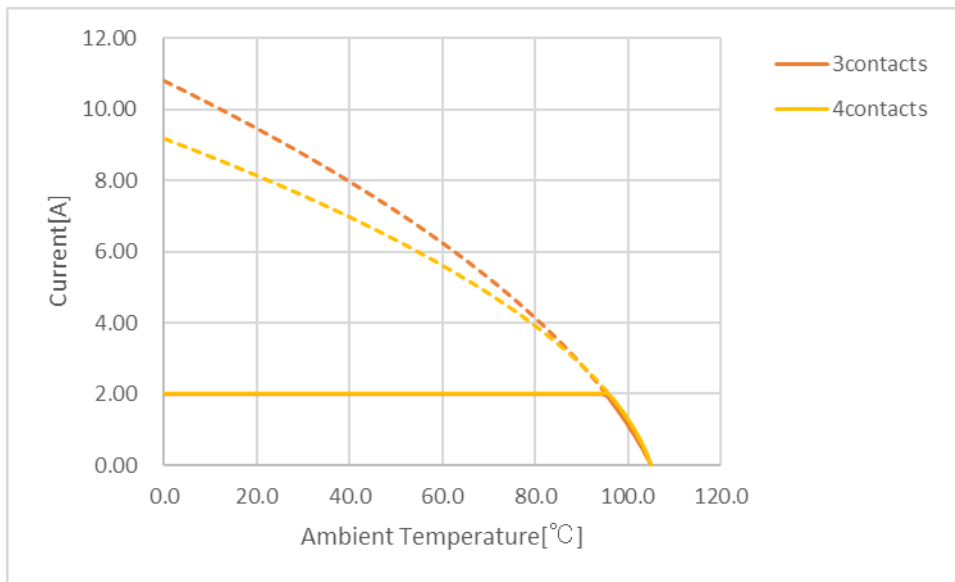


Figure 4