Qualification Test Report

PV4-S CONNECTOR

1. INTRODUCTION

1.1 Purpose

This document provides the qualification summery of TE Connectivity PV4-S CONNECTOR.

1.2 Scope

This specification covers the electrical, mechanical, and environmental performance of PV4-S CONNECTORS.

Connector Male
PV4-SMX……
(PN 2270024)

Connector Female
PV4-SFX……
(PN 2270025)

Fig 1

1.3 Product Description

P/ N (Trade Mark)	Name	Remarks
2270024	PV4-SMX	Pin connector
2270025	PV4-SFX	Socket connector

1.4 Ratings

- Rated Voltage — TUV:1500V DC/ UL 1000V DC
- Rated Current (At 85°C ambient) — 25A Max. for 2.5mm² / AWG14; 35A Max. for 4.0mm² / AWG12; 40A Max. for 6.0mm² / AWG10
- Ambient temperature — -40°C ~+85°C
- Protection Degree — IP68（1m, 24h）
- Protection Class — II
- Cable Wire size — 2.5mm2 / AWG12;4.0mm2 / AWG12; 6.0mm2 / AWG10;
- Cable Jacket Diameter — 5.5mm to 7.8mm
- Overvoltage category — III
- Pollution degree — 2

1.5 Qualification Test Sequence

Test or Examination	Test Group														
	A	B	C	D	E	F	G	H	I	J	K	L	M		
	Test Sequence (a)														
Visual and dimensional examination	1,3	1,6	1,3	1,6	1,8	1,5	1,5	1,3	1,3	1,5	1,7	1,6	1,5		
terminations and connection methods	2														
contact retention force in insert	2														
Mating Force	2														
Mechanical Operation (Durability)		3													
Bending Test (flexing)		5													
Mechanical strength at lower temperature (Impact test)								2							
Strain Relief Test									2						
Contact Resistance		2,4			2,7					2,4	2,6		2,4		
Temperature Rise Test			2												
Dielectric Voltage Withstand Test (Impulse)				4		4									
Dielectric Voltage Withstand Test (Voltage Proof)				3	5	3						4			
Wet Insulation Resistance Test				5	6		4				5	2,5			
Dry Heat										3					
Temperature Cycle Test				2							3				
Damp Heat					4							3			
Thermal Shock Test					3										
Humidity Freezing Test						2					4				
Degree of protection							2								
Degree of protection IP code							3								
Salt Mist Corrosion Test													3		

*** Notes:**

1) Numbers indicate the sequence in which the tests are performed.
2) Group A are for themselves separate tests

2. TEST CONTENT

No.	Description	Test procedure according	Requirements	
2.1	Visual and dimension examination	5.5 of IEC 61512-1-1/-2, Test 1a and 1b	Meets requirements of product drawing	
2.2	Terminations and connection methods	Pull out force test of crimped connections 5.5 of EN 50521	Min. 230N for 2.5mm^2, 310N for 4mm^2 and 360N for 6mm^2 See Table 1 of EN60352-2	
2.3	Contact retention force in insert	Shall withstand for a force of 200N applied in any direction permitted by the construction, either directly or through any wire or cable 5.15.2 of EN 50521	No damage likely to impair function	
2.4	Contact Resistance (initial)	Test current:1A Measure points a at the end of the termination	initial	The Max. values shall be 0.5mΩ
			final	Deviation of the contact resistance shall be no more than 50% of the initial reference value (0.5 mΩ)
2.5	Mechanical Operation (Durability)	6.3.5 of EN 50521	1) 100 operation cycles without load 2) No damage likely to impair function 5.11.1 of EN 50521	
2.6	Mating Force	The Max. values of insertion force shall be 70N	The specified force shall be applied in the direction of the insertion of the unmated pair with the rate of 25.4mm/min.	
2.7	Bending Test (flexing)	The cable is loaded with a weight such that the force applied is 20N (in Figure 1) 6.3.6 of EN 50521	100 repeat bends 5.11.2 of EN 50521	
2.8	Temperature Rise Test	- length of test cable = 500mm±50mm test 5a of EN 60512 6.3.4 of EN 50521	temperature rise(△T) of a connector shall not exceed 30℃ 5.13 of EN 50521	
2.9	Dry Heat	1000h at +85℃±2℃ 11i of IEC 61512	No damage likely to impair function	
2.10	Temperature Cycle Test (Thermal Cycle)	-40±2℃to +90±2℃, 200 cycles with current rating, see Figure 35.1 35 of UL1703	No damage likely to impair function	
2.11	Damp Heat	1000h at +85℃±2℃and 85%±5%RH, 10.13 of IEC 61215 6.3.12 of EN 50521	No damage likely to impair function	
2.12	Dielectric Voltage Withstand Test (Impulse)	Impulse test voltage according to Table 5, applied three impulses of each polarity and interval of at least 1s between impulses. 6.3.8a) of EN 50521	No flashover or breakdown of voltage	
2.13	Dielectric Voltage Withstand Test (Voltage Proof)	withstand voltage (50/60Hz) with a r.m.s value of 2000V plus (4 times rated voltage) for 1 min. 6.3.8b) of EN 50521	No flashover or breakdown of voltage	
2.14	Wet Insulation Resistance Test	In both polarities, applied a 1500V dc according En50521:2008+A1	Insulation resistance shall be not less than 400 MΩ	
2.15	Dielectric Voltage Withstand Test	Withstand 2 times the system voltage plus 1000V until the leakage current is stabilized for at least 1 min. The voltage is to be applied	The leakage current shall not exceed than 50uA dc	

		in both polarities 26 of UL1703	
2.16	Humidity Freezing Test	10 cycles from +85℃±2℃, 85%RH±2.5% to -40℃±2℃, see Figure 36.1 36 of UL1703	No damage likely to impair function
2.17	Degree of protection	Test finger IP20 at 10N Per 60529 6.3.3.1 of EN 50521	no live parts shall be accessible by test finger 5.4.1 of EN 50521
2.18	Degree of protection IP code	Test IP 68（1m,24h） per IEC 60529 6.3.3.2 of EN 50521	IP 68, No ingress of water or dust 5.9 of EN 50521
2.19	Mechanical strength at lower temperature (Impact test)	Impact normal to the surface with 51mm diameter smooth steel sphere, weight 535g, falling through a vertical distance of 1.295m. at 25℃and also after being cooled and maintained for 3h at a temperature of minus 35.0±2.0℃ 30 of UL1703	No breakage and crack(test per clause 30 of UL1703)
2.20	Strain Relief Test	clause 22 of UL1703	Without damage to the connector, or separation of the two mating connectors.
2.22	Thermal Shock	200 cycle temperature change from 85℃ to -40℃,transfer duration <3min Follow 6.3.11 En50521	No damage likely to impair function
2.21	Salt Mist Corrosion Test	Mated connector and expose to the following salt mist condition. Duration: 96 hours exposure; Atmosphere: salt spray from a 5±1% solution; Temperature: 35 ±2°C PH value: 6.5~7.2 IEC60068-2-11	No damage likely to impair function

3. SUMMARY OF TEST RESULTS:

Examination of product – all test group

	Test Item	Test Result	Requirement	Judgment
Group A	Terminations &connection methods	300 Min	230N min.	passed
		380 Min	310N min.	passed
		420 Min	360N min.	passed
	Mating Force	56N Max.	70N Max.	passed
	Contact retention force in insert	No physical damage	No abnormalities	passed
Group B	Contact Resistance	0.37 Max.	0.5mΩ Max.	passed
	Durability test	No physical damage	No abnormalities	passed
	Contact Resistance	0.38 Max	0.75mΩ Max.	passed
	Bending Test (flexing)	No physical damage	No abnormalities	passed
Group C	Temperature Rise Test (△T)	△T≤15 for 25A DC	△T≤30℃	passed
		△T≤15 for 35A DC	△T≤30℃	passed
		△T≤15 for 40A DC	△T≤30℃	passed
Group D	Temperature Cycle Test	No physical damage	No abnormalities	passed

	Dielectric Voltage Withstand Test	No breakdown or flashover	No abnormalities	passed
	Dielectric Voltage Withstand Test(Impulse)	No breakdown or flashover	No abnormalities	passed
	Wet Insulation Resistance Test	>400 MΩ	$4x10^8$Ω Min	passed
Group E	Contact Resistance	0.37 Max.	0.5mΩ Max.	passed
	Thermal Shock Test	No physical damage	No abnormalities	passed
	Damp Heat	No physical damage	No abnormalities	passed
	Dielectric Voltage Withstand Test	No breakdown or flashover	No abnormalities	passed
	Wet Insulation Resistance Test	>400 MΩ	$4x10^8$Ω Min	passed
	Contact Resistance	0.35 Max	0.75mΩ Max	passed
Group F	Humidity Freezing Test	No physical damage	No abnormalities	passed
	Dielectric Voltage Withstand Test	No breakdown or flashover	No abnormalities	passed
	Dielectric Voltage Withstand Test(Impulse)	No breakdown or flashover	No abnormalities	passed
Group G	Degree of protection	No live parts be accessible by test finger	No abnormalities	passed
	Degree of protection IP code	No ingress of water	No abnormalities	passed
	Wet Insulation Resistance Test	>400 MΩ	$4x10^8$Ω Min	passed
Group H	Mechanical strength at lower temperature (Impact test)	No physical damage	No abnormalities	passed
Group I	Strain Relief Test	No physical damage	No abnormalities	passed
Group J	Contact Resistance	0.39 Max	0.5mΩ Max	passed
	Dry Heat Test	No physical damage	No abnormalities	passed
	Contact Resistance	0.43 Max	0.75mΩ Max	passed
Group K	Contact Resistance	0.34 Max	0.5mΩ Max	passed
	Thermal Cycle Test	No physical damage	No abnormalities	passed
	Humidity FreezeTest	No physical damage	No abnormalities	passed
	Wet Insulation Resistance	>400 MΩ	$4x10^8$Ω Min	passed
	Contact Resistance	0.37 Max	0.75mΩ Max	passed
Group L	Wet Insulation Resistance	>400 MΩ	$4x10^8$Ω Min	passed
	Damp Heat Test	No physical damage	No abnormalities	passed
	Dielectric Voltage Withstand Test	No flashover or breakdown	No abnormalities	passed
	Wet Insulation Resistance	>400 MΩ	$4x10^8$Ω Min	passed
Group M	Contact Resistance	0.38 Max	0.5mΩ Max	passed
	Salt Spray Test	No physical damage	No abnormalities	passed
	Contact Resistance	0.39 Max	0.5mΩ Max	passed