



Testroof Engineering and Certification Co., Ltd.
İnönü Mah. Kayışdağı Cad. No: 150/3 Ataşehir / İstanbul /TURKEY

Technical Requirement Assesment	
EN 61984:2009	
Connectors. Safety requirements and tests	
Report reference No.....	19-0301/01
Date of issue.....	28.10.2019
Testing laboratory.....	Testroof Engineering and Certification Co, Ltd.
Address.....	İnönü, Kayışdağı Cad. No:150-3, 34755 Ataşehir/İstanbul
Testing location	As above
Applicant	TTAF ELEKTRONİK SANAYİ VE TİCARET ANONİM ŞİRKETİ
Address.....	Kavaklı Mah. İstanbul Cad. No:21 Beylikdüzü / İstanbul / TURKEY
Standard	EN 61984:2009
Number of pages (Report)	16
Tested Model(s).....	WPI-0302M20/S1
Model(s).....	WPI-0302M20/S1, WPI -0302M20/S2
Manufacturer.....	The same as applicant
Compiled by.....	
Signature Eng. E. Cengiz	Signature Eng. M. Kocas
test case does not apply to the test object.....	N/A
test object does meet the requirement.....	P(ass)
test object does not meet the requirement.....	F(ail)
General Remarks	
<p>"(see remark #)" refers to a remark appended to the report.</p> <p>"(see appended table)" refers to a table appended to the report.</p> <p>Through out this report a comma is used as the decimal separator.</p> <p>This report shall not be reproduced except in full without the written approval of the testing laboratory.</p>	






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Clause	Requirement + Test	Result - Remark	Verdict
	MECHANICAL TEST GROUP A (TABLE 10)		
A1	VISUAL EXAMINATION: IEC 60512 Test 1a		
6.2.2	Marking indelible and easily legible		P
	Minimum marking on the connector a) trademark	TTAF	P
	Markings a) trademark and b) type identification on smallest unit of packaging	Trademark on product	P
	All other markings (c – k) given in the technical documentation or catalogue of the manufacturer		P
	c) Rated current	32 A max	P
	c) Rated voltage	600 VAC max	P
	e) Over voltage category	II/III	P
	f) Pollution degree	IV	P
	g) Protection degree	IP68	P
	h) Range of temperature	-40 / + 85 °C	P
	i) Type of terminals	Screw	P
	j) Connectable conductors	Manufacturer's specification	P
	k) Reference to this standard or to the DS	DS	P
6.2.3	Position for the contacts and protective earthing contacts clearly indicated. Marking of protective earthing contacts applies symbol  or "PE". This requirement is not necessary for non rewirable connectors.	Marked	P
6.9.2	Fixing means not used to fix live parts.		P
6.9.3	Termination without damage possible.		P
6.10	CBC has adequate breaking capacity.		N/A
6.11	Free connector: Wires protected against shear and tensile stress at the termination and secured to prevent twisting.		P
	The above requirement does not apply to:		
	a) free connectors for termination to cables in fixed mountings (plug connection in the sense of a detachable connection)		N/A
	b) free connectors in which the terminations are protected against pull and twisting by mounting provisions in the end-use product		P

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Clause	Requirement + Test	Result - Remark	Verdict
	DIMENSIONAL EXAMINATION: IEC 60512		
6.19	Clearances and creepage distances according to IEC 60664.		P
	Connector dimensions comply with the DS or manufacturer's specification.		P
A2	DURABILITY OF MARKING		
7.3.2	Test liquid: water Test piston size 1; force 5 N; 10 cycles IEC 60068-2-70 Test Xb „Abrasion of marking“	IEC 60068-2-70 Test Xb “Abrasion of marking” in the moulding	P
	VISUAL EXAMINATION: IEC 60512 Test 1a		
	Visible with the naked eye		P
A3	POLARISATION AND CODING: IEC 60512 / Test [13e]		
	- For unenclosed connectors (internal connections) 20 N	>> 60 N	P
	- For enclosed connectors (external connections) 1,5 x mating force, but not higher than 80 N		N/A
6.3	Multipole connector: Contact between protective earthing contacts and live contacts is not possible by engagement.		P
6.9.1	Multipole connector: Polarisation prevents improper connection of mating parts.		P
	VISUAL EXAMINATION: IEC 60512 Test 1a		
	No damage likely to impair function		P
A4	PROVISIONS FOR EARTHING		
6.5.1	For a CBC the earthing contact is a “first make - last break” contact.		N/A
7.3.3	No electrical contact indication between earth contact and the other contacts.		N/A
6.5.4	CONNECTION OF THE PROTECTIVE EARTH CONNECTOR		
	VISUAL EXAMINATION: IEC 60512 Test 1a		
	Remove any available covers if required.		N/A
6.5.4.1	The protective conductor terminal accepts a conductor with a minimum cross-section as specified in Table 1, Column 2:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Minimum cross- section according to Table 1	Table 1 Column 2	□
6.5.4.2	With regard to design and type of construction, the protective conductor terminations are at least equivalent to the other terminations according to clause 6.:		P
A5	INTERLOCK		
7.3.4	The specimens are engaged by hand over their full engagement distance. All other contacts are wired in series. The interlock contacts “make last and break first”, before any other contact does.		P
6.7	The connector with an interlock cannot be engaged or disengaged as long as the contacts are live.		P
A6	TERMINATIONS		
6.6	Range of connectable conductor(s)	DS	□
6.6.1 a)	Test acc. to: IEC 60352-1 Wrapped connections		N/A
6.6.1 b)	Test acc. to: IEC 60352-2 Crimped connections		N/A
6.6.1 c)	Test acc. to: IEC 60352-3 or IEC 60998-2-3 Accessible insulation displacement connections		N/A
6.6.1 d)	Test acc. to: IEC 60352-4 or IEC 60998-2-3 Non-accessible insulation displacement connections		N/A
6.6.1 e)	Test acc. to: IEC 60352-5 Press-in connections		N/A
6.6.1 f)	Test acc. to: IEC 60352-6 or IEC 60998-2-3 Insulation piercing connections		N/A
6.6.1 g)	Test acc. to: IEC 60999-1 or IEC 60999-2 or IEC 60352-7 Screwless-type clamping units		N/A
6.6.1 h)	Test acc. to: IEC 60999-1 or IEC 60999-2 Screw-type clamping units		P
6.6.1 i)	Test acc. to: IEC 60760 or IEC 61210 Flat, quick-connect terminations		N/A
	Test acc. to: IEC 60068-2-20 Solder terminations		N/A
	Other terminations, not mentioned above, acc. to IEC standard.....:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
A7	CONTACT RETENTION IN INSERT: IEC 60512 Test 15a		
	Test load shall be three times the specified insertion force (mating) of one contact or the specified insertion force of one contact plus 50 N, whichever is less. Minimum test load 20 N.	> 30 N	—
	VISUAL EXAMINATION: IEC 60512 Test 1a		
6.18.2	Contacts safety retained		P
	No axial displacement likely to impair normal operation		P
A8	CABLE CLAMP: IEC 60512		
6.17	The cable clamp is made of insulating material or metal.		P
6.17	Metal cable clamps meet one of the following requirements:		
	a) Provided with a covering of insulating material to prevent any accessible metal part becoming live in case of a fault.		N/A
	b) No contact possible with the IEC test finger according to IEC 60529.		N/A
	c) Be connected to protective earth.		
	Cable clamping range (6.17 Table 6 or manufacturer's specification)		—
A8.1	CABLE CLAMP (PULL) IEC 60512 Test 17c		N/A
	VISUAL EXAMINATION: IEC 60512 Test 1a		N/A
	Covers mounted / contacts not connected		P
A8.2	CABLE CLAMP (TORSION): IEC 60512 Test 17d		N/A
	VISUAL EXAMINATION: IEC 60512 Test 1a		N/A
	Covers mounted		P
A9	MECHANICAL STRENGTH IMPACT (Only free Connectors and CBC): IEC 60512 Test 7b		
	Dropping cycles: 8 positions in 45° steps		—
	Dropping height		—
	VISUAL EXAMINATION: IEC 60512 Test 1a		
6.18.1	No damage likely to impair safety		P

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Clause	Requirement + Test	Result - Remark	Verdict
6.18.3	Internal insulations not damaged		P
	Parts against electric shock not damaged		P
	Clearances and creepage distances not reduced		P
SERVICE LIFE TEST GROUP B (TABLE 11)			
B1	INITIAL MEASUREMENTS (CONTACT RESISTANCE): IEC 60512 Test 2b		
	Reference value for subsequent measurement:		
	Test current.....:	A	
B2	BREAKING CAPACITY (ONLY FOR CBCs)		
7.3.5	Operating cycles		—
	Speed of insertion/ withdrawal	0,8 m/s	
	Test voltage	V	
	Test current	A	
	Power factor / cos(φ)	0,9	
	Time constant	1 ms 15%	
VISUAL EXAMINATION: IEC 60512 Test 1a			
6.14.2	No damage occurred, which could impair normal use		N/A
B3	MECHANICAL OPERATIONS: IEC 60512 Test 9a		
7.3.9	Operating cycles	100	
	Insertion speed	0,01 m/s	
	Rest	30 s	
VISUAL EXAMINATION: IEC 60512 Test 1a			
6.14.1	No damage occurred, which could impair normal use		P
B4	FINAL MEASUREMENTS (CONTACT RESISTANCE): IEC 60512 Test 2b		
	Test current	1 A	
			P
DIELECTRIC STRENGTH: IEC 60512 Test 4a			
	a) Impulse withstand voltage	2,95 kV	

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Clause	Requirement + Test	Result - Remark	Verdict
	b) r.m.s. withstand voltage	2,0 kV	□
6.13	No breakdown or flashover occurred		
B5	BENDING (FLEXING) TEST (To be performed on new specimen)		
7.3.10	Only non-rewirable connectors		
	Rated current	A	
	Rated voltage	V	
	Wire cross section	mm ²	
	Load: □ 0,75 mm ² / 20 N ; □ 0,75 mm ² / 10 N	N	
	Numbers of bending		
	DURING THE TEST		
	No interruption of the test current		N/A
	No short-circuit between the conductors		N/A
	AFTER THE TEST		
	Cable support sleeve not loosened from the body		N/A
	Insulation shows no signs of abrasion or of wear and tear.		N/A
	Broken strands do not pierce the insulation.		N/A
	VISUAL EXAMINATION: IEC 60512 Test 1a		
6.14.3	No damage occurs, which could impair normal use.		N/A
	THERMAL TEST GROUP C (TABLE 12)		
C1	TEMPERATURE RISE TEST: IEC 60512 Test 5A		
	Test conductor length according Table 7	250	□
	Test conductor cross-section.....	1,5 mm ²	□
7.3.7	Mated specimen		□
	Test current	10 A	□
	Ambient temperature – components	24 °C	□
	Upper limit temperature – components	100 °C	□
6.16	The upper limiting temperature specified for the specimen is not exceeded		P

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Clause	Requirement + Test	Result - Remark	Verdict
	CLIMATIC TEST GROUP D (TABLE 13)		
D1	INITIAL MEASUREMENTS (CONTACT RESISTANCE): IEC 60512 Test 2b		
	Reference value for subsequent measurement...:		
	Test current	1 A	
D2	COLD: IEC 60512 Test 11j		
	Mated specimen		
	Test duration	2 h	
	Lower temperature limit	-35 °C	
	VISUAL EXAMINATION: IEC 60512 Test 1a		
6.6.3	Sufficient contact pressure through insulation		P
6.8 / 6.15	No visual damage, no cracks on insulations parts likely to impair safety		P
6.18.3	Internal insulation shows no damage likely to impair safety		P
	No damage occurred, which could impair normal use		
D3	DRY HEAT: IEC 60512 Test 11i		
	Mated specimen.....		—
	Test duration		—
	Upper temperature limit		—
	VISUAL EXAMINATION: IEC 60512 Test 1a		
6.6.3	Sufficient contact pressure through insulation		
6.8 / 6.15	No visual damage, no cracks on insulations parts likely to impair safety		
6.18.3	Internal insulation shows no damage likely to impair safety		
	No damage occurred, which could impair normal use		

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Clause	Requirement + Test	Result - Remark	Verdict
D4	PROTECTION AGAINST CORROSION: IEC 60512 Test 11g		
7.3.14 Test 1	Flowing mixed gas corrosion according to IEC 60512-11-7, test 11g Method 1 or alternatively Method 4 (Table 1 of IEC 60512-11-7)). Test duration is 4 days.		N/A
7.3.14 Test 2 alternative	Sulfur dioxide test with general condensation of moisture according to ISO 6988 . Test duration is 24h (1 test cycle)		
	VISUAL EXAMINATION: IEC 60512 Test 1a		
6.21	Function guaranteed		
	No damage occurred, which could impair normal use		
D5	FINAL MEASUREMENT (CONTACT RESISTANCE): IEC 60512 Test 2b		
	Test current	1 A	∅
			P
D6	DIELECTRIC STRENGTH: IEC 60512 Test 4a		
	Mated specimen		∅
	Impulse withstand voltage	2,95 kV	∅
	r.m.s. withstand voltage	2,0 kV	∅
6.13	No breakdown or flashover occurred	See appended table D6	P
	DEGREE OF PROTECTION TEST GROUP E (TABLE 14)		
E1	PROTECTION AGAINST ELECTRIC SHOCK		
	Unenclosed connectors (for use inside an enclosure):		
	5.4 c1) COC classified as IPOX, no test required		
6.4.2.2	5.4 c2) COC Hand back safety (IP1X or IPXXA) 50 mm sphere pressed with 20 N against mated specimen. No live parts accessible.		P

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Clause	Requirement + Test	Result - Remark	Verdict
6.4.2.3	5.4 c3) COC Finger safety (IP2X or IPXXB) Jointed test finger pressed with 20 N against mated specimen. No live parts accessible.		P
6.4.2.3	5.4 d) CBC finger safety (IP2X or IPXXB) Jointed test finger pressed with 20 N against mated and unmated specimen. No live parts accessible.		N/A
	Enclosed connectors (COCs and CBCs)		
6.4.1	Test at mated and unmated specimen. Jointed IEC test finger pressed with 20 N against the surface except the mating face of the male part of the connector. Creepages and clearances ensured between live parts and test finger.		N/A
	All parts necessary to ensure protection against electric shock only removable with a tool.		N/A
6.4.3	For a CBC, protection against electric shock is ensured also during insertion and withdrawal. This is proved by use of the jointed IEC test with a test force of 20 N. Creepages and clearances ensured between live parts and test finger.		N/A
E2	PROVISION FOR EARTHING		
7.3.13 6.5.3	Resistance between accessible metal parts and the earthing contact $\leq 100 \text{ m}\Omega$		N/A
E3	DEGREE OF PROTECTION IP CODE: IEC 60529		
7.3.6.3	Tests for IP Codes higher than IP2X or IPXXB		
6.12 7.3.7.1	IP code according to IEC 60529 in mated condition or according manufacturers conditions	IP68	—
	Maximum and minimum cross-section wiring or cable diameter connected		—
7.3.7.2	Protection against ingress of foreign solid objects, tested according to IEC 60529		P
7.3.7.3	Protection against harmful ingress of water, tested according to IEC 60529		P

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Clause	Requirement + Test	Result - Remark	Verdict
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B1	TABLE: Initial measurements (Contact resistance)					
Test current	1 A				—	
Test sample	Contact	1	2	3	4	
1	U1 [mV]	0,77	0,78	0,78	N/A	
	R1 [mΩ]	0,78	0,78	0,78	N/A	
2	U1 [mV]	0,74	0,74	0,74	N/A	
	R1 [mΩ]	0,74	0,74	0,74	N/A	
3	U1 [mV]	0,77	0,77	0,77	N/A	
	R1 [mΩ]	0,77	0,77	0,77	N/A	

supplementary information: Connectors with solder pins

B4.2	TABLE: Dielectric strength (mated specimen)			
Test voltage applied between:	a) Impulse withstand voltage applied	b) r.m.s withstand voltage applied	Breakdown / flashover (Yes/No)	
Contact - Contact	2,95 kV	2,0 kV	No	
Contact - Earth	2,95 kV	2,0 kV	N/A	
Contact - Surface	N/A	N/A	N/A	

supplementary information: Connectors with solder pins

B4.2	TABLE: Dielectric strength (mated specimen)			
Test voltage applied between:	a) Impulse withstand voltage applied	b) r.m.s withstand voltage applied	Breakdown / flashover (Yes/No)	
Contact - Contact	2,95 kV	2,0 kV	No	
Contact - Earth	N/A	N/A	N/A	
Contact - Surface	N/A	N/A	N/A	

supplementary information: Connectors with Cage Clamp connection

D1	TABLE: Initial measurements (Contact resistance)					
Test current	1 A				—	
Test sample	Contact	1	2	3	PE	
1	U1 [mV]	0,78	0,78	0,78	N/A	
	R1 [mΩ]	0,74	0,74	0,74	N/A	

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Clause	Requirement + Test	Result - Remark	Verdict
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supplementary information: Connectors with solder pins

D1	TABLE: Initial measurements (Contact resistance)					
Test current					1 A	—
Test sample	Contact	1	2	3	PE	□
1	U1 [mV]	0,77	0,77	0,77	N/A	
	R1 [mΩ]	0,77	0,77	0,77	N/A	

supplementary information: Connectors with Cage Clamp connection

D6	TABLE: Dielectric strength (mated specimen)			
Test voltage applied between:	a) Impulse withstand voltage applied	b) r.m.s withstand voltage applied	Breakdown / flashover (Yes/No)	
Contact - Contact	2,95 kV	2,0 kV	No	
Contact - Earth	2,95 kV	2,0 kV	No	
Contact - Surface	N/A	N/A	N/A	

supplementary information:

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Clause	Requirement + Test	Result - Remark	Verdict
0.1	TABLE: Characteristic features		
Example	X	Please mark relevant line with "X"	
Kind of equipment	X	Connector without breaking capacity (COC)	
		Connector with breaking capacity (CBC)	
Existence of an enclosure		Unenclosed connector	
	X	Enclosed connector	
Design of the connector	X	Fixed connector	
		Free connector	
Additional characteristics	X	Connector with protective earthing contact	
		Connector without protective earthing contact	
		Connector with cable clamp	
	X	Connector without cable clamp	
	X	Connectors (COC) with protection against electric shock for hand back safety, when mated	
	X	Connectors (COC) with protection against electric shock for finger safety	
		CBC with protection against electric shock for finger safety, both in mated and unmated condition	
	X	Degree of protection of a connector	
		Connector for class II equipment	
		Connector with interlock	
		Connector without interlock	
		Non-rewirable connector	
	X	Rewirable connector	
Pollution degree		1	
		2	
		3	
	X	4	
Over voltage category		I	
	X	II	
	X	III	
		IV	

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Clause	Requirement + Test	Result - Remark	Verdict
0.1	TABLE: Characteristic features		
Operating cycles		10	
		50	
	X	100	
		500	
		1000	
		2000	
		5000	
		Accordinging manufacturer's	
Bendings		10	
		50	
		100	
		500	
		1000	
		2000	
		5000	
		20000	
	Accordinging manufacturer's:		
Upper temperature limit		70°C	
	X	85°C	
		100°C	
		125°C	
		Accordinging manufacturer's:	
Lower temperature limit		-10°C	
		-25°C	
	X	-40°C	
		-55°C	
		0°C	
		Accordinging manufacturer's: - 40 °C	

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0.1	TABLE: Characteristic features		
Type of conductor	X	Solid	
	X	Flexible	
Termination and connection		Wrapped connection	
		Crimped connection	
		IDC Accessible	
		IDC Non-accessible	
		Press in connections	
		Insulation piercing connections	
	X	Solder termination	
		Screwless-type clamping units	
	X	Screw-type clamping units	
		Flat, quick-connect terminations	
	According manufacturer's:		
Values for cable clamp		[4-9 mm]	
		[9-12 mm]	
		[12-20 mm]	
		[20-32 mm]	
		[33-42 mm]	
	X	[≥ 42 mm]	
	X	According manufacturer's:	
Rated voltage(s)		600 V	
Rated current		32 A	
Rated impulse voltage(s)		2,5 kV	
Rated insulation voltage(s)		2,5 kV	
Number of poles		3-3	
Protection degree (IP-Code) ...		IP68	
Mounting			
Wire cross section area or cross section range		According manufacturer's:	
Material and coating of female contact			
Material and coating of male contact:			

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0.3.1		TABLE: IEC 60112 / Tracking test					
Specimen				Erosion depth [mm]			
Part	Material	Material-thickness [mm]	Colour	PTI Test solution [A]	CTI	PTI Test solution [B]	Result
						-	

Supplementary information:

0.3.2		TABLE: IEC 60695-2-11 / Glow-wire-test [60 s]							
Specimen				Flame					
Part	Material	Material-thickness [mm]	Colour	[°C]	Start [s]	End [s]	Height [mm]	Ignition of tissue paper	Result

Supplementary information: * samples from production have been tested

0.3.3		TABLE: IEC 89/336/CD / Ball-pressure test					
Specimen				Ball-pressure test			
Part	Material	Material-thickness [mm]	Colour	[C°]	Measured [mm]	Required [mm]	Result
	PA 6	0,9-3.1	Black	125	1,1	< 2	P

Supplementary information:

0.3.4		TABLE: IEC 60695-2-2 / Needle-flame test					
Specimen				Flame			
Part	Material	Material-thickness [mm]	Colour	Burning duration [s]	Start [s]	End [s]	Result
				-	-	-	
				-	-	-	
				-	-	-	
				-	-	-	
				-	-	-	
				-	-	-	

Supplementary information:

Date/ Engineer:

Eng. E CENGİZ
2019-10-28

Control:

Eng. M. KOCAS
2019-10-28