TEST REPORT

EN 61076-2-101

Connectors for electronic equipment — Product requirements

Part 2-101: Circular connectors —

Detail specification for M12 connectors with screw-locking

Report reference No. ..... :	704102400700-00
Date of issue ..... :	2024-08-16
Testing laboratory..... :	TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
Address ..... :	No.151 Hengtong Rd., Shanghai, 200070, P. R. China
Testing location ..... :	No. 1999, Duhui Road, Shanghai, 201108, P. R. China
Applicant..... :	Shenzhen Signal Electronics Co., Ltd.
Address ..... :	Building 15, Xia Lang Industrial Park He Shui Kou Community Guangming District 518106 Shenzhen, GD, PEOPLE'S REPUBLIC
Standard..... :	EN 61076-2-101: 2012
Test Report Form No. ..... :	EN 61076-2-101_1A
TRF modified by. ..... :	TÜV Product Service GmbH
Master TRF..... :	Dated 2014-09
Copyright blank test report ..... :	This test report is based on the contents of the standard. It was prepared by TÜV Product Service GmbH.
Test procedure ..... :	TUV MARK
Procedure deviation..... :	N/A
Non-standard test method..... :	N/A
National deviations ..... :	N/A
Number of pages (Report) ..... :	24

Compiled by.... : Chiyi ZHUANG (Project Handler)

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Approved by .... : Ying LIU (Mandatory reviewer)

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Type of test object ..... :	M12 D-coding connector
Trademark ..... :	N/A
Model and/or type reference ..... :	120404-01-xxx, 120404-02-xxx, 120404-03-xxx, 120404-04-xxx, 120404-05-xxx, 120404-06-xxx, 120404-10-xxx, 120404-20-xxx, 120404-21-xxx, 120404-57-xxx, 120404-67-xxx (See details at page 4)
Rating(s) ..... :	See page 4 of this report
Manufacturer..... :	Same as applicant
Address ..... :	Same as applicant
Sub-contractors/ tests (clause)..... :	N/A
Address ..... :	N/A
Date of receipt of test item ..... :	2024-01-24
Date(s) of performance of test..... :	2024-01-25 to 2024-08-16
Test item particulars..... :	M12 D-coding connector
Coding.....:	D
Style.....	See details at page 4
Contacts.....	4
Rated Voltage a.c. or d.c. (V).....:	See details at page 4
Rated current	See details at page 4
Climatic category.....:	25/85/21

Possible test case verdicts:

- 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)

Attachments:

•Test report EN 61076-2-101:2012

•Photo documentation

•Data form for electrical equipment and machinery

General remarks:

"(see remark #)" refers to a remark appended to the report.
"(see appended table)" refers to a table appended to the report.

Throughout this report a ~~point~~ (comma) is used as the decimal separator.

The test results presented in this report relate only to the object tested.

This report shall not be reproduced except in full without the written approval of the testing laboratory.

Remark:

N/A

Summary of testing:
The sample's mentioned in this report is/are submitted/ supplied/ manufactured by client. The laboratory therefore assumes no responsibility for accuracy of information on the brand name, model number, origin of manufacture, consignment or any information supplied.

1. Complete tests on set of 120404-01-040-1 match 120404-02-033-1 and 120404-03-003 match 120404-04-099. Rest of the models for construction check only.
2. These test results comply with the requirements of EN 61076-2-101: 2012

Copy of marking plate:

Refer to CDF

Factory:

Same as applicant.

General product information:

Models:	120404-01-xxx, 120404-02-xxx, 120404-03-xxx, 120404-04-xxx, 120404-05-xxx, 120404-06-xxx, 120404-10-xxx, 120404-20-xxx, 120404-21-xxx, 120404-57-xxx, 120404-67-xxx "xxx": means customer designed number, may be three digits or letter combinations.
Rated voltage:	250Vac / Vdc
Rated current:	4A
Connector type:	D
Number of contacts:	4
Degree of protection：	IP68 (2m, 1h) (after mated)

Model	Styles of connectors
120404-01-xxx	Assemble male style
120404-02-xxx	Assemble female style
120404-03-xxx	Fix male style
120404-04-xxx	Fix female style
120404-05-xxx	Free male style
120404-06-xxx	Free female style
120404-10-xxx	Free male to male style
120404-20-xxx	Free male to female style welding type
120404-21-xxx	Free female style welding type
120404-57-xxx	Free male style
120404-67-xxx	Free female style

Remark:

Test group EP depend on the factory process documentation and material certification.

Test group FP depend on end use application verification.

EN 61076-2-101			
Clause	Requirement + Test	Result - Remark	Verdict
	Preliminary Test group P (TABLE 12)		P
P1	General examination		P
	Visual examination: IEC 60512 Test 1a		P
	Unmated connectors		P
	There shall be no defect that would impair normal operation		P
	Dimensional examination: IEC 60512 Test 1b		P
	The dimensions shall comply with those specified in Clause 4		P
P2	Polarizing method		N/A
4.3.5	Conditions: IEC60512, test 13e Insertion force: 35N min.	Not applicable, see test group AP	N/A
P3	Contact resistance		P
5.2.4	Conditions: IEC 60512, Test 2a Standard atmospheric conditions connecting points see 6.2		P
	10 mΩ max. Initial value:	See Appendix Table P3	P
P4	Insulation resistance		P
5.2.5	Test voltage 500 V ± 15 V d.c. Method A		P
	10^8 Ω min.	See Appendix Table P4-P5	P
P5	Voltage proof		P
5.2.2	Between contacts	See Appendix Table P4-P5	P
	Between contacts and metal-housing	See Appendix Table P4-P5	P
	Test voltage:	See Appendix Table 8	P
P6	Pressure differential		N/A
5.3.7	Applicable for connectors with glass to metal seal.		N/A
	IEC 60512 Test 14b		N/A
	Standard atmospheric conditions		N/A
	Connectors unmated		N/A
	Lubricant not required		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Pressure differential 100±5 kPa		N/A
	No leakage permitted		N/A
	Dynamic/ climatic Test group AP (TABLE 13)		P
AP1	Insertion and withdrawal forces		P
5.3.3	IEC 60512, Test 13b		P
	Standard atmospheric conditions Max. speed = 10 mm/s		P
	Number of poles:	4	P
	Max. total insertion force(N):	<10N	P
	Max. total withdrawal force (N):	<15N	P
AP2	Gauge retention force		P
	IEC 60512, Test 16e		P
	Female contacts only 3 contacts		P
	Each contact to be tested shall have the maximum size gauge specified inserted and withdrawn three times.		P
	After which, the minimum size retention force gauge specified shall be inserted.		P
	During testing: Contacts shall support the weight of the individual contact retention force gauge in the vertically downward direction. The gauge shall be maintained for 5s minimum.		P
AP3	Vibration		P
5.3.6	IEC 60512, Test 6d		P
	Standard atmospheric condition.		P
	Connectors in mated and locked position		P
	The fixed and free connector shall be rigidly installed in a suitable fixture as specified in 6.3		P
	Vibration severity: 10 Hz to 500 Hz and 0,35 mm or 50 m/s^2		P
	Sweep cycles: 10		P
	Full duration: 6 h		P
	Duration of disturbance 1 µs max.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Contact resistance rise in relation to initial values 15 mΩ max.	See Appendix Table AP3	P
	There shall be no defect that would impair normal operation.		P
AP4	Shock		P
	Half sine shock acceleration 490 m/s² (50 g)		P
	Duration of impact: 11 ms		P
	Duration of disturbance 1 µs max.		P
	Contact resistance rise in relation to initial values 15 mΩ max.	See Appendix Table AP4	P
	There shall be no defect that would impair normal operation.		P
AP5	Rapid change of temperature		P
	IEC 60512, Test 11d		P
	–25°C to 85 °C, t = 30 min, 5 cycles		P
	Contact resistance rise in relation to initial values 15 mΩ max.	See Appendix Table AP5	P
	Insulation resistance 10^8 Ω min	>10^8 Ω	P
	Voltage proof : same as P5		P
	There shall be no defect that would impair normal operation	no defect	P
AP6	Climatic sequence		P
AP6.1	Dry heat		P
	Temp.: 85 °C	85 °C	P
	Duration: 16 h	16 h	P
	Insulation resistance at high temperature 10^8 Ω min	>10^8 Ω	P
AP6.2	Damp heat, cyclic, first cycle		P
	IEC 60512 11m Method Db		P
	Temp.: 40 °C	40 °C	P
	Recovery time: 2 h	2 h	P
	There shall be no defect that would impair normal operation	no defect	P

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Clause	Requirement + Test	Result - Remark	Verdict
AP6.3	Cold		P
	Temp.: –25 °C	–25 °C	P
	Duration: 2 h	2 h	P
	Recovery time: 2 h	2 h	P
	There shall be no defect that would impair normal operation	no defect	P
AP6.4	Damp heat, cyclic, remaining cycles		P
	Conditions according to AP6.2		P
	5 cycles, Recovery time: 2 h		P
	Contact resistance rise in relation to initial values 15 mΩ max.	See Appendix Table AP6.4	P
	Insulation resistance 10^8 Ω min	>10^8 Ω	P
	Voltage proof : same as P5		P
	There shall be no defect that would impair normal operation	no defect	P
	Insertion and withdrawal forces as AP1.		P
AP7	Impacting dust and water		P
AP7.1	IP code second characteristic numeral	IP68 (2m, 1h) (after mated)	P
	No leakage on contacts		P
AP7.2	IP code first characteristic numeral	IP68 (2m, 1h) (after mated)	P
	IP6X no deposit of dust on contacts		P
AP7.3	applies only to connectors with glass to metal seal.		N/A
	Contact resistance rise in relation to initial values 15 mΩ max.		N/A
	Insulation resistance 10^8 Ω min		N/A
	Voltage proof : same as P5		N/A
	Insertion and withdrawal forces as AP1.		N/A
	Pressure Differential : same as P6		N/A
AP7.4	Contact resistance rise in relation to initial values 15 mΩ max.	See Appendix Table AP7	P
	Insulation resistance 10^8 Ω min	>10^8 Ω	P
	Voltage proof : same as P5		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Insertion and withdrawal forces as AP1.		P
AP8	Visual examination		P
	There shall be no defect that would impair normal operation		P
AP9	Polarizing method		P
	Conditions: IEC 60512, Test 13e		P
	Insertion force: 35 N min.		P
	It shall be possible to correctly align and mate the appropriate mating connectors.		P
	It shall not be possible to mate the connectors in any other than the correct manner.		P
	Mechanical endurance Test group BP (TABLE 14)		P
BP1	Gauge retention force		P
	IEC 60512, Test 16e		P
	Female contacts only 3 contacts		P
	Each contact to be tested shall have the maximum size gauge specified inserted and withdrawn three times.		P
	After which, the minimum size retention force gauge specified shall be inserted.		P
	During testing: Contacts shall support the weight of the individual contact retention force gauge in the vertically downward direction. The gauge shall be maintained for 5s minimum.		P
BP2	Mechanical operation (half of the specified number of operations)		P
	First half of the specified number of operations:		P
	Speed 10 mm/s max.		P
	Rest 30 s (unmated)		P
	Operations see 5.3.2		P
	Contact resistance rise in relation to initial values 15 mΩ max.	See Appendix Table BP2	P
	There shall be no defect that would impair normal operation		P

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Clause	Requirement + Test	Result - Remark	Verdict
BP3	Climatic test		P
BP3.1	Corrosion industrial atmosphere		P
	Flowing mixed gas corrosion – 4 days, test method 4 according IEC 60068-2-60		P
	Contact resistance rise in relation to initial values 15 mΩ max.	See Appendix Table BP3.1	P
BP4	Mechanical operation (remaining half of specified number of operations)		P
	Remaining half of the specified number of operations :		P
	Speed 10 mm/s max.		P
	Rest 30 s (unmated)		P
	Operations see 5.3.2		P
	Contact resistance rise in relation to initial values 15 mΩ max.	See Appendix Table BP4	P
	Insulation resistance 10^8 Ω min	>10^8 Ω	P
	Voltage proof : same as P5		P
	Unmated connectors		P
	Pressure Differential: same as P6		P
	Visual examination		P
	There shall be no defect that would impair normal operation		P
BP5.1	IP code second characteristic numeral		P
	No leakage on contacts	IP68 (2m, 1h) (after mated)	P
BP5.2	Insulation resistance 10^8 Ω min	>10^8 Ω	P
	Voltage proof : same as P5		P
BP6	Insertion and withdrawal forces		P
5.3.3	IEC 60512, Test 13b		P
	Standard atmospheric conditions Max. speed = 10 mm/s		P
	Number of poles:	4	P
	Max. total insertion force(N):	<10N	P
	Max. total withdrawal force (N):	<15N	P

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Clause	Requirement + Test	Result - Remark	Verdict
BP7	Gauge retention force		P
	IEC 60512, Test 16e		P
	Female contacts only 3 contacts		P
	Each contact to be tested shall have the maximum size gauge specified inserted and withdrawn three times.		P
	After which, the minimum size retention force gauge specified shall be inserted.		P
	During testing: Contacts shall support the weight of the individual contact retention force gauge in the vertically downward direction. The gauge shall be maintained for 5s minimum.		P
	Electrical load Test group CP (TABLE 15)		P
CP1	Rapid change of temperature		P
	IEC 60512, Test 11d		P
	–25°C to 85 °C, t = 30 min, 5 cycles		P
	Contact resistance rise in relation to initial values 15 mΩ max.	See Appendix Table CP1	P
	Insulation resistance 10^8 Ω min		P
	Voltage proof : same as P5		P
	There shall be no defect that would impair normal operation		P
CP2	Mechanical operation		P
	First half of the specified number of operations :		P
	Speed 10 mm/s max.		P
	Rest 30 s (unmated)		P
	Operations see 5.3.2		P
	Contact resistance rise in relation to initial values 15 mΩ max.	See Appendix Table CP2	P
	There shall be no defect that would impair normal operation		P
CP3	Electrical load and temperature		P
	Duration: 1 000 h		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Amb.temp.: 40 °C		P
	Current load according to 5.2.3		P
	Recovery time: 2 h		P
	Temp. sensor in centre of specimen		P
	Contact resistance rise in relation to initial values 15 mΩ max.	See Appendix Table CP3	P
	Insulation resistance 10^8 Ω min		P
	Voltage proof : same as P5		P
CP4	Impacting dust and water		P
CP4.1	IP code second characteristic		P
	No leakage on contacts		P
CP4.2	Insulation resistance 10^8 Ω min		P
	Voltage proof : same as P5		P
CP5	Unmated connectors		P
	Visual examination		P
	There shall be no defect that would impair normal operation		P
	Chemical resistivity Test group DP (TABLE 16)		P
DP1	Resistance to fluids		P
	IEC 60512, Test 19c		P
	5 cycles		P
	The fluid used for testing is upon agreement between manufacturer and user :		P
	Phase 3 test temperature specified in the specification:		P
DP2	Clearing of specimen by washing briefly in light petrol		P
	Contact resistance rise in relation to initial values 15 mΩ max.	See Appendix Table DP2	P
DP3	Voltage proof : same as P5		P
DP4	Visual examination		P

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Clause	Requirement + Test	Result - Remark	Verdict
	There shall be no defect that would impair normal operation		P
	Connection method tests - Test group EP (TABLE 17)		P
EP1	Solderless connections: screw, crimp, insulation displacement, insulation piercing, press-in	Crimp	P
	See relevant IEC 60352 standard, for screw-type terminations see relevant IEC 60998-2-1 or IEC 60999	Routine test according to IEC 60352	-
	Electrical transmission - Test group FP (TABLE 18)		N/A
FP1	Insertion loss		N/A
	IEC 60512, Test 29a		N/A
	≤0,04 √f		N/A
	Attenuation at frequencies that correspond to calculated values of less than 0,1 dB shall revert to a requirement of 0,1 dB maximum.		N/A
	All transmission results shall report worst case overall for the corresponding pair or pair combination after testing the all samples.		N/A
	All measurements to be performed on mated connectors.		N/A
	For all formulas f is the frequency in MHz. Frequency range from 1 MHz to 100 MHz.		N/A
FP2	Near end crosstalk		N/A
	IEC 60512, Test 29c		N/A
	All pairs, both directions (pair to pair)		N/A
	≥ 83 – 20log(f)		N/A
	NEXT loss at frequencies that correspond to calculated values of greater than 80 dB shall revert to a minimum requirement of 80 dB		N/A
	All transmission results shall report worst case overall for the corresponding pair or pair combination after testing the all samples.		N/A
	All measurements to be performed on mated connectors.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	For all formulas f is the frequency in MHz. Frequency range from 1 MHz to 100 MHz.		N/A
FP3	Return loss		N/A
	IEC 60512, Test 29b		N/A
	All pairs, both directions		N/A
	≥ 60 – 20log(f)		N/A
	Return loss at frequencies that correspond to calculated values of greater than 30 dB shall revert to a minimum requirement of 30 dB		N/A
	All transmission results shall report worst case overall for the corresponding pair or pair combination after testing the all samples.		N/A
	All measurements to be performed on mated connectors.		N/A
	For all formulas f is the frequency in MHz. Frequency range from 1 MHz to 100 MHz.		N/A
FP4	Far end crosstalk		N/A
	IEC 60512, Test 29d		N/A
	All pairs, both directions (pair to pair)		N/A
	≥ 75,1 – 20log(f) dB		N/A
	All transmission results shall report worst case overall for the corresponding pair or pair combination after testing the all samples.		N/A
	All measurements to be performed on mated connectors.		N/A
	For all formulas f is the frequency in MHz. Frequency range from 1 MHz to 100 MHz.		N/A
	FEXT loss at frequencies that correspond to calculated values of greater than 75 dB shall revert to a minimum requirement of 75 dB		N/A
FP5	Transverse conversion loss		N/A
	All pairs, both directions		N/A
	IEC 60512, Test 29f		N/A
	All pairs: ≥ 68 – 20log(f) dB		N/A
	All transmission results shall report worst case overall for the corresponding pair or pair combination after testing the all samples.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	All measurements to be performed on mated connectors.		N/A
	For all formulas f is the frequency in MHz. Frequency range from 1 MHz to 100 MHz.		N/A
	TCL and TCTL at frequencies that correspond to calculated values of greater than 50 dB shall revert to a minimum requirement of 50 dB.		N/A
FP6	Transverse conversion transfer loss		N/A
	All pairs, both directions		N/A
	IEC 60512, Test 29g		N/A
	All pairs: ≥ 68 – 20log(f) dB		N/A
	All transmission results shall report worst case overall for the corresponding pair or pair combination after testing the all samples.		N/A
	All measurements to be performed on mated connectors.		N/A
	For all formulas f is the frequency in MHz. Frequency range from 1 MHz to 100 MHz.		N/A
	TCL and TCTL at frequencies that correspond to calculated values of greater than 50 dB shall revert to a minimum requirement of 50 dB.		N/A
FP7	Transfer impedance		N/A
	IEC 60512, Test 26e		N/A
	≤ 0,1 × f ^{0,3}Ω from 1 MHz to 10 MHz ≤ 0,02 × f Ω from 10 MHz to 100 MHz		N/A
	For all formulas f is the frequency in MHz. Frequency range from 1 MHz to 100 MHz.		N/A
FP8	Input to output resistance		N/A
	Measurement points as defined in 6.2. All signal contacts and screen / specimens		N/A
	IEC 60512, Test 2a		N/A
	Signal contact resistance ≤ 200 mΩ max. Screen resistance ≤ 100 mΩ max.		N/A
FP9	Resistance unbalance		N/A
	IEC 60512, Test 2a		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Measurement points as defined in 6.2 All signal contacts		N/A
	Unbalance resistance ≤ 50 mΩ max.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

P3	TABLE: Initial measurements (Contact resistance) 10 mΩ max.							P
Test current .....:		0.1A						—
Test sample	Contact	1	2	3	4			—
1	ΔU1 [mV]	0.762	0.741	0.672	0.676			P
	R1 [mΩ]	7.62	7.41	6.72	6.76			
2	ΔU1 [mV]	0.713	0.722	0.684	0.693			P
	R1 [mΩ]	7.13	7.22	6.84	6.93			
3	ΔU1 [mV]	0.751	0.762	0.632	0.677			P
	R1 [mΩ]	7.51	7.62	6.32	6.77			
4	ΔU1 [mV]	0.722	0.803	0.659	0.691			P
	R1 [mΩ]	7.22	8.03	6.59	6.91			
5	ΔU1 [mV]	0.751	0.717	0.632	0.621			P
	R1 [mΩ]	7.51	7.17	6.32	6.21			
6	ΔU1 [mV]	0.732	0.753	0.687	0.674			P
	R1 [mΩ]	7.32	7.53	6.87	6.74			
7	ΔU1 [mV]	0.793	0.711	0.632	0.655			P
	R1 [mΩ]	7.93	7.11	6.32	6.55			
8	ΔU1 [mV]	0.703	0.732	0.651	0.673			P
	R1 [mΩ]	7.03	7.32	6.51	6.73			
9	ΔU1 [mV]	0.781	0.769	0.658	0.639			P
	R1 [mΩ]	7.81	7.69	6.58	6.39			
10	ΔU1 [mV]	0.832	0.731	0.693	0.678			P
	R1 [mΩ]	8.32	7.31	6.93	6.78			
11	ΔU1 [mV]	0.716	0.780	0.683	0.652			P
	R1 [mΩ]	7.16	7.80	6.83	6.52			
12	ΔU1 [mV]	0.711	0.795	0.612	0.654			P
	R1 [mΩ]	7.11	7.95	6.12	6.54			
supplementary information: Max contact resistance for combination match as below 120404-01-040-1 match 120404-02-033-1 and 120404-03-003 match 120404-04-099								

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Clause	Requirement + Test	Result - Remark	Verdict

P4-P5	**TABLE:Voltage proof / Insulation resistance**			**P**
	Insulation resistance R (MΩ) 500 V ± 15 V d.c.	Voltage proof U (V)		
	Between contacts and metal-housing 10^8 Ω min.	Between contacts 1400V	Between contacts and metal-housing 1400V	
1	>500MΩ	ok	ok	
2	>500MΩ	ok	ok	
3	>500MΩ	ok	ok	
4	>500MΩ	ok	ok	
5	>500MΩ	ok	ok	
6	>500MΩ	ok	ok	
7	>500MΩ	ok	ok	
8	>500MΩ	ok	ok	
9	>500MΩ	ok	ok	
10	>500MΩ	ok	ok	
11	>500MΩ	ok	ok	
12	>500MΩ	ok	ok	
supplementary information: JUT M414-M414-6D				

AP3	TABLE: Final measurements (Contact resistance) 15 mΩ max							P
Test current .....:		0.1A						—
Condition ..... :		ΔR =R2-R1						
Test sample	Contact	1	2	3	4			—
1	ΔU2 [mV]	0.938	0.916	0.886	0.946			P
	R2 [mΩ]	9.38	9.16	8.86	9.46			
	ΔR[mΩ]	1.76	1.75	2.14	2.70			
2	ΔU2 [mV]	0.897	0.961	0.802	0.831			P
	R2 [mΩ]	8.97	9.61	8.02	8.31			
	ΔR[mΩ]	1.35	2.20	1.30	1.55			
3	ΔU2 [mV]	0.933	0.929	0.758	0.858			P
	R2 [mΩ]	9.33	9.29	7.58	8.58			
	ΔR[mΩ]	1.82	1.67	1.26	1.81			
supplementary information: Max contact resistance for combination match as below 120404-01-040-1 match 120404-02-033-1 and 120404-03-003 match 120404-04-099								

EN 61076-2-101			
Clause	Requirement + Test	Result - Remark	Verdict

AP4	TABLE: Final measurements (Contact resistance) 15 mΩ max							P
Test current .....:				0.1A				—
Condition ..... :				ΔR =R2-R1				
Test sample	Contact	Green	Green White	Orange	Orange White			—
1	ΔU2 [mV]	0.962	0.862	0.817	0.887			P
	R2 [mΩ]	9.62	8.62	8.17	8.87			
	ΔR[mΩ]	2.00	1.21	1.45	2.11			
2	ΔU2 [mV]	0.836	0.886	0.934	0.848			P
	R2 [mΩ]	8.36	8.86	9.34	8.48			
	ΔR[mΩ]	1.23	1.64	2.5	1.55			
3	ΔU2 [mV]	0.895	0.914	0.733	0.957			P
	R2 [mΩ]	8.95	9.14	7.33	9.57			
	ΔR[mΩ]	1.44	1.52	1.01	2.80			
supplementary information: Max contact resistance for combination match as below 120404-01-040-1 match 120404-02-033-1 and 120404-03-003 match 120404-04-099								

AP5	TABLE: Final measurements (Contact resistance) 15 mΩ max							P
Test current .....:				0.1A				—
Condition ..... :				ΔR =R2-R1				
Test sample	Contact	1	2	3	4			—
1	ΔU2 [mV]	0.880	0.912	0.906	0.943			P
	R2 [mΩ]	8.80	9.12	9.06	9.43			
	ΔR[mΩ]	1.18	1.71	2.34	2.67			
2	ΔU2 [mV]	0.926	0.888	0.897	0.813			P
	R2 [mΩ]	9.26	8.88	8.97	8.13			
	ΔR[mΩ]	2.13	1.66	2.13	1.20			
3	ΔU2 [mV]	0.949	0.952	0.771	0.925			P
	R2 [mΩ]	9.49	9.52	7.71	9.25			
	ΔR[mΩ]	1.98	1.90	1.39	2.48			
supplementary information: Max contact resistance for combination match as below 120404-01-040-1 match 120404-02-033-1 and 120404-03-003 match 120404-04-099								

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Clause	Requirement + Test	Result - Remark	Verdict

AP6.4	TABLE: Final measurements (Contact resistance) 15 mΩ max							P
Test current .....:		0.1A						—
Condition ..... :		ΔR =R2-R1						
Test sample	Contact	1	2	3	4			—
1	ΔU2 [mV]	0.949	0.923	0.846	0.878			P
	R2 [mΩ]	9.49	9.23	8.46	8.78			
	ΔR[mΩ]	1.87	1.82	1.74	2.02			
2	ΔU2 [mV]	0.901	0.867	0.832	0.922			P
	R2 [mΩ]	9.01	8.67	8.32	9.22			
	ΔR[mΩ]	1.88	1.45	1.48	2.29			
3	ΔU2 [mV]	0.925	0.868	0.793	0.800			P
	R2 [mΩ]	9.25	8.68	7.93	8.00			
	ΔR[mΩ]	1.74	1.06	1.61	1.23			
supplementary information: Max contact resistance for combination match as below 120404-01-040-1 match 120404-02-033-1 and 120404-03-003 match 120404-04-099								

AP7	TABLE: Final measurements (Contact resistance) 15 mΩ max							P
Test current .....:		0.1A						—
Condition ..... :		ΔR =R2-R1						
Test sample	Contact	1	2	3	4			—
1	ΔU2 [mV]	0.880	0.848	0.844	0.944			P
	R2 [mΩ]	8.80	8.48	8.44	9.44			
	ΔR[mΩ]	1.18	1.07	1.72	2.68			
2	ΔU2 [mV]	0.844	0.893	0.860	0.819			P
	R2 [mΩ]	8.44	8.93	8.60	8.19			
	ΔR[mΩ]	1.31	1.71	1.76	1.26			
3	ΔU2 [mV]	0.946	0.977	0.898	0.916			P
	R2 [mΩ]	9.46	9.77	8.98	9.16			
	ΔR[mΩ]	1.95	2.15	2.66	2.39			
supplementary information: Max contact resistance for combination match as below 120404-01-040-1 match 120404-02-033-1 and 120404-03-003 match 120404-04-099								

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Clause	Requirement + Test	Result - Remark	Verdict

BP2	TABLE: Final measurements (Contact resistance) 15 mΩ max							P
Test current .....:				0.1A				—
Condition ..... :				ΔR =R2-R1				
Test sample	Contact	1	2	3	4			—
4	ΔU2 [mV]	0.886	0.961	0.804	0.913			P
	R2 [mΩ]	8.86	9.61	8.04	9.13			
	ΔR[mΩ]	1.64	1.58	1.45	2.22			
5	ΔU2 [mV]	0.864	0.960	0.742	0.761			P
	R2 [mΩ]	8.64	9.60	7.42	7.61			
	ΔR[mΩ]	1.13	2.43	1.10	1.40			
6	ΔU2 [mV]	0.955	0.986	0.883	0.779			P
	R2 [mΩ]	9.55	9.86	8.83	7.79			
	ΔR[mΩ]	2.23	2.33	1.96	1.05			
supplementary information: Max contact resistance for combination match as below 120404-01-040-1 match 120404-02-033-1 and 120404-03-003 match 120404-04-099								

BP3.1	TABLE: Final measurements (Contact resistance) 15 mΩ max							P
Test current .....:				0.1A				—
Condition ..... :				ΔR =R2-R1				
Test sample	Contact	1	2	3	4			—
4	ΔU2 [mV]	0.926	0.981	0.920	0.857			P
	R2 [mΩ]	9.26	9.81	9.20	8.57			
	ΔR[mΩ]	2.04	1.78	2.61	1.66			
5	ΔU2 [mV]	0.866	0.917	0.875	0.896			P
	R2 [mΩ]	8.66	9.17	8.75	8.96			
	ΔR[mΩ]	1.15	2.00	2.43	2.75			
6	ΔU2 [mV]	0.842	0.918	0.928	0.783			P
	R2 [mΩ]	8.42	9.18	9.28	7.83			
	ΔR[mΩ]	1.10	1.65	2.41	1.09			
supplementary information: Max contact resistance for combination match as below 120404-01-040-1 match 120404-02-033-1 and 120404-03-003 match 120404-04-099								

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Clause	Requirement + Test	Result - Remark	Verdict

BP4	TABLE: Final measurements (Contact resistance) 15 mΩ max							P
Test current .....:				0.1A				—
Condition ..... :				ΔR =R2-R1				
Test sample	Contact	1	2	3	4			—
4	ΔU2 [mV]	0.993	0.922	0.867	0.914			P
	R2 [mΩ]	9.93	9.22	8.67	9.14			
	ΔR[mΩ]	2.71	1.19	2.08	2.23			
5	ΔU2 [mV]	0.995	0.892	0.855	0.804			P
	R2 [mΩ]	9.95	8.92	8.55	8.04			
	ΔR[mΩ]	2.44	1.75	2.23	1.83			
6	ΔU2 [mV]	0.946	0.916	0.935	0.808			P
	R2 [mΩ]	9.46	9.16	9.35	8.08			
	ΔR[mΩ]	2.14	1.63	2.48	1.34			
supplementary information: Max contact resistance for combination match as below 120404-01-040-1 match 120404-02-033-1 and 120404-03-003 match 120404-04-099								

CP1	TABLE: Final measurements (Contact resistance) 15 mΩ max							P
Test current .....:				0.1A				—
Condition ..... :				ΔR =R2-R1				
Test sample	Contact	1	2	3	4			—
7	ΔU2 [mV]	0.999	0.922	0.780	0.768			P
	R2 [mΩ]	9.99	9.22	7.80	7.68			
	ΔR[mΩ]	2.06	2.11	1.48	1.13			
8	ΔU2 [mV]	0.895	0.903	0.889	0.839			P
	R2 [mΩ]	8.95	9.03	8.89	8.39			
	ΔR[mΩ]	1.92	1.71	2.38	1.66			
9	ΔU2 [mV]	0.930	0.880	0.818	0.852			P
	R2 [mΩ]	9.30	8.80	8.18	8.52			
	ΔR[mΩ]	1.49	1.11	1.60	2.13			
supplementary information: Max contact resistance for combination match as below 120404-01-040-1 match 120404-02-033-1 and 120404-03-003 match 120404-04-099								

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Clause	Requirement + Test	Result - Remark	Verdict

CP2	TABLE: Final measurements (Contact resistance) 15 mΩ max							P
Test current .....:				0.1A				—
Condition ..... :				ΔR =R2-R1				
Test sample	Contact	1	2	3	4			—
7	ΔU2 [mV]	0.948	0.969	0.863	0.879			P
	R2 [mΩ]	9.48	9.69	8.63	8.79			
	ΔR[mΩ]	1.55	2.58	2.31	2.24			
8	ΔU2 [mV]	0.821	0.975	0.782	0.840			P
	R2 [mΩ]	8.21	9.75	7.82	8.40			
	ΔR[mΩ]	1.18	2.43	1.31	1.67			
9	ΔU2 [mV]	0.986	0.972	0.876	0.749			P
	R2 [mΩ]	9.86	9.72	8.76	7.49			
	ΔR[mΩ]	2.05	2.03	2.18	1.10			
supplementary information: Max contact resistance for combination match as below 120404-01-040-1 match 120404-02-033-1 and 120404-03-003 match 120404-04-099								

CP3	TABLE: Final measurements (Contact resistance) 15 mΩ max							P
Test current .....:				0.1A				—
Condition ..... :				ΔR =R2-R1				
Test sample	Contact	1	2	3	4			—
7	ΔU2 [mV]	0.979	0.961	0.865	0.856			P
	R2 [mΩ]	9.79	9.61	8.65	8.56			
	ΔR[mΩ]	1.86	2.50	2.33	2.01			
8	ΔU2 [mV]	0.979	0.961	0.865	0.856			P
	R2 [mΩ]	9.79	9.61	8.65	8.56			
	ΔR[mΩ]	1.86	2.50	2.33	2.01			
9	ΔU2 [mV]	0.979	0.961	0.865	0.856			P
	R2 [mΩ]	9.79	9.61	8.65	8.56			
	ΔR[mΩ]	1.86	2.50	2.33	2.01			
supplementary information: Max contact resistance for combination match as below 120404-01-040-1 match 120404-02-033-1 and 120404-03-003 match 120404-04-099								

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Clause	Requirement + Test	Result - Remark	Verdict

DP2	TABLE: Final measurements (Contact resistance) 15 mΩ max							P
Test current .....:				0.1A				—
Condition ..... :				ΔR =R2-R1				
Test sample	Contact	1	2	3	4			—
10	ΔU2 [mV]	0.982	0.853	0.937	0.950			P
	R2 [mΩ]	9.82	8.53	9.37	9.50			
	ΔR[mΩ]	1.50	1.22	2.44	2.72			
11	ΔU2 [mV]	0.940	0.906	0.787	0.883			P
	R2 [mΩ]	9.40	9.06	7.87	8.83			
	ΔR[mΩ]	2.24	1.26	1.04	2.31			
12	ΔU2 [mV]	0.827	0.900	0.883	0.884			P
	R2 [mΩ]	8.27	9.00	8.83	8.84			
	ΔR[mΩ]	1.16	1.05	2.71	2.30			
supplementary information: Max contact resistance for combination match as below 120404-01-040-1 match 120404-02-033-1 and 120404-03-003 match 120404-04-099								