Industrial Mini IO Cat 5e / Cat 6A IE FI

1. SCOPE

1.1 Content

This specification covers the performance, tests and quality requirements of the Mini IO Field Installable Cable Plug for use in Industrial Ethernet applications.

The plug is a data plug to Gigabit Ethernet. It meets the requirements of Cat 5e respectively Cat 6A and conforms to IEC CD 61076-3-122 ED2 (issued 2019-07-08). In section 3.6.5 the different transmission performance of Cat 5e and Cat 6A properties are considered.

1.2 Qualification

When tests are performed on the subject product line, procedures specified in the Qualification Test Requirements table (see 3.6) shall be used. All inspections shall be performed using the applicable inspection plans and product drawings.

2. APPLICABLE DOCUMENTS

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. In the event of conflict between the requirements of this specification and the product drawings, the product drawings shall take precedence. In the event of conflict between the requirements of this specification and the reference documents, this specification shall take precedence.

2.1 TE Documents

- 114-94602: Application Specification *Mini-IO Field Installable Connector*
- 501-19296: Qualification Test Report
- 502-153674: Performance Test Result (1500 Mating cycles TG-“M”)
- 411-18646: Instruction Sheet *MINI IO Cat5e/ Cat6A Cable Termination GENERAL*

2.2 Overview of the Standards related to the Product

IEC 61076-3-122 (2017)	Connectors for electrical and electronic equipment – **Product Requirements**
IEC 60050-581(2008)	International Electrotechnical Vocabulary (IEV) – Chapter 581: **Electromechanical components for electronic equipment**
IEC 60068-1 (2013)	Environmental testing – Part 1: **General and guidance**
IEC 60068-2-38 (2010)	Basic environmental testing procedures – Part 2-38: Tests – Test Z/AD: **Composite temperature/ humidity cyclic test**

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IEC 60512-1 (2018)	Connectors for electronic equipment – **Tests and measurements – Part 1: General**
IEC 60512-1-1 (2002)	Connectors for electronic equipment – Tests and measurements – Part 1-1: General examination – Test 1a: **Visual examination**
IEC 60512-1-2 (2002)	Connectors for electronic equipment – Tests and measurements – Part 1-2: General examination – Test 1b: **Examination of dimension and mass**
IEC 60512-2-1 (2003)	Connectors for electronic equipment – Tests and measurements – Part 2-1: Electrical continuity and contact resistance tests – Test 2a: **Contact resistance** – Millivolt level method
IEC 60512-3-1 (2002)	Connectors for electronic equipment – Tests and measurements – Part 3-1: Insulation tests – Test 3a: **Insulation resistance**
IEC 60512-4-1 (2003)	Connectors for electronic equipment – Tests and measurements – Part 4-1: Voltage stress tests – Test 4a: **Voltage proof**
IEC 60512-5-1 (2002)	Connectors for electronic equipment – Tests and measurements – Part 5-1: Current-carrying capacity tests – Test 5a: **Temperature rise**
IEC 60512-6-3 (2002)	Connectors for electronic equipment – Tests and measurements – Part 6-3: Dynamic stress tests – Test 6c: **Shock**
IEC 60512-6-4 (2002)	Connectors for electronic equipment – Tests and measurements – Part 6-4: Dynamic stress tests – Test 6d: **Vibration** (sinusoidal)
IEC 60512-9-1 (2010)	Connectors for electronic equipment – Tests and measurements – Part 9-1: Endurance tests – Test 9a: **Mechanical operation**
IEC 60512-9-3 (2011)	Connectors for electronic equipment – Tests and measurements – Part 9-3: Endurance tests – Test 9c: **Mechanical operation (mating and unmating) with electrical load**
IEC 60512-11-3 (2002)	Connectors for electronic equipment – Tests and measurements – Part 11-3: Climatic tests – Test 11c: **Damp heat, steady state**
IEC 60512-11-4 (2002)	Connectors for electronic equipment – Tests and measurements – Part 11-4: Climatic tests – Test 11d: **Rapid change of temperature**
IEC 60512-11-7(2003)	Connectors for electronic equipment – Tests and measurements – Part 11-7: Climatic tests – Test 11g: **Flowing mixed gas corrosion test**
IEC 60512-11-9(2002)	Connectors for electronic equipment – Tests and measurements – *Part 11-9: Climatic tests – Test 11i:* ***Dry heat***
IEC 60512-11-10(2002)	Connectors for electronic equipment – Tests and measurements – Part 11-10: **Climatic tests** – Test 11j: **Cold**

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IEC 60512-13-2(2006)	Connectors for electronic equipment – Tests and measurements – Part-13-2: Mechanical operation tests – Test 13b: **Insertion and withdrawal forces**
IEC 60512-15-6(2006)	Connectors for electronic equipment – Tests and measurements – Part 15-6: Connector tests (mechanical) – Test 15f: **Effectiveness of connector coupling devices**
IEC 60512-26-100(2011)	Connectors for electronic equipment – Tests and measurements – Part 26-100: Measurement setup, test and reference arrangements and measurements for connectors according to IEC 60603-7 – Tests 26a to 26g
IEC 60512-27-100(2011)	Connectors for electronic equipment – Tests and measurements – Part 27-100: **Signal integrity tests** up to 500 MHz on 60603-7 series connectors – Tests 27a to 27g
IEC 60512-99-002(2015)	Connectors for electronic equipment – tests and measurements – Part-99-002: Endurance test schedules – Test 99b **Test for unintended unmating under electrical load**
IEC 60529(2014)	**Ingress Protection**
IEC 61076-1(2006)	Connectors for electronic equipment – Product Requirements – Part 1: Generic specification
IEC 61076-3-122(2017)	Connectors for electronic equipment – Product Requirements – Part 3: Rectangular connectors –Sectional specification
IEC 11801-1(2017)	Information technology – General cabling for customer premises – Part 1: General requirements
IEC 60512-11-9(2003)	Connectors for electronic equipment – Tests and measurements – Part 11-9: Climatic tests; Test 11i: Dry heat
IEC 60512-11-10(2002)	Connectors for electronic equipment – Tests and measurements – Part 11-10: Climatic tests; Test 11j: Cold
IEC 60512-11-12(2002)	Connectors for electronic equipment – Tests and measurements – Part 11-12: Climatic tests; Test 11m: Damp heat, cyclic
IEC 60068-2-60(2016)	Environmental testing – Part 2-60: Tests – Test Ke: Flowing mixed gas corrosion test (IEC 60068-2-60:2015)
IEC 60512-29-100(2016)	Connectors for electronic equipment – Tests and measurements – Part 29-100: Signal integrity tests up to 500 MHz on M12 style connectors – Tests 29a to 29g
IEC 61935-2(2011)	Specification for the testing of balanced and coaxial information technology cabling – Part 2: Cords as specified in ISO/IEC 11801 and related standards

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3. REQUIREMENTS

3.1 Design and Construction

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

3.2 Materials

3.2.1 General Requirements

All connectors are specified on the TE Connectivity Product Drawings. Contact resistance tests shall be applied to the entire connector mated with receptacle on PCB.

3.2.2 Specimens for Test

Appendix A Amount of all specimens which are necessary for each test group
Appendix B Specific arrangement of all specimens related to individual test group

3.3 Ratings

Operation Voltage	50V AC / 60V DC
Rated Current	max. 0.5A
Wire Range Cat 5e	AWG 22/1 solid, AWG 22/7 strands, AWG 22/19 strands
Wire Range Cat 6A	AWG 24-30/ 1 solid, AWG 24-30 (in strands: 7 - 19 – fine~)
Operating Temperature	from -55°C up to +105°C suitable cable used
Storage Temperature	from -40°C up to +85°C
Ingress Protection	IP 30
Mating Cycles	N = 750
Wire Insulation Material	min. 70 Shore A … 80 Shore D max. and
Cable Style	EN 50290-2-23 (VDE 0819), table L/MD (HD 624.3)
Shielding	min. 85% coverage with cable strands and/ or foils. Less coverage of shielding, use a copper foil at cable braid
Connector Kits	**X-2350278-1/(-2) Industrial Mini IO Cat 5e Type 1/ (Type 2)**
Wire Diameter	1.40 … 1.60 mm max./ AWG 22
Cable Diameter	4.70 … 5.70 mm
	0-/1-2350310-1/(-2) Industrial Mini IO Cat 6A Type 1/ (Type 2)
Wire Diameter	0.58 … 1.20 mm / AWG 24-30
Cable Diameter	6.50 … 8.10 mm
	3-/2-2350310-1/(-2) Industrial Mini IO Cat 6A Type 1/ (Type 2)
Wire Diameter	0.58 … 1.20 mm / AWG 24-30
Cable Diameter	4.70 … 5.70 mm
	X-2350323-1/(-2) Industrial Mini IO Cat 5e Type 1/ (Type 2)
Wire Diameter	1.40 … 1.60 mm max./ AWG 22
Cable Diameter	6.50 … 8.10 mm max.
	X-2350304-1/(-2) Industrial Mini IO Cat 5e Type 1/ (Type 2)
Wire Diameter	0.58 … 1.20 mm / AWG 24-30

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	Cable Diameter 4.70 … 5.70 mm
Receptacles	0-2271656-1/ (-2) Mini IO HDR SMD Type 1/ (Type 2) Vertical 0-2294417-1/ (-2) Mini IO HDR SMD Type 1/ (Type 2) Horizontal

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3.4 Approvals and Certifications

The products have the following Agency Approvals Certifications:

United States and Canada	UL/CSA–Underwriters Laboratories as Recognized Component
Europe	RoHS – Restriction of Hazardous Substances/ EU 2017/2102)
Europe	WEEE 2012/19/EU – Waste of Electrical and Electronic Equipment

3.5 Performance and Test Description

Unless otherwise specified in the following tables, all tests shall be performed at ambient environmental conditions per IEC 60512.

3.6 Qualification Test Requirements and Procedures

3.6.1 General Examination

Test specimens are arranged individually according to Appendix B.

Test phase	Test Description	Requirement	Procedure
1	Visual examination	There shall be no defects that would impair normal operation	According to IEC 60512-1-1 / 1a
	Examination of Dimensions	The dimensions shall comply with those specified in the detail specification	According to IEC 60512-1-2 / 1b

3.6.2 Electrical Inspection

Test phase	Test Description	Requirement	Procedure
2.1	Low level Contact Resistance	200 mΩ max.	According to IEC 60512-2-1 / 2a All contacts /specimens acc. to App. A + B
2.2	Insulation resistance	500 MΩ min.	According to IEC 60512-3-1 /3a Specimens acc. to App. A + B
2.3	Voltage Proof	No breakdown or flashover	According to IEC 60512-4-1 / 4a 1000 VAC or 1500 VDC - signal to signal 1500 VAC or 2250 VDC - contacts to shield Leak Current 2 mA Specimens acc. to App. A + B
2.4	Mechanical operations with electrical load	Shall meet visual requirements, show no physical damage or wear through	According to IEC 60512-99-002/ 99b 25 cycles shall be performed under I=3A at U=55Vdc with a speed of 150mm/s. Next 25 cycles with reversed polarity.
2.5	Current-carrying capacity tests Temperature increase (**Derating)**	Temp. rise <30K at 0.5A All signal lines loaded at the same time Limited temperature 115°C Consider max. cable performance	According to IEC 60512-5-1 / 5a Achievable with suitable cable style. Specimens acc. to App. A + App. B

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3.6.3 Mechanical Inspection

Test phase	Test Description	Requirement	Procedure
3.1	Effectiveness of connector coupling device	100N for 60s ± 5s	According to IEC 60512-15-6 / 15f Rate of load application 45 N/s
3.2	Insertion and withdrawal force	20N max. for insertion and for withdrawal	According to IEC 60512-13-2 / 13b Measure the force necessary to insert / withdraw the specimens at a rate of 10mm per minute 50 mating cycles latching mechanism inactivated
3.3	Mechanical operation half of specified number of cycles	Shall meet visual requirements, show no wear through to base material. One specimen per cable type, because impact on interface to be checked only.	According to IEC 60512-9-1 / 9a Mate and unmate the specimens for N/2 cycles Speed of 10 mm/min. Dwell time of 1s between each cycle. No manually mating
3.4	Mechanical operation	Shall meet visual requirements, show no physical damage or wear through	According to IEC 60512-9-1 / 9a Mate and unmate the specimens for 50 cycles at a rate of 200 cycles/hour
3.5	Vibration, sinusoidal 10g	No contact discontinuity >1 µs	10-55 Hz, 1,55 mm displacement or **10g**, 2 hrs in each of 3 mutually perpendicular axes,
3.6	Vibration, sinusoidal 5g	No contact discontinuity >1 µs	55-500 Hz, 0,35 mm displacement or **5 g,** 2 hrs in each of 3 mutually perpendicular axes
3.7	Mechanical shock	No contact discontinuity >1 µs.	According to IEC 60512-6-3 / 6c **50g** shock pulses of 11ms duration, 3 shocks in both directions of 3 mutually perpendicular directions (totally 18 shocks)
3.8	Cable Holding Force influenced by cable construction	Cable Holding Force Part Number / Cable Dia. / Force max. 2350310 6.5 - 8.0 100N 2350323 5.8 - 6.5 100N 2350278 4.7 - 5.8 100N 2350304 4.7 - 5.8 100N For cable style acc. to EN 50290-2-23 (VDE 0819), tab. L/MD (HD 624.3) and limited by permittable cable tensile strength End of cable may move from insulation cable clamp by max. 1.0mm	According to IEC 60512-9,117c Force load to be increased gradually at a rate with 20 N/s until the specified value is reached. Axial force load only. The maximum value shall be maintained for 1 min.
3.9	Connector Re-Use 10 times	Signal: 200 mΩ max. Screen: 100 mΩ max.	Terminate the same cable type 10 times Insert /remove the Termination Unit as described with App. B.9

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3.6.4 Environmental Inspection

Test phase	Test Description	Requirement	Procedure
4.1	Rapid change of temperature	Shall meet visual requirements, show no physical damage.	According to IEC 60512-11-4 / 11d Subject mated specimens to 10 cycles between -55°C and +85°C (consider cable temperature performance) with 30 minutes dwell at temp. extremes and 1-minute transition between temperatures
4.2	Dry heat	Shall meet visual requirements, show no physical damage.	According to IEC 60512-11-9 / 11i Subject mated specimens to a temperature of +85°C for 21 days
4.3	Humidity/ temperature cycling	Shall meet visual requirements, show no physical damage.	According to IEC 60068-2-38, test Z/AD Subject mated specimens to 10 cycles (10 days) between 25°C and 65°C at 80% to 100% RH
4.4	Coldness	Shall meet visual requirements, show no physical damage.	According to IEC 60512-11-10 / 11j Subject mated samples to a temperature of -55°C for 10 days
4.5	Flowing mixed gas test	Shall meet visual requirements, show no physical damage. DMG-Test for extra specimens 1x mated / 1x unmated	According to IEC 60512-11-7 / 11g Subject mated specimens to environment Method 2 for 14 days unmated for 7 days, then mated for 7 days
4.6	Damp heat, steady state	Shall meet visual requirements, show no physical damage.	According to IEC 60512-11-3 / 11c Subject mated specimens to a relative humidity of 95% at a temperature of 40°C for 10 days
4.7	Ingress Protection	Table 1 / IP30 Unmated connectors	According to IEC 60529: 2014

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3.6.5 Signal integrity Cat 5e / *Cat 6A* *(cursive marked where different values applied)*
Test device arranged according to appendix B.5

Test phase	Test Description	Requirement	Procedure
5.1	Insertion loss	Connectors up to 100 MHz: All pairs: max.0,04 √ f dB from 1 MHz to 100 MHz *Connectors up to 500 MHz:* *All pairs: max. 0,02 √ f dB from 1 MHz to 500 MHz*	According to IEC 60512-26-100 Test: 26a/27a All pairs, one direction
5.2	Return loss	Connectors up to 100 MHz: All pairs: min. 60-20log (f) dB from 1 MHz to 100 MHz *Connectors up to 500 MHz:* *All pairs: min. 68-20log (f) dB from 1 MHz to 500 MHz*	According to IEC 60512-26-100 Test: 26b/27b All pairs, both directions.
5.3	Near end crosstalk	Connectors up to 100 MHz: All pair combinations: min. 83-20log (f) dB from 1 MHz to 100 MHz *Connectors up to 500 MHz:* *All pair combinations: min. 94-20log (f) dB from 1 MHz to 250 MHz* *All pair combinations: min. 46,04-30log (f /250) dB from 250 MHz to 500 MHz*	According to IEC 60512-26-100 Test: 26b/27b All pairs, both directions, (pair to pair)
5.4	Far end crosstalk	Connectors up to 100 MHz: All pair combinations: min. 75,1-20log (f) dB from 1 MHz to 100 MHz *Connectors up to 500 MHz:* *All pair combinations: min. 83,1-20log (f) dB from 1 MHz to 500 MHz*	According to IEC 60512-26-100 Test: 26d/27d All pairs, both directions, (pair to pair)
5.5	Transverse conversion loss	Connectors up to 100 MHz: All pairs: min. 66-20log (f) dB from 1 MHz to 100 MHz *Connectors up to 500 MHz:* *All pairs: min. 68-20log (f) dB from 1 MHz to 500 MHz*	According to IEC 60512-26-100 Test: 26f/27f All pairs, both directions.
5.6	Transverse conversion transfer loss	Connectors up to 100 MHz: All pair combinations: min. 66-20log (f) dB from 1 MHz to 100 MHz *Connectors up to 500 MHz:* *All pair combinations:* *min. 68-20log (f) dB from 1 MHz to 500 MHz*	According to IEC 60512-26-100 Test: 26g/27g All pairs, both directions.

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5.7	Transfer impedance	Mated connectors: All pairs: max. 0,1 x f 0,3Ω from 1 MHz to 10 MHz and max. 0,02 x f Ω from 10 MHz to 80 MHz	According to IEC 60512-26-100 Test: 26e Measuring points as defined in.5.1.1, all signal contacts and screen.
5.8	Signal contact resistance Screen resistance	Signal: 200 mΩ max. Screen: 100 mΩ max.	According to IEC 60512-26-100 Test: 2a Measurement points as defined in 5.1.1 All input/output connector path
5.9	Unbalance resistance	50 mΩ max.	According to IEC 60512-26-100 Test: 2a Measurement points as defined in 5.1.1 All input/output connector paths combinations

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Test Groups Overview

Title		Test Groups Setup´s acc to Appendix B												
		A	B	C	D	E10	E5	F	G	H	J	K	L	M
		AP	BP	CP	DP	E10P	E5P	FP	GP	HP	-	-	-	-
1	General Examination	1/18	1/13	1/11	1/10	1/6/9	1/6/9	1	1/8/12	1/7	1/3	1	1	1, 9
2.1	Contact resistance	2/10/14	2/7/9/12	2/7	2/7	2/8	2/8	2	2/9	2/6	4		3	2, 10
2.2	Insulation resistance	3/9/16	3	3/8	3/8	3	3	3	3/10	3			4	
2.3	Voltage Proof	4/8/15	4	4/9	4/9	4	4	4	4/11	4			5	
2.4	Mechanical operations with electrical Load								5/7					
2.5	Derating									5				
3.1	Effectiveness of connector coupling device	5												
3.2	Insertion and withdrawal force	6/17	5	5/10										3, 8
3.3	Mechanical operation (half of the spec. number of cycles)		6/10											4, 5, 6, 7 (1500 cyc.)
3.4	Mechanical operation				5									
3.5	Vibration sinusoidal 10g					5								
3.6	Vibration sinusoidal 5g						5							
3.7	Mechanical shock					7	7							
3.8	Cable Holding Force											2		
3.9	Connector / Re-Use 10x												2	
4.1	Rapid change of temperature	7												
4.2	Dry heat	11			6									
4.3	Humidity/ temperature cycling	12	11											
4.4	Coldness	13												
4.5	Flowing mixed gas corrosion		8						6					
4.6	Damp heat steady state			6										
4.7	Ingress Protection										2			
5.1	Insertion loss							5						
5.2	Return loss							6						
5.3	Near end crosstalk							7						
5.4	Far end crosstalk							8						
5.5	Transverse conversion loss							9						
5.6	Transverse conversion transfer loss							10						
5.7	Transfer impedance							11						
5.8	Signal contact resistance Screen resistance							12						
5.9	Unbalance Resistance							13						

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QUALITY ASSURANCE PROVISIONS

3.7 Qualification Testing

A Sample selection

The samples shall be prepared in accordance with product drawings and application specification. They shall be selected randomly from current production, in accordance with Appendix A.

B Test sequence

Qualification inspection shall be verified by testing samples as specified in paragraph 3.6.

3.8 Requalification Testing

If changes affecting significantly form, fit or function are made to the product or to the manufacturing process, product assurance shall coordinate requalification testing, consisting of all or part of the original testing sequence as determined by development / product, quality, and reliability engineering.

3.9 Acceptance

Acceptance is based on verification that the product meets the requirements of paragraph 3.6. Failures attributed to equipment, test setup, or operator deficiencies shall not disqualify the product.
When product failure occurs, corrective actions shall be taken and samples resubmitted for qualification.
Testing to confirm corrective action is required before resubmission.

3.10 Quality Conformance Inspection

The applicable TE quality inspection plan will specify the sampling acceptable quality level to be used. Dimensional and functional requirements shall be in accordance with the applicable product drawing and this specification

3.11 Others

The product described herein has not been fully tested to ensure conformance to the requirements outlined above.
TE makes no representation or warranty, expressed or implied, that the product or design will comply with these requirements. Further, TE may change these requirements based on the results of additional testing and evaluation. Contact TE Engineering for further details.

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APPENDIX

A. Number of Specimens/ Test Groups terminated with Cable Length

P/N 2350278-1 **Mini IO Cat 5e** Field Installable Cable Plug

Test Group TE (IEC)	Mini IO 2350278-1 [pc]	AWG22 PNO solid 6XV1840-2AH10 [mm]	AWG22 PNO 7 strands 6XV 1870- 2B [mm]	AWG22 PNO 19 strands 6XV1870-2F [mm]
P	(∑36max.)	-	-	
A (AP)	3	50	50	50
B (BP)	3 +1 (BP4)	50	50	50
C (CP)	6	50	50	50
D (DP)	3	50	50	50
E1 (5g) (EP)	3	350	350	350
E2 (10g) (EP)	3	350	350	350
F1 (FP)	3	50	-	-
F2 (FP) Trans.Imp.	3	1000	-	-
G (GP)	8	-	-	3 000
H (HP)	3	300	-	-
J (n/a)	1	50	50	50
K (n/a)	9	300	300	300
L (n/a)	3	50	50	50
	Max. demand per cable type	*Use nut PN 2350320-1 drilled for Dia.6.5*	*Use nut PN 2350320-1 drilled for Dia.6.5*	*Use nut PN 2350320-1 drilled for Dia.8.2/*

Test Group Cat 6A	**Mini IO 2350310 2350304 [pc]**	**AWG 24 solid 6XV1878-2A [mm]**	**AWG 24 stranded 6XV1878-2B [mm]**	**AWG 26 7 stranded/ Cat 5e 1939708-1 [mm]**
(P)	32 (+4)	-	-	-
A (AP2)	3	50	50	50
B (BP2)	3	50	50	50
C (CP2)	6	50	50	50
D (DP2)	3	50	50	50
E1 (5g) (EP2)	3	350	350	350
E2 (10g) (EP2)	3	350	350	350
F (FP2)	3	50	-	-
F (FP2) Trans.Imp.	3	1000	-	-
G (GP2)	8	3000	3000	3000
H (HP2)	3	-	-	-
J (n/a)	1	50	50	50
K (n/a)	3	300	300	300
L (n/a)	3	50	50	50
Cable required [m]→		*30*	*30*	*30*

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Field Installable Cable Plug

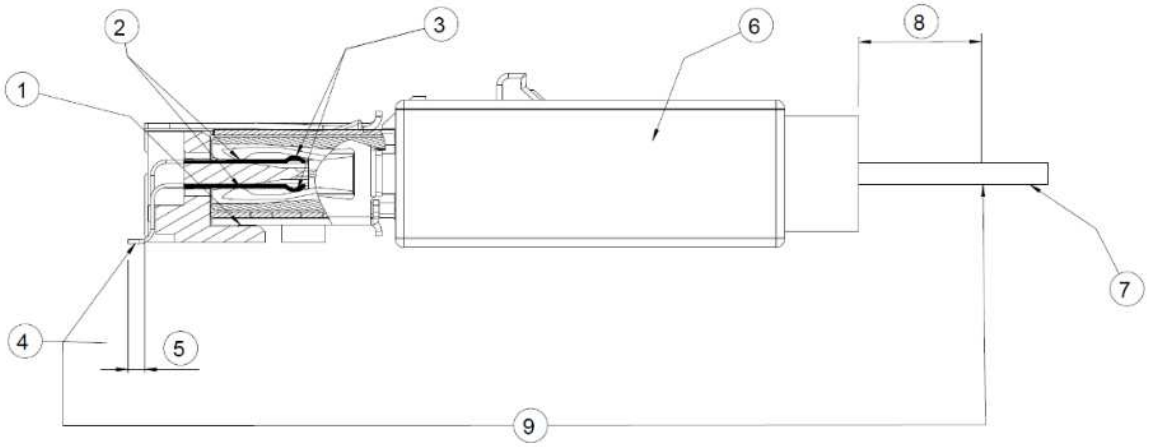
B.1 Test procedures and measuring methods

The test methods specified and given in the relevant standards are the preferred methods but not necessarily the only ones that can be used. In case of dispute, however, the specified method shall be used as the reference method.

Unless otherwise specified, all tests shall be carried out under standard atmospheric conditions for testing as specified in IEC 60068-1.

Where approval procedures are involved and alternative methods are employed, it is the responsibility of the manufacturer to satisfy the authority granting approval that any alternative methods which he may use give results equivalent to those obtained by the methods specified in this standard.

B.2 Arrangement for test *Contact Resistance*



Key
1 Fixed connector.
4 Point A. Measure the DC resistance across each of the 8 signal pins.
5 As short as practical.
6 Free connector.
7 Point C.
8 As short as practical.
9 Input-to-output resistance measurement points.

Figure 7 – Arrangement for input-to-output resistance test

The test procedure is as follows:

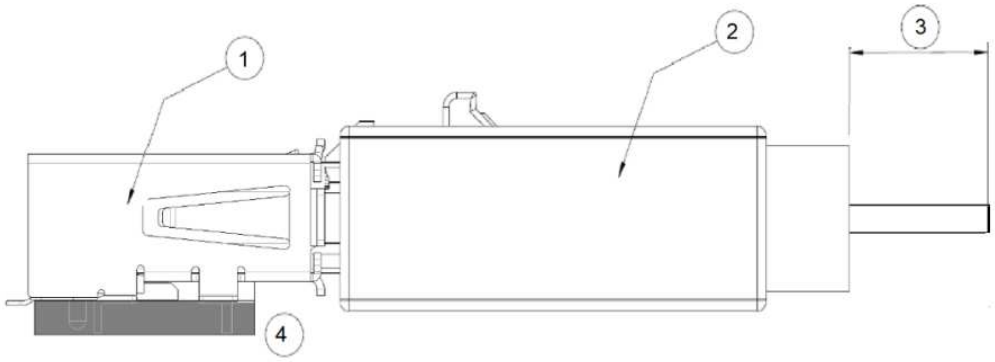
Determine the input-to-output resistance of the mated connector by measuring the resistance between points A and C, following the requirements and procedures of IEC 60512, Test 2a, and subtracting the resistance of the cable (de-embedding).

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B.3 Specimen Arrangement for Test Group AP / BP / CP / DP

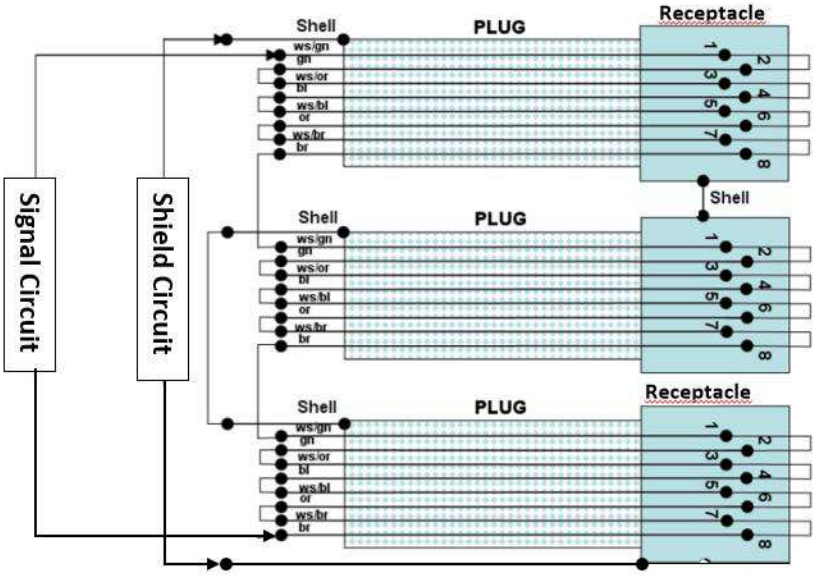
Test Group BP required additional specimens for (un)mated plug and receptacle

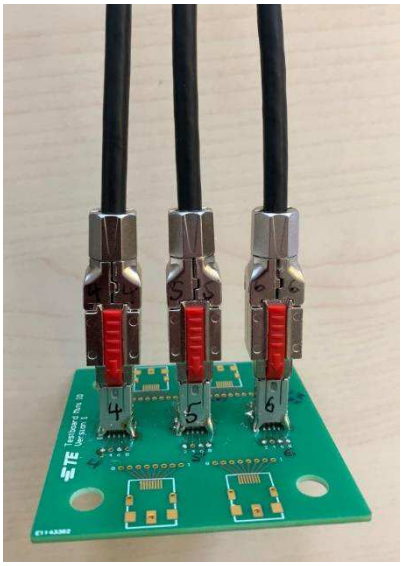


Key

1	Fixed connector (vertical or R/A version) rigidly fixed to the mounting plate
2	Free connector
3	50 mm distance between free connector and cable fixation
4	Mounting plate No cable fixation

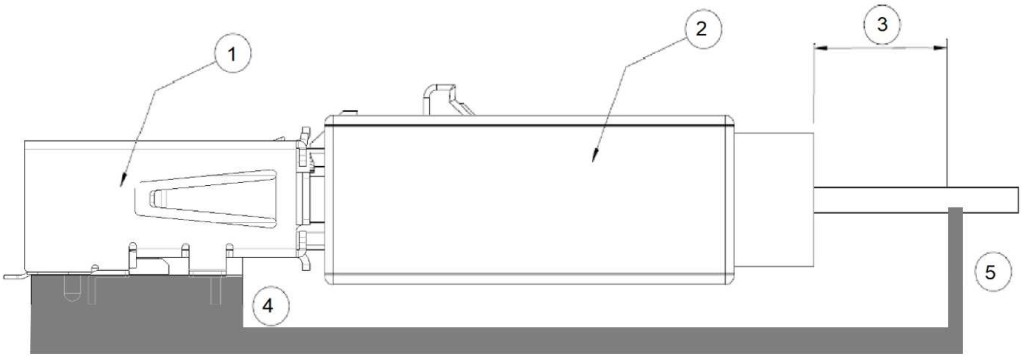
Principle electrical scheme for specimens acc. to Cat 5e and Cat 6A version





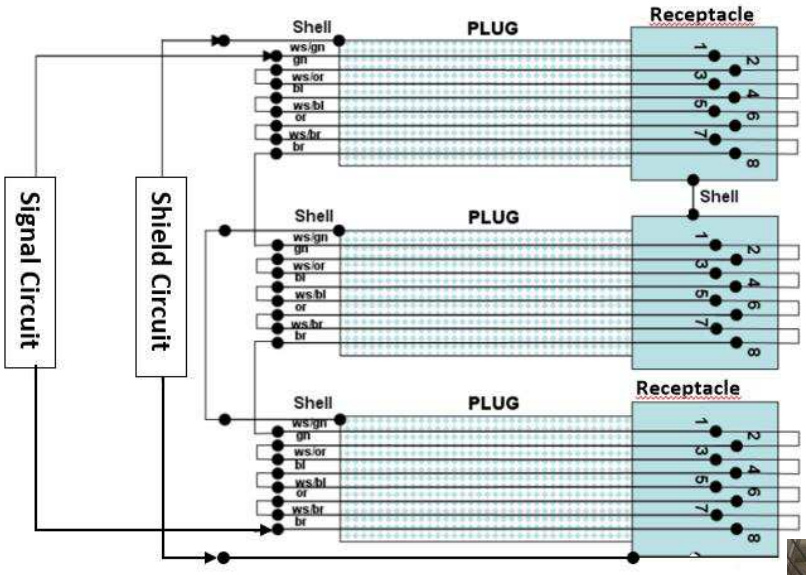
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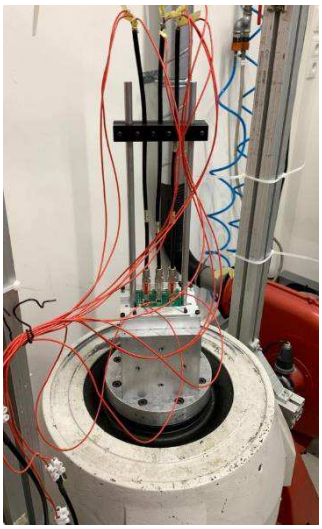
B.4 Specimen Arrangement for *Vibration Test* – Test Group EP

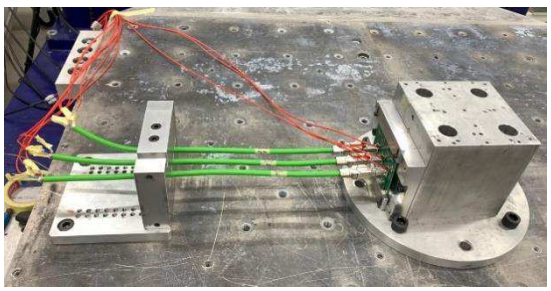


Key
1) Fixed connector (vertical or R/A version) rigidly fixed to the mounting plate
2) Free connector
3) Distance between free connector and cable fixation: 200 mm
4) Mounting plate
5) Cable fixations

Principle electrical scheme for specimens acc. to Cat 5e and Cat 6A version

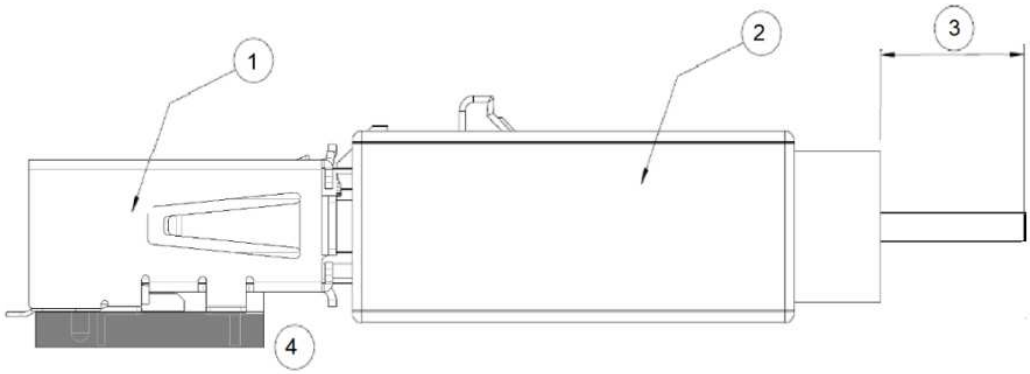






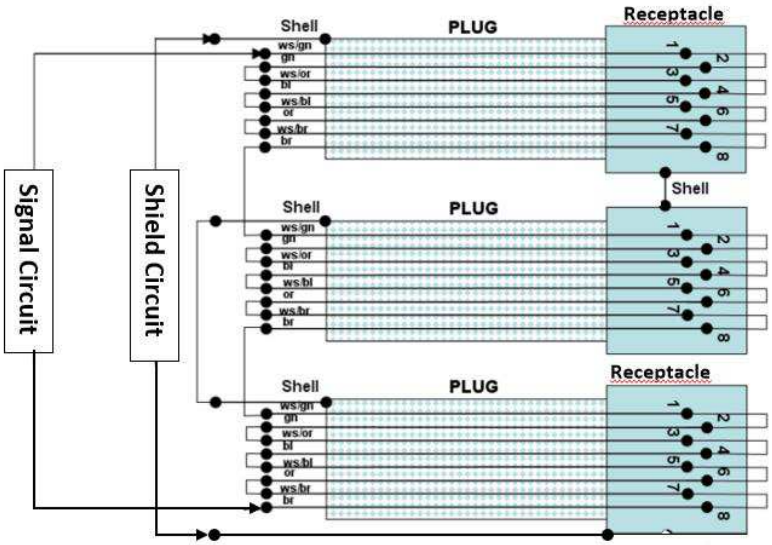
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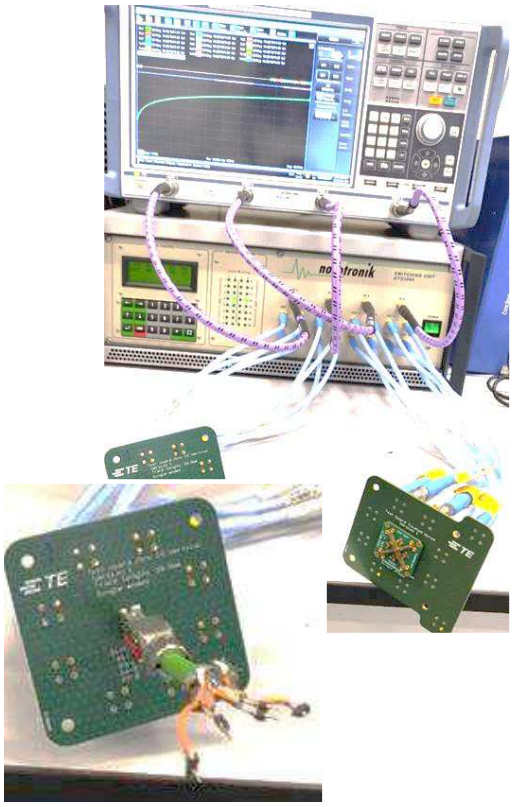
B.5 Specimen Arrangement for Test – Test Group FP
Signal Integrity



Key
1 Fixed connector (vertical or R/A version) rigidly fixed to the mounting plate
2 Free connector
3 max. 50 mm cable length; open current circuit closed with electrical resistance of 100 Ohm
cable length for measuring "Transfer Impedance": 1000mm
4 PCB

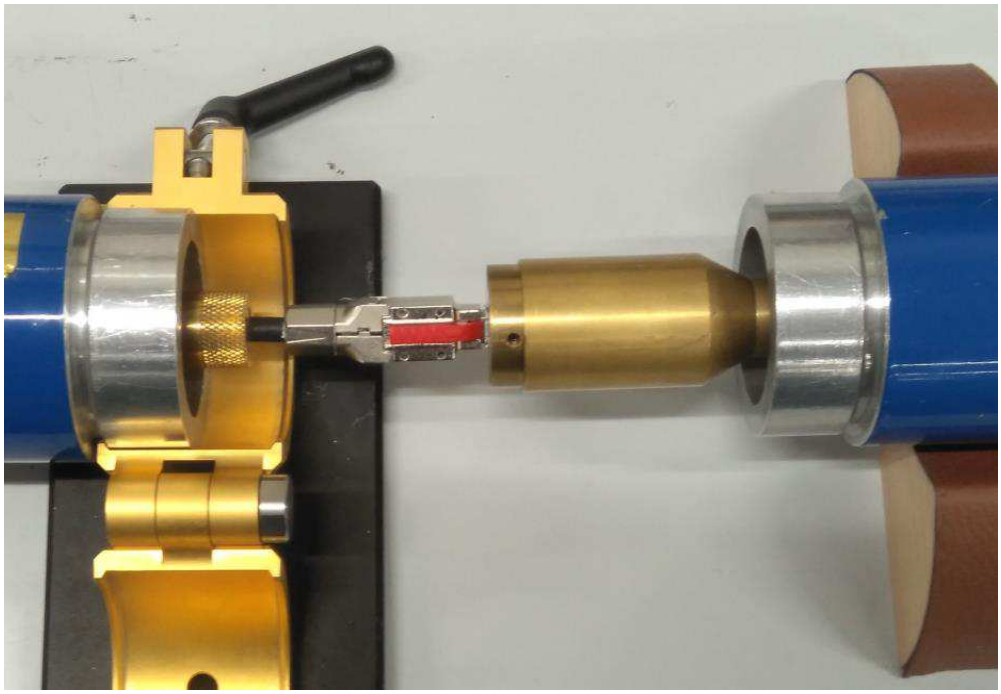
Principle electrical scheme for specimens acc. to Cat 5e and Cat 6A version





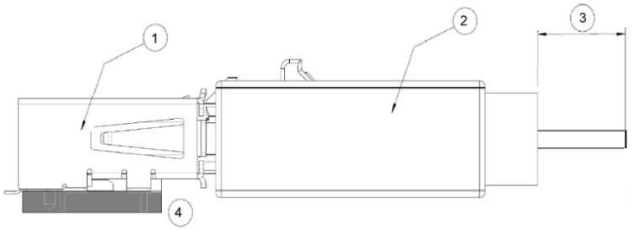
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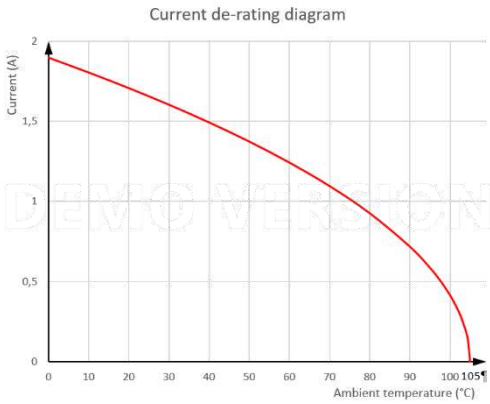
Specimen Arrangement for Test – Test Group FP
Transfer Impedance



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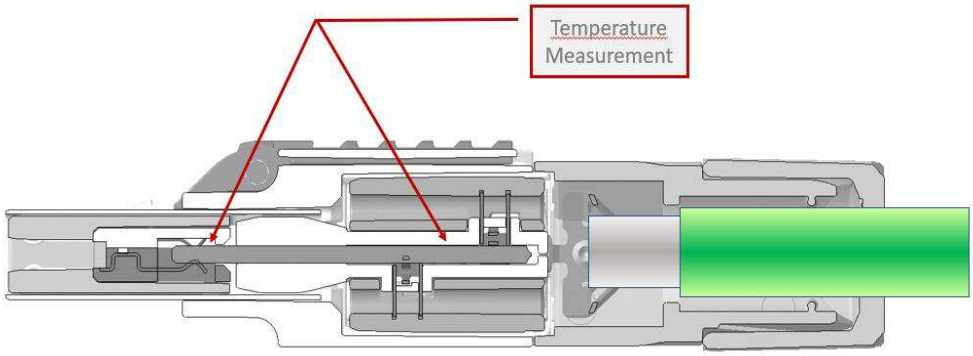
B.6 Specimen Arrangement for Test *Derating* – Test Group HP



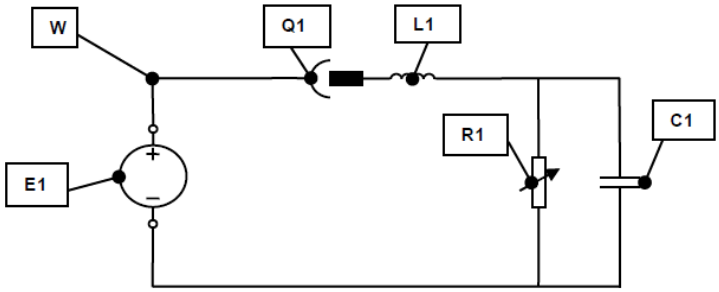


Key

1 Receptacle (fixed connector) rigidly fixed to the mounting plate
2 Free connector
3 Cable length 300 mm / AWG22 PNO, 19 strands, 6XV1870-2F
4 PCB
5 The investigation requires no fan for an entire distribution of the heat.



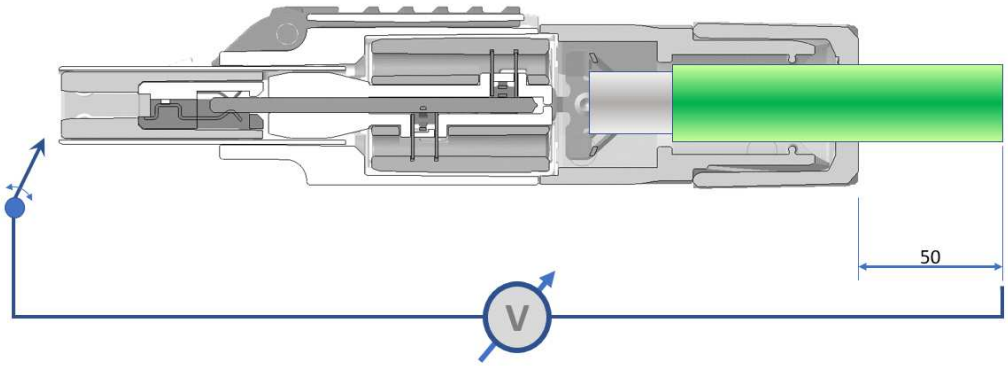
Principle electrical scheme for specimens acc. to Cat 5e and Cat 6A version



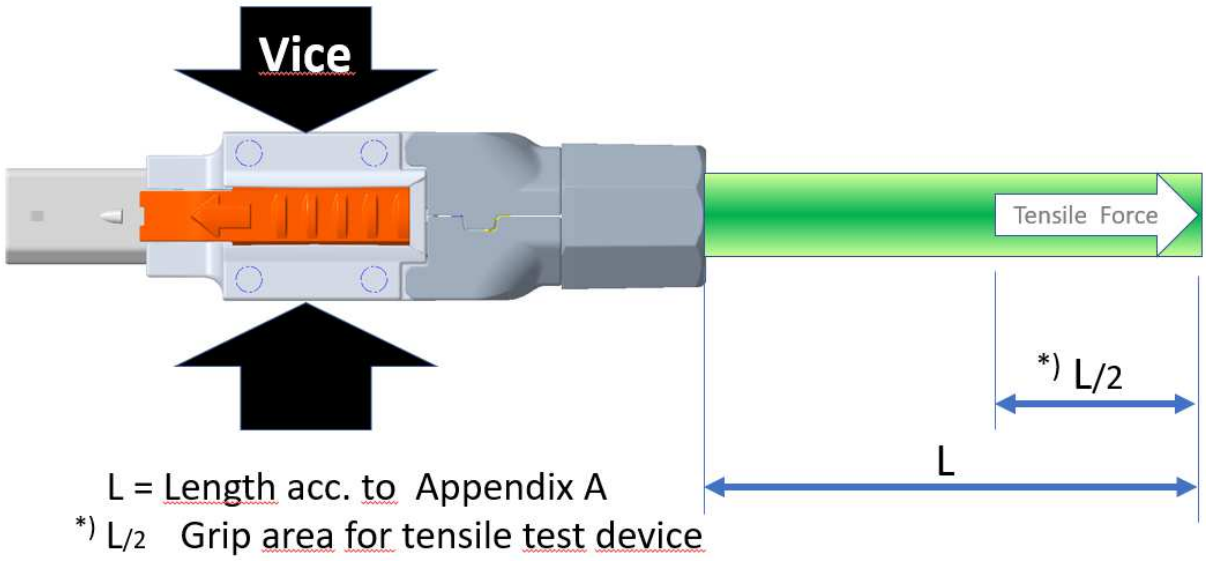
W	Cable Length acc. to appendix A.
Q1	Connector under Test
L1	Inductor L = 100µH
R1	Variable resistor (e.g. 50Ω to 300Ω)
C1	Capacitor 5µF
E1	Voltage source

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B.7 Specimen Arrangement for Test *Ingress Protection* – Test Group J



B.8 Specimen Arrangement for Test *Cable Holding Force* – Test Group K



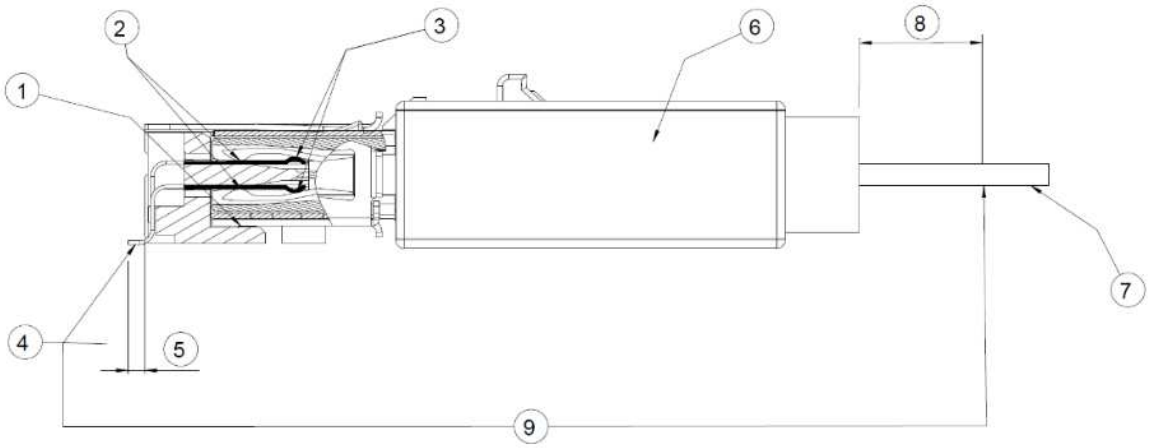
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B.9 Arrangement for test *Contact Resistance after 10x of Re-Use*– Test Group L

Connect the required cable type 10 times to the same Termination Unit. After each termination process cut-off and remove the former applied cable end. Then start with a fresh cable end each re-connection.

After the last termination process insert and remove the Termination Unit with the Screen Housing Assembly (symbolic No.6) up to 10 times again. Closing the cable outlets with a nut is not required.

With the 10th cycle, close the entire connector finally. Measure the bulk resistance of signal and shielding with the mated application as shown below.



Key

1 Fixed connector.

25	Point A. Measure the DC resistance across each of the 8 signal pins.
25	As short as practical.
25	Free connector.

7 Point C.
8 As short as practical.
9 Input-to-output resistance measurement points.

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Revision Record

Revision	Remarks	Name	Date
A	PRODUCT SPECIFICATION RELEASED	M. Szelag	27 JUL 2020
.B	PARTNUMBERS OF CONNECTOR KITS CAT 6A ADDED	M. Szelag	13 AUG 2020
C	TABLE OF TEST GROUP CORRECTION OF TG - L	M. Szelag	04.NOV.2020
D	CHAP. 3.3 “CABLE STYLE” ADDED; CHAP. 3.8 MOD. TG OVERVIEW: TG-E5/ E10 RENAMED	M. Szelag	01.DEC.2020
E	Appendix A.: “PIMF Cable removed”	M. Szelag	08.DEC.2020
F	Pos. 2.3 alternative VDC values added and Pos. 3.1 new 100N	M. Szelag	23.FEB.2021
G	Chap.: 3.3: Wire Range Cat 6A: PNs added 3-//-1, 3-//-2, 2-//-2, 2-//-1; 2350278/-304: wire size range extended from “-24” to “-30” and “(7- 19 - fine~)”; Test group “M” added (1500 Mating’s); Chap. 3.6.6/ Pos. 3.8: added “influenced by cable construction”	M. Szelag	05.APR.2023
H	Added Performance Test Result report: 502-153674	S. Sharma	28.Jun.2023

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