Title: CIRCULAR HYBRID CONNECTOR Hybrid Connector HC.26

Design Objective
108-74097

CIRCULAR HYBRID CONNECTOR
Hybrid Connector HC.26

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1. Scope

1.1 Content

This specification covers the performance, tests and quality requirements for the Circular Hybrid Connector HC.26 series. Contact inserts are available for “11-pos. + ground” and “7-pos. + ground + 4-pos. Ethernet”.

1.2 Qualification

When tests are performed the following guidelines and standards must be used. All tests must be executed according to the applicable inspection plans and product drawings.

2. Applicable Documents

If they are mentioned the following documents form a part of this specification. Should there be a contradiction between this specification and the product drawing or between this a specification and the listed documents, the specification has priority.

2.1 TE Documents

A 109-1: General Requirements for Test Specifications
B Customer Drawings and Designation

1103426	MALE INSERT ASSY	SERIES HC26, 4-POS. 22DF
1103427	FEMALE INSERT ASSY	SERIES HC26, 4-POS., 22DF
1103428	MALE INSERT ASSY	SERIES HC26, 8-POS. TYPE III+
1103429	FEMALE INSERT ASSY	SERIES HC26, 8-POS. TYPE III+
1103430	MALE INSERT ASSY	SERIES HC26, 4-POS. 22DF, PCB
1103431	MALE INSERT ASSY	SERIES HC26, 12-POS. TYPE III+
1103432	FEMALE INSERT ASSY	SERIES HC26, 12-POS. TYPE III+
1103433	BULKHEAD HOUSING ASSY	SERIES HC26, DESIGN PLASTIC
1103434	ANGLED CONNECTOR HSG. ASSY	SERIES HC26, DESIGN PLASTIC
1103436	BULKHEAD HOUSING ASSY	SERIES HC26, DESIGN METAL
1103437	ANGLED CONNECTOR HSG. ASSY	SERIES HC26, DESIGN METAL
1103439	COUPLING HOUSING ASSY	SERIES HC26, DESIGN METAL
1103440	CONNECTOR HOUSING ASSY	SERIES HC26, DESIGN METAL
1103467	CONNECTOR HOUSING ASSY	SERIES HC26, DESIGN PLASTIC
1103470	COUPLING HOUSING ASSY	SERIES HC26, DESIGN PLASTIC
1103483	ACCESSORY KIT	SERIES HC26, CONNECTOR HSG.
1103519	ACCESSORY KIT	SERIES HC26, ANGLED CONN. HSG.
1108846	BULKHEAD HSG. WITH PCB SOLDER UNIT	SERIES HC26, 8+4 POS., PCB
1103536	CAT5E HYBRIDE CABLE	SERIES HC26, 8+4-POS.

C	Prod. Spec.	108-74097	CIRCULAR HYBRID CONNECTOR Hybrid Connector HC.26
D	Prod. Spec.	108-74109	HC.26 4-pos. Shielded 22DF Connector Inserts
E	Prod. Spec.	108-10042	Contacts, Type III+, Stamped and Formed
F	Test Spec.	109-30	Contact Retention
G	Test Spec.	109-35	Contact Engaging and Separation
H	Appl. Spec.	114-74103	CIRCULAR HYBRID CONNECTOR Hybrid Connector HC.26

I	Appl. Spec.	114-10004	Contacts, Type III+ (Size16)
J	Qual. Test	501-66	Contacts, Type III+, Stamped and Formed
K	Qual. Test	501-19219	Circular Hybrid Connector System

2.2 Other Documents

A	IEC 60512	Electromechanical components for electronic equipment, Basic testing procedures and measuring methods / Edition
B	EN 60664-1	Insulation coordination for equipment within low- voltage systems
C	IEC 60068	Electrical Engineering, Basic Environmental Testing Procedures / Edition
D	DIN EN 61984	Connectors – Safety requirements and tests
E	IEC 60529	Degrees of protection provided by enclosures (IP Code)

3. Requirements

3.1 Design and Construction

The product must correspond to the design and the physical dimensions of the product drawings.

3.2 Material

For information about materials, please refer to the drawings.

3.3 Ratings

3.3.1 General

A_1	Temperature range	-20℃ up to +80℃ (ambient temperature range and current heating)
A_2	Fire protection measures	acc. to UL 94 V-0 - halogen-free - low flammability - fire retardant
B_1	Protection category	IP 20 open female IP 65 when closed
C_1	Durability	50 cycles
C_2	altitude	Max. 2.000m above sea level
D_1	Mech. requirements - Insert to Housing	Engaging force: 50N max. Separating force: 125N min.
D_2	Mech. requirements Locking and Unlocking torque of coupling nut	Locking: 50 Nm Unlocking: 70 Nm
D_3	Mech. requirements - Retaining force of strain relief	Retaining force cable: 150N min. without fully loaded inserts

3.3.2 Insert 11-pos.+ ground

A_1	Voltage	U = max. 60V (DC)
A_2	Isolation level	test voltage: 1.5kV AC / 50Hz test duration: 60s ±10%
A_3	Isolation co-ordination	min. values for creepage distances acc. to IEC 60664-1 (degree of pollution 3, overvoltage class II Isolation class IIIa/b: - Creepage distances 1.8 mm (for 60 V) - Clearance distances 0.8 mm (for 60V)
B	Current carrying capacity continuous	I = 10 A rms (2.5 mm^2); insert fully loaded (11x)
C_1	Mech. requirements - Contact / Insert	Engaging force: 10,0N max. Separating force: 44,5N min. cable termination: crimped wire 2.5mm^2
C_2	Mech. requirements - Insert to Insert	Mating force: 100N max. Unmating force: 100N min. With fully loaded inserts (12 x Type III+)

3.3.3 Insert 7-pos.+ ground + 4-pos. Ethernet

A_1	Voltage	U = max. 25V (DC)
A_2	Isolation level	test voltage: 0.8kV AC / 50Hz test duration: 60s ±10%
A_3	Isolation co-ordination	min. values for creepage distances acc. to IEC 60664-1 Isolation class IIIa/b: - Creepage distances 1.25 mm (for 25 V) - Clearance distances 0.8 mm (for 25V)
B	Current carrying capacity continuous	I = 10 A rms (2.5 mm^2); insert fully loaded (7x); Inclusive Ethernet Core with shielding
C_1	Mech. requirements - Contact / Insert	Engaging force: 10,0N max. Separating force: 44,5N min. cable termination: crimped wire 2.5mm^2
C_2	Mech. requirements - Insert to Insert	Mating force: 100N max. Unmating force: 100N min. With fully loaded inserts (8 x Type III+ / Ethernet)

3.4 Attributes and Test Description

This product fulfills the electrical, mechanical and climatic requirements as listed in point 3.5. Unless otherwise stated, all tests were carried out according to the environmental conditions listed in IEC 60512.

3.5 Test Requirements and Procedures Summary

Test Description	Requirements	Procedure
General Tests		
Visual and dimensional check	Compliance with product drawings	IEC 60512-1-1, IEC 60512-1-2
Durability of printing	Wet test with liquid: water Duration: 10 cycles Force: 5N	IEC 60068-2-70 Test Xb All male/female inserts
Internal Protection	Requirements IP20	Protection acc. to IEC 60529; fully loaded housings open, with female insert dust level: 2x water level: x0
Internal Protection	Requirements IP54	Protection acc. to IEC 60529; fully loaded housings close, with 11+PE inserts dust level: 5x water level: x4
Internal Protection	Requirements IP65	Protection acc. to IEC 60529; fully loaded housings close, with 11+PE inserts dust level: 6x water level: x5

Test Description	Requirements	Procedure
Electrical Tests		
Current carrying capacity 11+PE	See derating curves	Acc. to IEC 60512-5-1, 5-2 Testing wire size • 2.5 mm² • 1,5 mm² • 1,0 mm² Limit temperature: 125℃
Current carrying capacity 7+PE+Ethernet Core	See derating curves	Acc. to IEC 60512-5-1, 5-2 Testing wire size • AWG 16 / 10,0A • AWG 22 / 0,8A Limit temperature: 125℃
Cyclic current stress 11+PE	Test current dependent on nominal current of contact. I_N= according to wire A: Wire size 2.5 mm² /10,0A	Acc. IEC 60512-9-5 ambient temperature: 40℃ duration : 500h testing cycle: 45 min power on 15 min power off Limit temperature: 125℃
Cyclic current stress 7+PE+Ethernet Core	Test current dependent on nominal current of contact. A: Wire size 2,5mm² /10,0A	Acc. IEC 60512-9-5 ambient temperature: 40℃ duration : 500h testing cycle: 45 min power on 15 min power off Limit temperature: 125℃
Voltage proff	test voltage: U_{eff} = 1,5 kV *(see 3.3.2)* test voltage: U_{eff} = 0,8 kV *(see 3.3.3)*	Acc. to IEC 60512-4-1, type of connection: B Duration of test: 60 s, 50Hz
Insulation resistance	Value: 500V DC, min. 10 MΩ	test acc. to IEC 60512-3-1, type of connection: A, B
Resistance measurement power contacts	Contact resistance $R_1 \leq 15$ mΩ, (see picture 1)	acc. to IEC 60512-2-2, I=1,0A

Test Description	Requirements	Procedure
Mechanical Tests		
Tensile strength of wire. Wire pn 1103536-3	F> 180N	Acc. to IEC 60512-13-1 Actuating speed: 25 mm/min
Engaging and separating forces / Insert to Housing *(See 3.3.1 D1)*	Engaging force: max. 50N Separating force: min. 125N	Acc. to IEC 60512-13-1 Actuating speed: 25 mm/min
Mating and unmating forces / Male to Female Connector Housing *(See 3.3.1 D2)*	Mating force: max. 120N Unmating force: max. 120N	Acc. to IEC 60512-13-1 Actuating speed: 25 mm/min
Retaining force of cable strain relief, cable clamp resistance to cable pull tensile *(See 3.3.1 D3)*	No physical damage Permissible shift 1.0 mm	Acc. to IEC 60512-17-3 Actuating speed: 25 mm/min 150 N
Contact engaging to insert Contact separating from insert, contact insertion, release and extraction force *(See 3.3.2 C1 & 3.3.3 C1)*	Pin / Socket contact: Engaging: 10,0N max Separating 44.5N min.	Acc. to IEC 60512-15-4 Testing speed 25 mm/min
Mating and unmating forces / male to female insert, fully loaded *(See 3.3.2 C2 & 3.3.3 C2)*	A cycle consists of mating and unmating. Mating force: 100 N max. Unmating force: 100 N max.	Acc. to IEC 60512-13-1 Actuating speed: 25 mm/min Mating frequency: 50 cycles Visual check after every 10 cycles
Polarization of insulation bodies with contacts	Mating force: 85 N max.	acc. to IEC 60512-13-5
Physical shock	No physical damage No contact interruption t>1µs test in housing wire cross section 2,5 mm^2	Acc. to DIN EN 50155 100g, duration 5 ms 3 shocks in each of the 6 directions
Vibration	No physical damage No contact interruption t>1µs Test in housing Wire cross section 2.5mm^2	Acc. To DIN EN 50155 Frequency: 10-2000 Hz Amplitude: 4.5 mm Cross-over frequency: 18.4 Hz Acceleration: 30 m/s^2 Duration of test: 10 cycles/axis

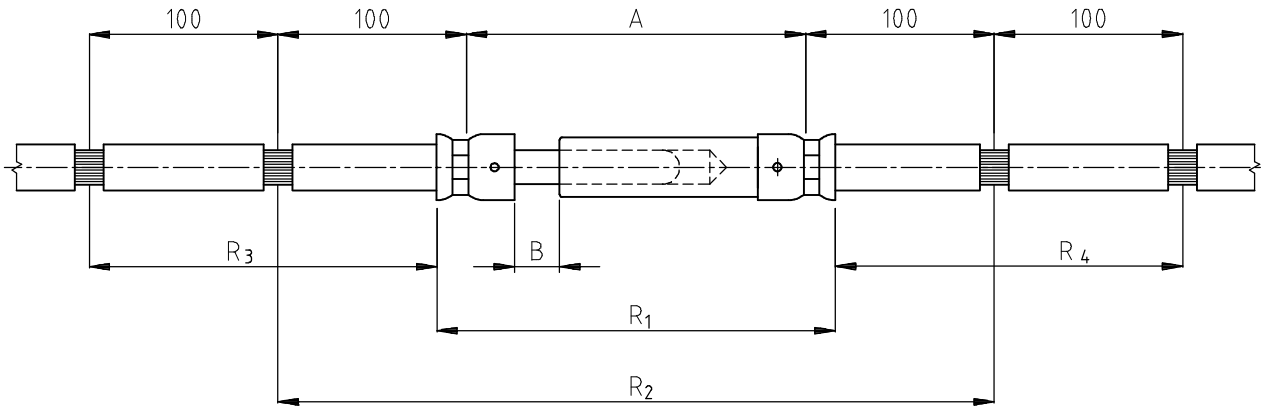
Test Description	Requirements	Procedure
Environmental Tests		
Rapid change of temperature	No physical damage	Acc. to IEC 60068-2-14, Na T_a= -40℃ T_b= +80℃ t_a=1,0h, t_b=1,0h number of cycles: 100
Cyclic damp heat	No physical damage	Test according to IEC 60068-2-30 Db, low air temp. 25℃±2℃, max. air temp. 40℃±2℃, humidity: 94%±3% temperature change 0,17K/min duration: 10 days
Dry heat, constant	No physical damage	Acc. to IEC 60068-2-2, Bb Duration: 120h, T= +80℃

Test Description	Requirements	Procedure
Solderability Performance Tests		
Component heat resistance to lead-free wave soldering	Method B (265℃ solder bath temperature) No damage or deformation of components, no destruction of surface of PCB in contact zone	According to TE specification 109-202
Solderability after aging	Meets requirements of specification 109-11-10	According to TE specification 109-11

3.6 Qualification and Re-Qualification Test Sequence

Test	Test Group [1]							
	A	B	C	D	E	F	G	H
	- Test Sequence [2]							
Visual and dimensional check	1/8	1/11	1/11	1/9	1/5	1/5	1/3	1/3
Durability of printing	7							
Internal Protection IP 20 female	2							
Internal Protection IP 54	5							
Internal Protection IP 65	6							
Current carrying capability				3/7				
Cyclic current stress				5				
Voltage proof			3/14					
Insulation resistance			2/13					
Resistance measurement		2/5/7 /9	4/6/8/ 10	2/4/ 6/8				
Engaging and separating forces Insert / Housing						4		
Mating and unmating forces Male to female connector housing						2		
Engaging and separating forces Contact / Insert						3		
Mating and unmating forces / Male to female insert					2			
Vibration		6						
Physical shock		8						
Retaining force Cable / strain relief					4			
Polarization of insulation bodies					3			
Change of temperature	3	3	5					
Dry heat, constant	4	4	7					
Damp heat			9					
Wave soldering							2	
Solderability after aging								2

1) See paragraph 4.1 A
2) Numbers indicate sequence in which tests are performed



Picture/1/Resistance measurement

Picture/2/Derating-curves

4. Quality Assurance Measures

4.1 Qualification Testing

A Sample Selection

The samples must correspond to the drawings. They are to be selected at random during a normal production run.

For the test groups:

Test Group A : 1103433-1, 1103434-1, 1103519-1, 1103536-3 (Anbau, gewinkelt, Plastik)
Test Group B : 1103433-1, 1103467-1, 1103483-1, 1103536-3 (Anbau, gerade, Plastik)
Test Group C : 1103436-1, 1103437-1, 1103419-2, 1103536-3 (Anbau, gewinkelt, Metall)
Test Group D : 1103436-1, 1103440-1, 1103483-2, 1103536-3 (Anbau, gerade, Metall)
Test Group E : 1103470-1, 1103467-1, 1103483-1, 1103536-3 (Kupplung, gerade, Plastik)
Test Group F : 1103439-1, 1103440-1, 1103483-2, 1103536-3 (Kupplung, gerade, Metall)
Test Group G : 1108846-1
Test Group H : 1108846-1

B Test Groups

The tests must be performed acc. to the listed test groups under item 3.6.

4.2 Re-Qualification Test

If changes which significantly affect form, fit, or function are made to the product or to the manufacturing process, the development department in charge will coordinate a re-qualification test.

This test consists of all or part of the original test sequence as determined by the development- and quality assurance department.

4.3 Acceptance

Acceptance is based on the verification that the product meets the requirements according to paragraph 3.5. Deviations attributed to equipment, test set-up, or operator deficiencies must not disqualify the product. When a product deviation occurs, corrective action must be taken and samples resubmitted for qualification. Confirmation that testing was successful must be supplied before requalification.

4.4 Quality Conformance Inspection

The conformance inspection takes place according to the applicable quality inspection plan, which stipulates the acceptable quality level of random samples. Dimensional and functional requirements must correspond to the product drawings of this specification.

5. Appendix

Class	Description	Name	Date
A	Created	T. Schn.	01.03.2007
B	Documents and standards updated	T. Schn.	09.12.2011
C	Document updated	E.Reiss	03.11.2015