

GPL 394 MONO-SHAPE Tab L.I.F. Connector P Code 0316

1. SCOPE

1.1 Content

This specification covers performance, test and quality requirements for the Mono-Shape™ 5 mm Pitch I.D.C. L.I.F. Connectors for Tab contacts. These connectors are designed and developed for multiple lead connections for household appliances and other commercial equipment. The proper meatable counterparts are plastic connectors assembled with tin-plated TAB contacts, according to DIN 46244 - A6.3-0.8 and RAST5 standards (tin thickness: from 2µm min. to 6µm max). Product is applicable on 0.5- 1.5 mm² single stranded wires as describe on par.3.2

2. APPLICABLE and REFERENCED DOCUMENTS

The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the latest edition of the document applies. In the event of conflict between requirements of this specification and product Inspection drawing, product Inspection drawing shall take precedence. In the event of conflict between requirements of this specification and referenced documents, this specification shall take precedence.

- TYCO Product Drawings Refer to TYCO Customer Drawing N° 284338 as typical product design
- TYCO Product Specification 108-20065 for I.D.C. Connector 5mm Pitch for TAB Contacts
- TYCO Application Specification 114-20016 for I.D.C. Connector 5mm Pitch for TAB Contacts
- RAST5 Raster Anschluß Steck Technik 5mm Teilung
- DIN 0281 HD 21.3 S3 PVC insulated cables of rated voltages up to 450/750 V General requirements.
- VDE 0627 (Rev. 09/91) Connector and plug-and-socket devices for rated voltages up to 1000Va.c./d.c. and rated currents up to 500A for each pole.
- IEC 60352-3/4 (Rev. 11/95) Testing For Insulation Displacement Connection
- IEC 60998-1/-2/-3 (rev.90-04/91-10) Connecting devices for low-voltage circuits for household
- IEC 60068-2-6 (Rev '95) Environmental testing – vibration sinusoidal
- IEC 60512-2-1 Contact Resistance dry circuit
- IEC 60512-2-2 Contact Resistance At Specified Current
- IEC 60512-4-1 Withstanding Voltage
- IEC 60512-5-1 Temperature Rise Versus Current
- IEC 60512-7 Insertion and Withdrawal force
- IEC 60512-11-9 Temperature Life
- IEC 60512-11-12 Humidity & Temperature Cycling
- EIA 364 –TSB Salt Spray Corrosion (see
- IEC 60512-16-4 and 16-20 Wire Termination tensile Strength
- EN60335-1 (ed.4.0) Fire hazard testing Glow-wire end-product test and guidance
- IEC 60112 Current Tracking Index
- EN 60998 – 1 Ball Pressure Test

A4	Current rating increase after tesing and approval	KD. Cheon	R. Robone	25.APR.2016
A3	ADDED PAR. 5.4, TEST FOR MATERIAL	C.CORDOLA	G.TURCO	FEB.2008
A2	REVISED TABLE ON PAG. 2 added new part	C.CORDOLA	G.TURCO	OCT.2007
A1	REVISED FOR ET00-0094-01	U.AIME	C.TARTARI	28 MAR 03
A	FIRST ISSUE, ET00-0133-00	M. COLOMBO	G. TURCO	19 MAY 00

3. REQUIREMENTS

3.1. Design and Construction

Product shall be of design, construction and physical dimensions specified on applicable product Inspection drawing.

3.2. Definition

3.2.1 Insulation Displacement Connection (I.D.C.): A terminating technique whereby an insulated wire is forced into a restrictive slot in a terminal, during which time the wire insulation is displaced, and the bare wire engages the sides of the slot.

3.2.2 Housing-connector: An insulating encapsulation for contacts. When pins or sockets are inserted into a housing, the assembly is usually referred to as a connector. Housing is sometimes referred to as "block."

3.2.3 TAB CONTACT: Used to describe the flat blade portion of certain terminals (e.g. a FASTON Conn* tab, a taper tab, a solder tab).

3.2.4 L.I.F. Low Insertion Force

3.3 Materials

- (1) I.D.C. TAB Contact: Brass CuZn 30 Post-Tinned
- (2) TAB connector Housings: Polyamide 6/6 glass fiber filled, UL 94V-2
- (3) Wires: Types suitable for this product refer to the table shown below

cross section nominal mm ² (AWG)	Stranded Wires diameter mm	numbers of single wire and max. diameter mm	single wire material*	insulation material type**	Insulation Outside dia. Ref. DIN0281 HD 21.3 S3
0.5 - (AWG20)	1	16x0.21	tinned or unplated copper	PVC	2.3
0.75 - (AWG18)	1.2	24x0.21	tinned or unplated copper	PVC	2.5
1.0 - (AWG17)	1.4	32x0.21	tinned or unplated copper	PVC	2.7
1.5 - (AWG16)	1.6	30x0.26	tinned or unplated copper	PVC	3.0

***Cable termination process on product, looking at insulation material type, must be analyzed and examined together with the Application Tooling Manufacturer of the Tooling used to terminate the product.**

3.4 Ratings

3.4.1 Voltage/Current : Voltages 220-240 V., current Rating according to wire size

Wire Sec.(mm ²)	Current (max.)
0.5	6A
0.75	6A
1.0 - 1.5(*)	7A

(*) SECTION 1.5 CAN BE APPLIED BUT CURRENT MAX. LOAD IS STILL LIMITED TO 7A DUE TO CONTACT DESIGN

3.4.2 Operating temperature: (increase due to current load Included) -25°C to +105°C

4. SAMPLE COMPOSITION AND PREPARATION.

Connectors are designed to meet the electrical, mechanical and environmental performances requirements according to test conditions as specified on following paragraphs.

Tests are split in three sections:

SECTION A: Tests on connection between Contacts and TAB

SECTION B: Tests on the total connection (wire-I.D.C. contact-TAB)

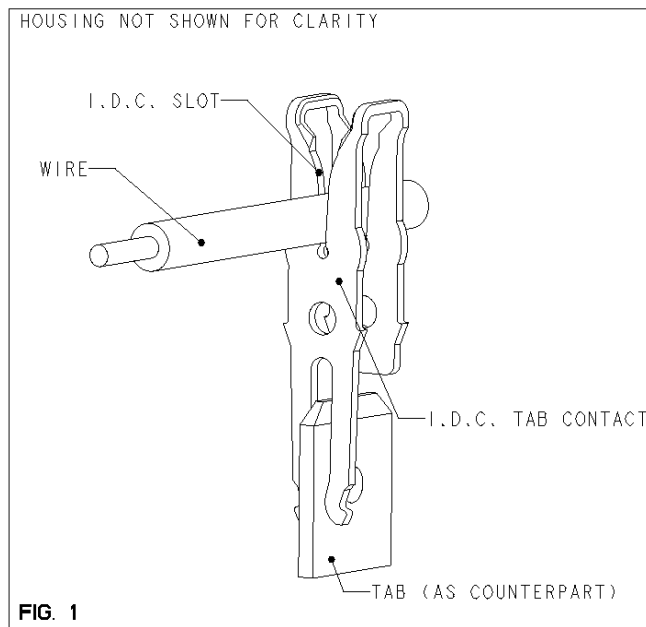
SECTION C: Tests on the connector (mechanical tests)

This specification doesn't take in consideration electrical, mechanical and environmental performances requirements of the connection between Wire and I.D.C. contact slot.

For this section test refer to TYCO spec. 108-20065 SECTION A.

For each section of wire applicable the minimum suggested group submitted to the test sequence is listed on paragraph 4.4, at list the minimum wire section (0,5mm²) and the maximum (1.0mm²) must be used for testing.

See attached Fig.1 for detail on mentioned features.



4.1 Samples selection.

Samples for testing must be selected at random for current production, must be in accordance to relevant Product drawings and functional per applicable inspection plan.

4.2 Samples Preparation.

All the operation made in order to prepare Samples for testing must be done in accordance to relevant Specification (Application spec for termination), wires and TAB must be inspected to verify the conformance to the correspondent specification. Where a temperature measurement probe on the product is requested, this must be applied at the hottest point of the connection. Operations which could be cause of damage or could influence the functionality of the product must be avoided.

4.3 Environmental Test Condition (Laboratory).

Unless otherwise specified, all tests shall be conducted at:

- Temperature 20°C ±5°
- Relative humidity 30 ÷ 95 %
- Atmospheric pressure 860 ÷ 1060 mBar

4.4 Suggested Samples for Test Group Composition.

Unless otherwise specified each group of connectors to be tested, shall be composed at least by:

- N°8 Tab L.I.F. Connector 2 ways
- N°8 Tab L.I.F. Connector 3 ways
- N°8 Tab L.I.F. Connector 8 ways
- N°8 Tab L.I.F. Connector 10 ways

Unless otherwise specified above listed quantity is requested for each section of the wire used terminate samples under test (see Par. 6 for test group and sequence).

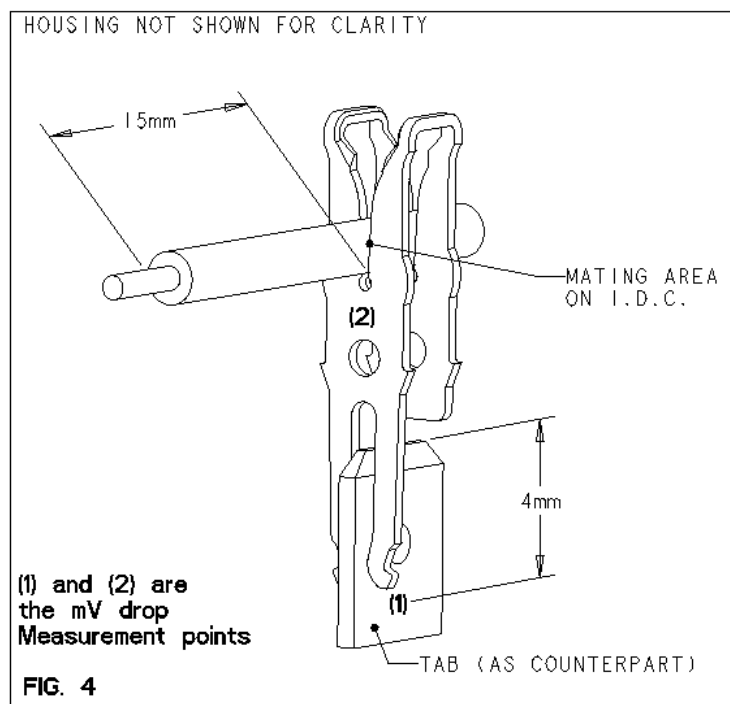
5. PERFORMANCE: TEST DESCRIPTION.

5.1 Section A - Tests on connection between I.D.C. contact and TAB

This section is focused on testing the performance of the TAB side of the connection, in order to reduce the influence of the IDC portion of the connection, the contact could be soldered to the I.D.C. slot mating area, for reference see sketch on paragraph 4

5.1.1 Contact Resistance At Specified Current (see also TYCO#109-25)

Conformance of the product shall be measured as shown on following Fig.4 The potential drop shall be measured between points (1) and (2) the applicable test current is according to wire section as reported on Par. 3.4.1. After mechanical, electrical or environmental tests sequences (if a contact resistance check is requested), the difference between Initial and Final values must be ≤ 5mΩ.



5.1.2 Durability Cycles (see also TYCO#109-27)

Connector under test shall be withstand for 1 day of a pre-conditioning cycle, at 50%

of relative humidity exposure. Than subjected to 10 cycles of Mating / Unmating using the TAB contact according to DIN 46244 - A6.3-0.8. Cycle rate shall be $V = 10\text{mm/minute}$. Time interval between cycles 30 seconds. At the end of the test there shall be no indication of damage which would interfere with mechanical or electrical performance requirements of the subsequent tests.

5.1.3 Temperature Rise Versus Current (see also TYCO#109-45-1)

Connector under test shall be withstand for 1 day of a pre-conditioning cycle, at 50% of relative humidity exposure. Than shall be withstand for 8 hours at the maximum current rate permitted, according to wire section as reported on Par. 3.4.1. Initial temperature $T = 23^{\circ}\text{C}$. Test shall be considered passed if, within the 8 hours time line, thermal stability will be achieved and if temperature rise value will be according to following table:

Wire Section (mm ²)	Max. T Rise
0.5	$\leq 20^{\circ}\text{C}$
0.75	$\leq 20^{\circ}\text{C}$
1.0 (or 1.5)	$\leq 30^{\circ}\text{C}$

At the end of the test there shall be no indication of damage which would interfere with mechanical or electrical performance requirements of the subsequent tests.

5.1.4 Thermal Shock (see also TYCO#109-22)

Connectors under test shall be withstand for 1 cycle. First step is 2 hours at a room temperature of -25°C , second step is 168 hours at 105°C . At the end of the test there shall be no indication of cracking, breaking or other damage which would interfere with mechanical or electrical performance requirements of the subsequent tests.

5.1.5 Withstanding Voltage (see also TYCO#109-29-1)

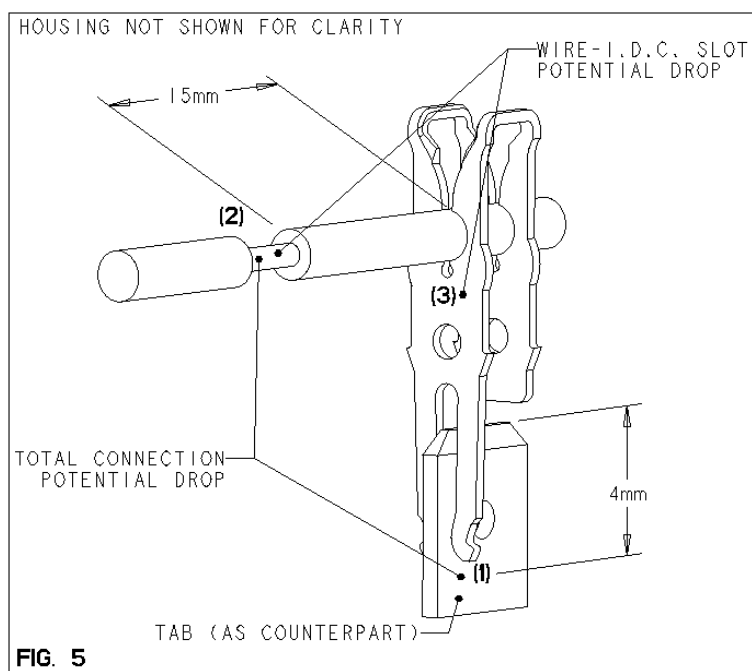
Connector under test shall be withstand for 4 minute at a Voltage rate of 1750V. Test shall be considered passed if, within the 4 minute time line, there will be no discharge. At the end of the test there shall be no indication of damage which would interfere with mechanical or electrical performance requirements of the subsequent tests.

5.2 Section B - Tests on the total connection (Wire + I.D.C. contact + TAB).

This section is focused on testing the performance of the total connection.

5.2.1 Contact Resistance At Specified Current (see also TYCO#109-25)

Conformance of the product shall be measured as shown on following Fig.5. The potential drop shall be measured between points (1) - (2) (total connection evaluation) the applicable test Current is according to wire section as reported on Par. 3.4.1. After mechanical, electrical-environmental tests sequences (if a contact resistance check is requested), the difference between Initial and Final values must be $\leq 5\text{m}\Omega$.



5.2.2 Current Cycling at High temperature (105°C). (see also TYCO#109-51)

Connectors under test shall be subjected to 500 cycles. Contacts shall be wired in series at a current rate according to wire section as reported on Par. 3.4.1. Each cycle consist of: 45 minute power on and 15 minute power off. Test must be performed in a climatic chamber, chamber initial temperature shall be arranged if needed in order to have a room temperature of 105°C max when the power is on. This temperature must be reached within 20 minute from the beginning of each cycle and maintained for the remaining portion of 45 minute, than the current must be switched off for 15 minutes; this is a complete cycle. At the end of the test there shall be no indication of cracking, breaking or other damage which would interfere with mechanical or electrical performance requirements of the subsequent tests.

5.2.3 Salt Spray Corrosion (see also TYCO#109-24)

Connectors under test shall be subjected for 96 hours to a controlled salt atmosphere, salt solution concentration 5%(NaCl) , Operating condition: Temperature 35°C±2. At the end of the test there shall be no indication of cracking, breaking or other damage which would interfere with mechanical or electrical performance requirements of the subsequent tests.

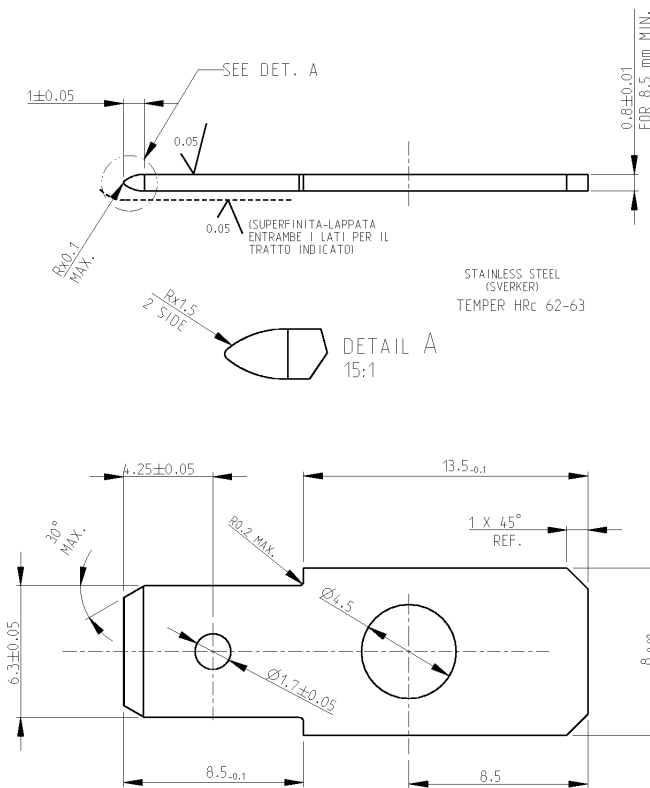
5.3 Section C - Mechanical Tests on the connector.

This section is focused on testing the mechanical performance of the connector. No electrical check are requested in this section.

5.3.1 Contact Insertion / Withdrawal force. IEC 60512-7 PAR. TEST 13b

The Insertion/ withdrawal force shall be verified using a polished flat steel gage, properly shaped as per sketch on Pag. 10 of 12. Rate value for insertion $V= 25.4 \text{ mm / minute}$. Value to be verified must be according to attached table: (Value reported are in Newton)

Dettaglio delle tipologie di cavità	MAX. forza di inserzione (1^in)	MIN. forza di estrazione (1^out)	MIN. forza di estrazione (VI^out)
A – value for way n°1 for 2,3,4 position TAB connectors having a retention feature inside the relevant cavity	40N	25N	3N
B – Value for all the other ways not included in the previous point.	10N	1,5N	1,5N



5.4 Test on Plastic material Compounds

5.4.1 Glow Wire Resistance (IEC 60335-1 vedi anche IEC 60695-2-1/1)

- Glow-wire flammability test method for end-products

Connectors are produced using plastic compound according to IEC 60335-1 edition 4 requirements, test on product/connectors are performed according the indication of this norm. The Annex O of the norm is describing the flow chart of the test performed.

Test parameter are defined based on material type and Current rating.

5.4.2 Current Tracking Index (see IEC 60112 test A)

- Method for the determination of the proof and the comparative tracking indices of solid insulating materials

Plastic Material used to mould Connectors must be tested to be in according to IEC rules, using relevant test procedure.

Test passed if Samples shall withstand at a CTI value of 250V min.

5.5.3 Ball Pressure Test (EN 60998 - 1 test n° 16.3)

- Fire hazard testing - Abnormal heat - Ball pressure test

Wires terminated Connectors must be tested to be in according to IEC rules, using relevant test procedure.

Test at 125°C temperature for 1 hour, passed if ball imprint diameter < 2 mm

6. QUALIFICATION AND/OR PERIODIC TESTS, TABLE FOR GROUPS AND SEQUENCE.

TEST DESCRIPTION	TEST PARAGRAPH	TEST GROUP AND SEQUENCE							
		I	II	III	IV	V	VI	VII	VIII
Contact Resistance	5.1.1	1,3	1,3	1,3					
Durability Cycles	5.1.2	2							
Temp. Rise Vs Current	5.1.3		2						
Thermal Shock	5.1.4			2					
Withstanding Voltage	5.1.5			4					
Contact Resistance	5.2.1				1,3,5				
Current Cycling	5.2.2				2				
Salt Spray Corrosion	5.2.3				4				
Mating/ Unmating Force	5.3.1					1			
Glow Wire	5.4.1						1		
Tracking Index	5.4.2							1	
Ball Pressure	5.4.3								1

Notes: Groups from I to III are relevant to samples to be tested according Section A of this specification
 Groups IV is relevant to samples to be tested according Section B of this specification
 Groups V is relevant to samples to be tested according Section C of this specification
 Groups from VI to VIII are to evaluate plastic material performances.

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