



Draft of IEC 60512-99-002

Catania - October 2015

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History

- › Damages caused by unmating of RJ-45 connectors with PoE load attached already discussed and reported (e.g. IEC 62652 TR Ed.1 (15Watt))
Conclusion:
Damages outside nominal contact area
- › Test Standard IEC 60512-99-001 / connector reliability based on IEEE 802.3at applications
- › Liaison related to current unbalance questions results in a new work item (IEC 60512-99-002/Ed1) to support higher currents up to maximum power acc. 802.3bt.

Contact areas

- › Damages in discharge area (disconnect area)
- › Nominal contact area may not be affected
- › RJ-45 plug more critical than RJ-45 jack
- › Could limit the use of non-RJ45 connectors (industrial circular connectors) for PoE



IEC 60512-99-002: Test Current

- › **Max. 1 A assumed as worst case**
- › **Discussion (48B/WG5 23.9.2015 Prague):
Worst case in 4-pair systems → 2 A?**
(If no independent power sources for the pairs)

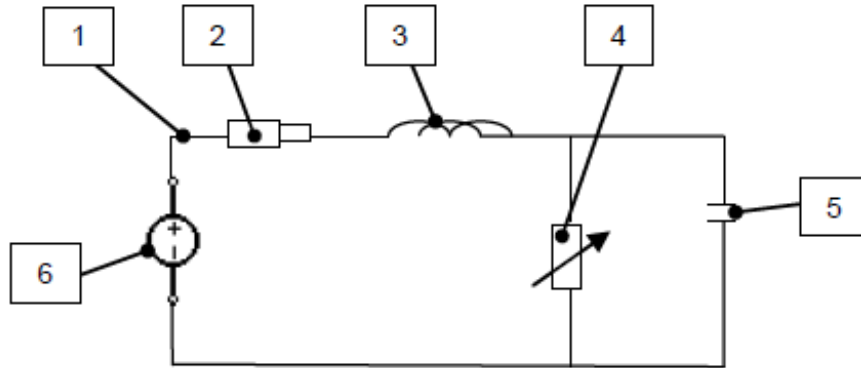
5.2 Voltage and current

The variable resistor(s) shall be set so that the electrical current in each circuit (mated contacts) of the specimen is 1,0 A. When specimen is unmated, the 'open circuit' voltage, in all circuits, shall be 55 V dc. See Annex A.

IEEE 802.3 bt specifies a maximum current of 0,5 A per conductor and an open circuit voltage of 55 V dc. The test current has been doubled to 1,0 A in order to represent the high probability that one contact of any given pair will separate before the other. Therefore, as in the cited application, the pairs form individual parallel circuits, the last to break will do so carrying all the current, (twice the nominal).

48B/2438/CD (60512-99-002) 5.2 Voltage and current

IEC 60512-99-002: Test Circuit



Key

1	Cables in accordance with 4.1
2	Connector under test
3	Inductor 100 μ H
4	Variable resistor (e.g. 50 to 300 Ω)
5	Capacitor 5 μ F
6	Voltage source

Significant higher damages reported with this test circuit compared with disconnect tests with real 4P-PoE circuit !

(PSE-PD Evaluation system with 90Watt /Type 4 (850mA /pair) 1m cable)

IEC 60512-99-002: Cycles

- › **Only few cycles expected:
Does this suit to future high power
PoE applications?**

60512-99-002/Ed1/CD © IEC (E)

3 General

A current and an open circuit voltage corresponding to the supported application are specified. Although many applications are configured such that the current is not drawn before full engagement of the connector has been achieved (i.e. the connector does not “make” the current), this test schedule is suitable for verification of engaging and separating of connectors under PoE Plus load conditions; **although it is misuse of the connector, it may occur in practice.**

An application specific current, and associated open circuit voltage, is specified that corresponds with the current and voltage of the supported application. It is recognized that not all connectors will see these currents and voltage, therefore this test schedule is regarded as an optional test, not normative for all connectors.

The circuitry and test conditions given in this standard correspond to the conditions associated with ISO/IEC 11801 Class D, or better, balanced cabling in support of IEEE 802.3at (PoE Plus – Power over Ethernet Plus).

An electrical load, current and open circuit voltage, as detailed in Clause 5, shall be applied to each specimen.

For the purpose of this test one connector shall be fixed and the other disengaged at a speed of

150 ± 10 mm/s.

One engagement and one separation constitutes one cycle.

25 cycles shall be performed.

The polarity of the dc source (direction of the electrical current) shall be reversed and **25 further cycles** performed.

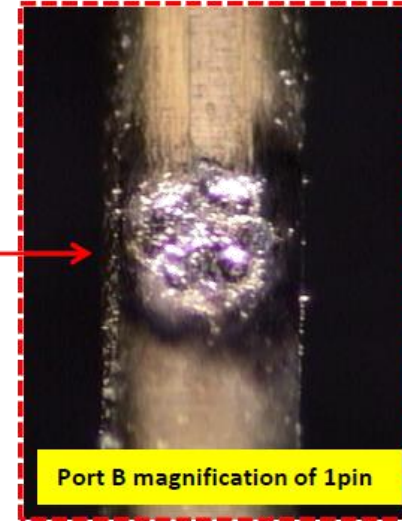
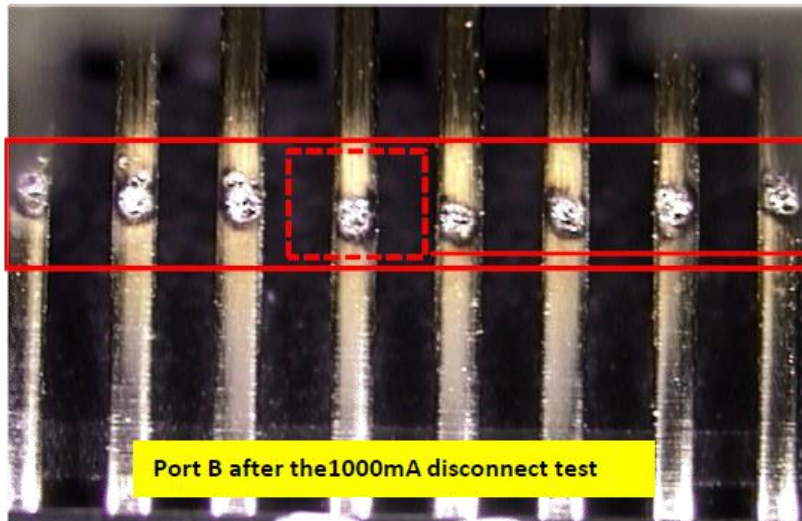
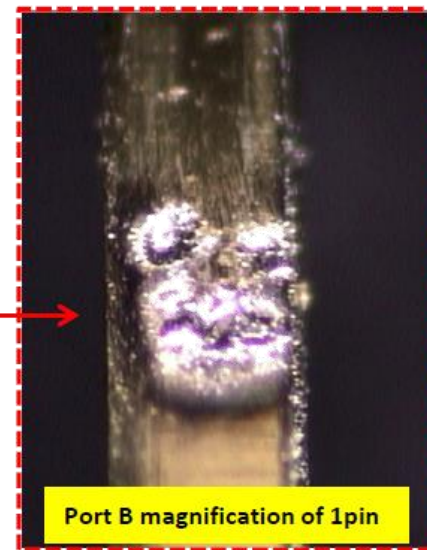
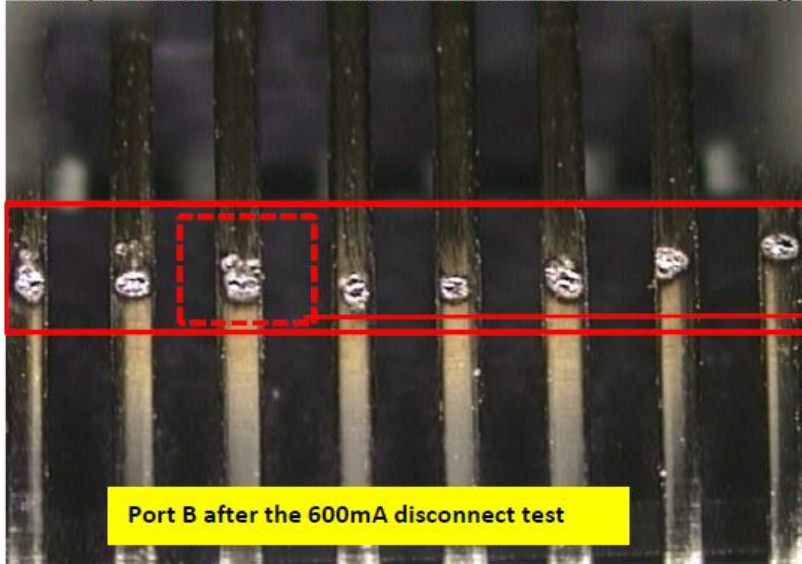
48B/2438/CD (60512-99-002)

3. General

6.1 Test Group 1 - UEL 1.5

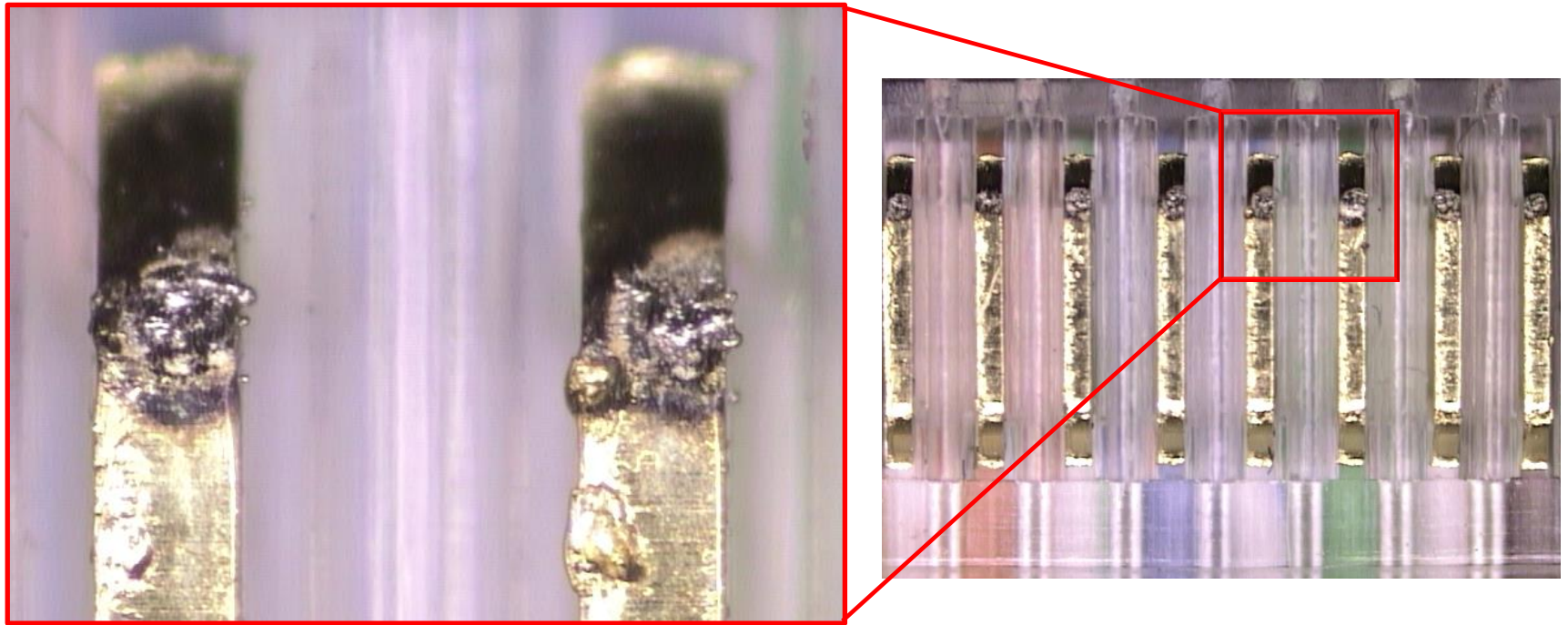
RJ-45 Jack / 600mA vs. 1A

RJ45 port contact condition after 600mA / 1000mA testing:



30 cycles / without aging

R-45 Plug 1A / 30 Cycles



Summary of results:

- › **Visual damages similar between 600mA and 1A (30 cycles / IEC test circuit only)**
 - › **Contact resistance not affected without aging* also after 750 cycles**
 - › **Resistance increase up to **114mΩ** reported after 750 cycles (1A) and aging* (no full FMG)!**
- **Unbalance calculations affected?**

* aging = 24h nitric acid