White Paper | etherCON 4 pair PoE 90W

Power over Ethernet PoE

IEEE 802.3bt Type 4

etherCON 4 pair PoE 90W
White Paper

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Contents

1.0 Scope

As demand grows for Power over Ethernet (PoE) for active loudspeakers, switches, network cameras, video monitors, and many other network applications, the RJ45 connector and associated cable must fulfil both data transfer and power transfer requirements. Additionally, the RJ45 receptacle connector must withstand a certain amount of connecting and disconnecting cycles under PoE loads even though this was not part of the original design specification. The advantage is that this combination saves investment in infrastructure and reduces complexity since it eliminates the need for a separate voltage supply cable system.

2.0 Relevant etherCON products

This etherCON 4 pair PoE 90W white paper addresses only to the following
NEUTRIK etherCON products:

NE8FBH-C5
NE8FBH-C5-LED-S
NE8FBH-C5-LED1-S
NE8FBH-C5-S
NE8FBH-C5-LED
NE8FBH-C5-LED1

NE8FAV-C5
NE8FAH-C5

NE8FBV-C5
NE8FBV-C5-S
NE8FBV-C5-LED-S

2.1 Relevant standards

For tests conducted by an independent external testing institute, the following standards were applied:

IEC 60512-5-2:2002
IEC 60512-99-001:2013-05
IEC 60512-99-002:2020-02
IEC 60603-7-1:2012-01
IEC 61076-3-110:2016
IEC 62946-01:2018/COR1:2020
IEEE P802.3bt/D1.5, 30th November 2015
Draft Standard for Ethernet Amendment: Physical Layer and Management Parameters for DTE Power via MDI over 4-pair, TIA TSB-184-A Draft 7.1

2.2 Initial measurements

First, the independent external testing institute performed a derating measurement to determine hot spots of the RJ45 receptacle connector and associated plug with the shield removed. These tests were performed using an infrared camera (Trotec® EC Serie 060 V). Neutrik decided to use the worst-critical sample NE8FBH-C5-LED-S for this investigation. Two samples—P01 and P02—were used for all subsequent measurements. In the later measurements, the testing institute placed thermocouples of type-T at these hot spots to measure the maximum temperature development during further measurements in which the RJ45's covering shield was reinserted. This provided an identical situation to the typical part application. The institute tested with 960 mA of current using a CAT6 network cable with AWG 23 from a name-brand supplier.

3.0 Derating measurements

The derating measurements were performed according to the standard IEC 60512-5-2:2003-01. The laboratory environment temperature was in the range of 20±5 °C. All measurements were performed in a closed polymer box with transparent cover plate about 0.4 meters horizontally apart from each other and 50 millimeters above the bottom surface of the measuring box. Additionally, the polymer box was equipped with type-T thermocouples to achieve the required temperatures inside the box during the derating test. At a constant current of 480 mA, a temperature increase of only 0.5 K was detected for the used RJ45 receptacle connectors compared to fresh, unused receptacle connectors. A further test with a constant current of 960 mA showed a temperature increase of 1.1 K in comparison to a new RJ45 receptacle connector.

3.1 Engaging and separating connectors under electrical load

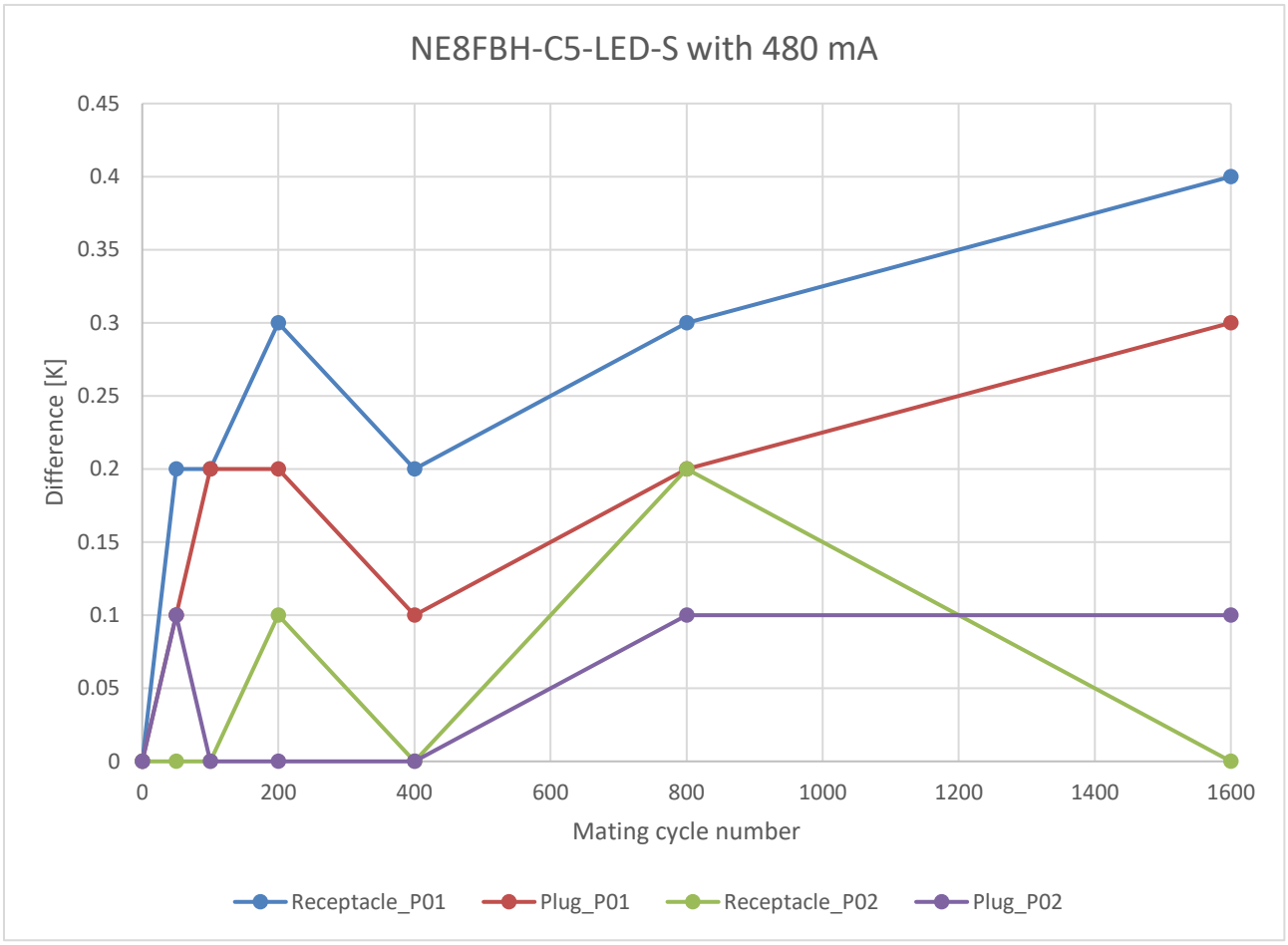
Both samples P01 and P02 were tested in engaging and separating cycles in the hot plug configuration under electrical load up to a maximum of 1,600 cycles. Neutrik specifies for the NE8FBH-C5 series a maximum of 1,000 engaging and separating cycles under electrical load. After half of the 1,600 cycles (i.e. 800 cycles), the P01 and P02 samples were measured with reversed polarity until the end of 1,600 cycles. During these engaging and separating connection cycles under electrical load, the tests were performed with 480 mA constant current and with 55.2 V DC voltage. Sample P01 showed a maximum temperature increase in the shielded receptacle of 4.2 K.
Next, these engaging and separating connection cycles were conducted under electrical load with higher, 960 mA constant current, still using 55.2 V DC voltage. In this test, the P01 sample connector experienced a maximum temperature increase in the shielded receptacle of 14.2 K. For all these tests, an insertion and release speed of 145 mm/s at 4 strokes per minute was used.

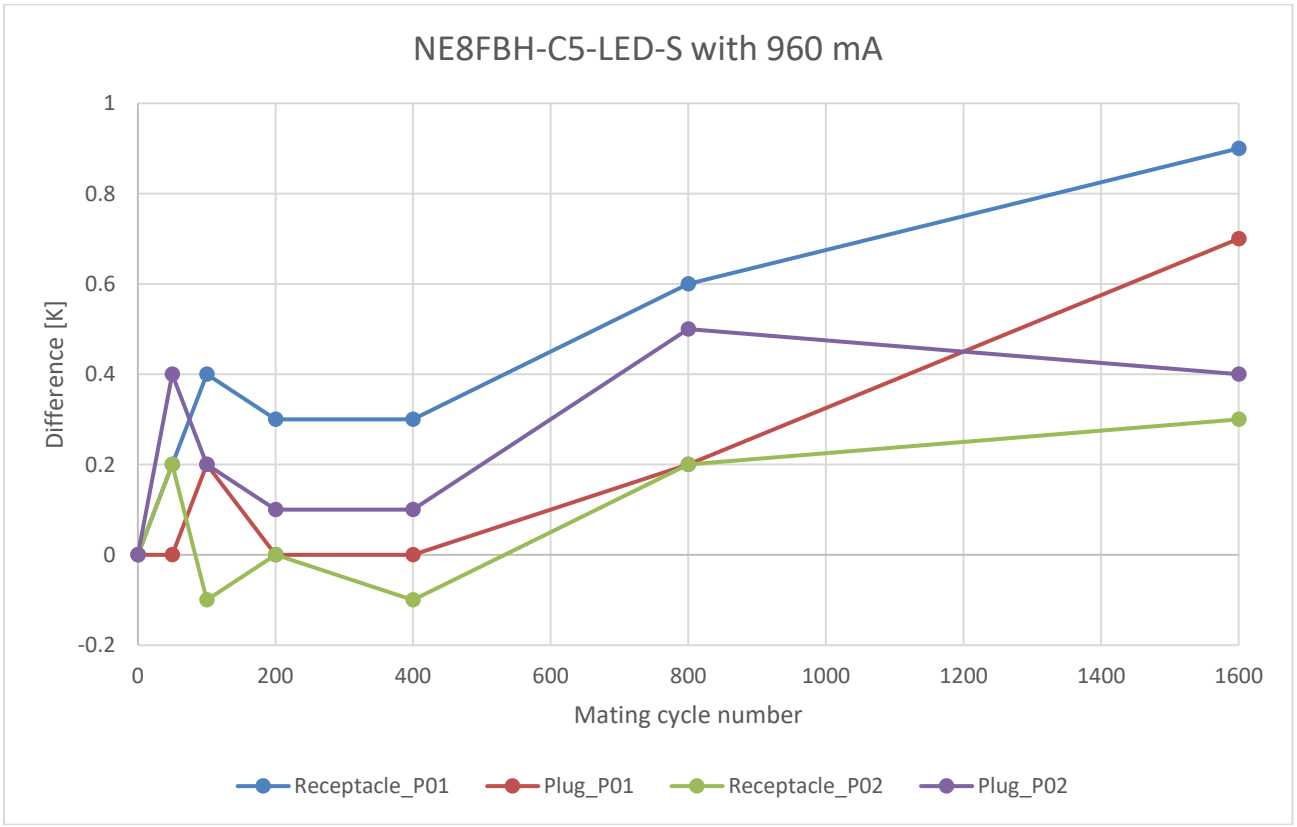
4 Conclusion

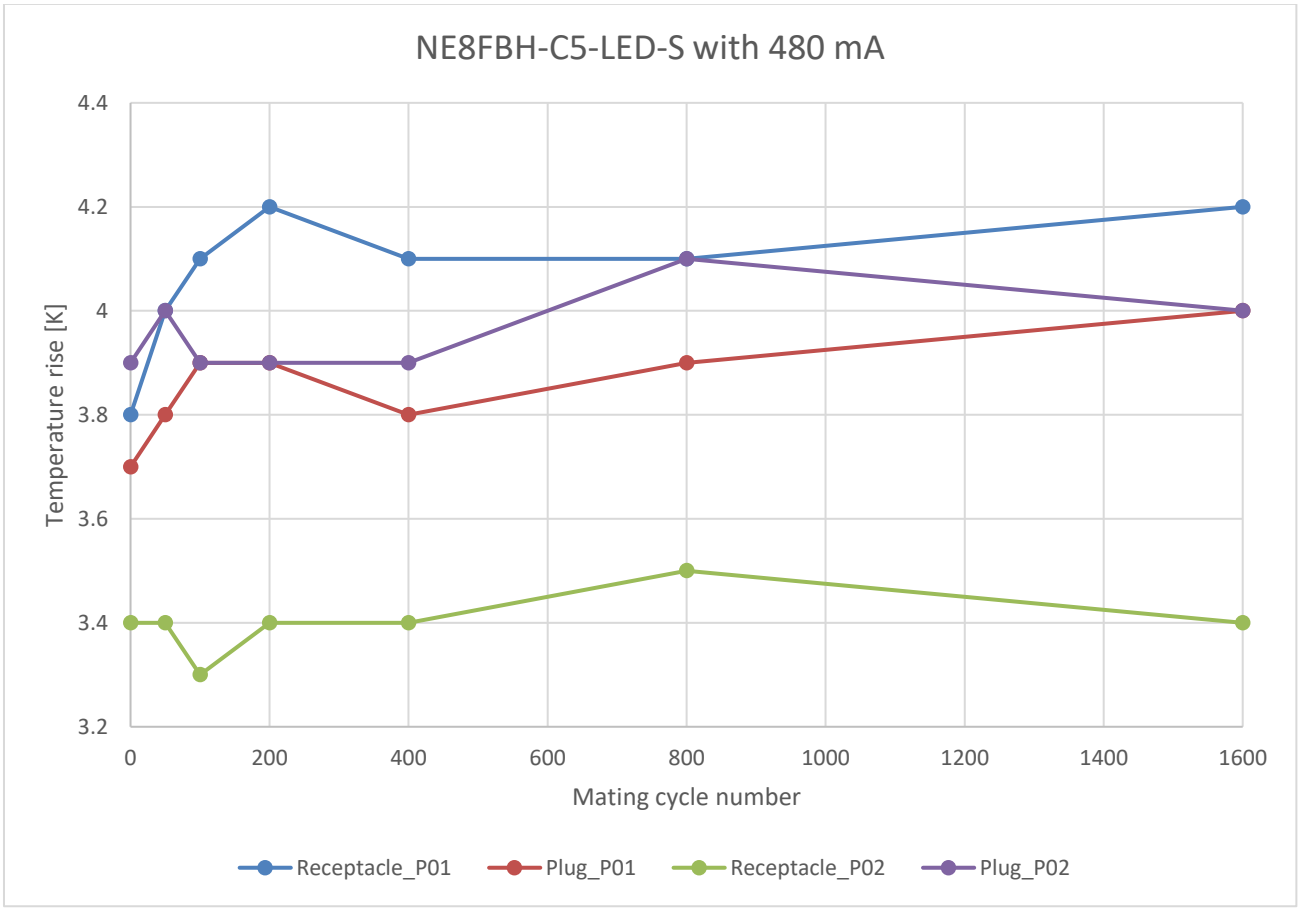
Our tests showed that our NE8FBV-C5, NE8FBH-C5, NE8FAV-C5 and NE8FAH-C5 series are applicable for PoE with 90W according to IEEE 802.3 bt/D1.5 from 30th November 2015 up to 1,000 mating and unmating cycles under electrical load. All products mentioned under paragraph 2.0 are PoE 90W capable under the limits of each individual specification data sheet.

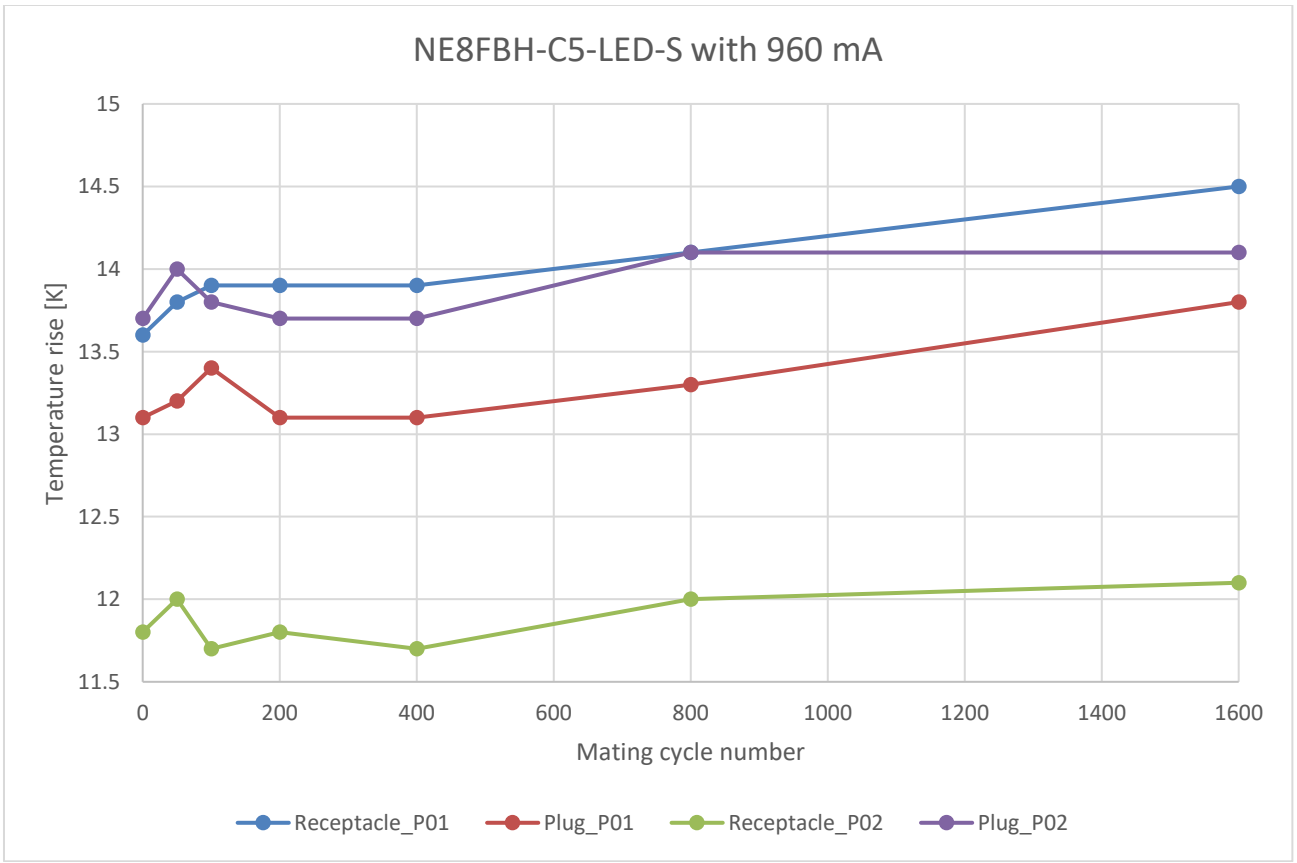
5 Reference

Independent Testing Institute Test Report P0983 from Wednesday, 10.th August 2022


NE8FBH-C5-LED-S with 480 mA
Difference [K]
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0
200
400
600
800
1000
1200
1400
1600
Mating cycle number
Receptacle_P01
Plug_P01
Receptacle_P02
Plug_P02


NE8FBH-C5-LED-S with 960 mA
Difference [K]
1
0.8
0.6
0.4
0.2
0
-0.2
0
200
400
600
800
1000
1200
1400
1600
Mating cycle number
Receptacle_P01
Plug_P01
Receptacle_P02
Plug_P02


NE8FBH-C5-LED-S with 480 mA
Temperature rise [K]
4.4
4.2
4
3.8
3.6
3.4
3.2
0
200
400
600
800
1000
1200
1400
1600
Mating cycle number
Receptacle_P01
Plug_P01
Receptacle_P02
Plug_P02


NE8FBH-C5-LED-S with 960 mA
Temperature rise [K]
15
14.5
14
13.5
13
12.5
12
11.5
0
200
400
600
800
1000
1200
1400
1600
Mating cycle number
Receptacle_P01
Plug_P01
Receptacle_P02
Plug_P02