1.0 Objective

This specification defines the performance, test, quality and reliability requirements of the BK100 Cable system.

2.0 Scope

This specification is applicable to the termination characteristics of the BK100 Cable system which provides a means of bringing high current from Bus bar to cable system.

3.0 Ratings

3.1 Operating Voltage Rating: 60V DC

3.2 Operating Current Rating: 2X8AWG Wires = 100 A, 1X6AWG Wire = 75A

3.3 Operating Temperature Range =-40 ~ 105 (^{o}C)[1]

Operating temperature is tested in accordance with EIA-364-17 Method A for 1008 hours at 105°C per EIA-364-1000 Table 8 to meet field temperature of 75°C for 10 years field life.

Note 1: includes the terminal temperature rise when powered

4.0 Applicable Documents

4.1 Specifications

4.1.1 Engineering drawing: 10142911, 10143222, 10143890

4.1.2 Application specification: GS-20-0535

4.2 Industry or Trade Association standards

4.2.1 Telcordia GR-1217

4.3 National or International Standards

4.3.1 Flammability: UL-94V-0

4.3.2 EIA 364: Electrical Connector/Socket Test Procedures Including Environmental Classifications

4.4 Laboratory Reports - Supporting Data

EL-2017-08-055

4.5 Safety Agency Approvals

4.4.1 CSA std. C22.2 No. 182.3-M1987

4.4.2 UL-1977: UL File NO. E66906

5.0 Requirements

5.1 Qualification

Connectors furnished under this specification shall be capable of meeting the qualification test requirements specified herein.

5.2 Material

The material for each component shall be as specified herein or equivalent.

Power Contacts – High Conductivity Copper alloy

Housing – Thermoplastic, UL 94V-0

5.3 Finish

The finish for applicable components shall be as specified herein or equivalent.

Contact area: AGT™ for power contacts

5.4 Design and Construction

Connectors shall be of the design, construction, and physical dimensions specified on the applicable product drawing. There shall be no cracks, burrs, or other physical defects that may impair performance.

5.5 Connectors Mating Part (Bus bar)

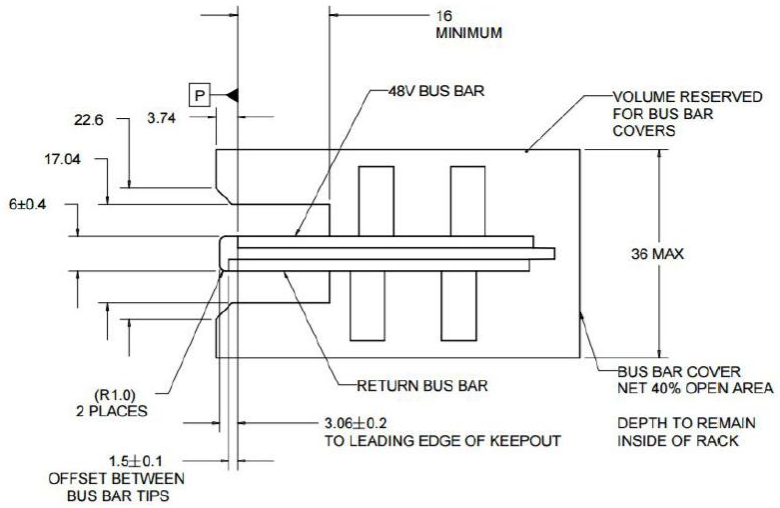
Recommended material: Copper, solid blade

Material Thickness: 6.0±0.40 mm

Surface roughness in contact area: Ra 1.6 µm maximum

Plating in contact area: 3 µm min Silver over 1.27 µm min Nickel

The Bus Bar dimensions as shown in below:



6.0 Electrical Characteristics

6.1 Contact Resistance, Low Level (LLCR)

6.1.1 The low level contact resistance shall not exceed 0.3 milliohms initially and after any treatment and/or environmental exposure. Measurements shall be in accordance with EIA 364-23.

The following details shall apply:

a. Test Voltage - 20 milli-volts DC max open circuit.

b. Test Current - Not to exceed 100 milli-amperes.

6.1.2 Power contacts tested at specified Current level depending on the wire used:
The contact resistance at a specified current shall not exceed 0.30 mΩ (milliohms) with silver plated Busbar initially and after test only applicable to Group 3 when measured in accordance with EIA 364-06.

6.2 Insulation Resistance

The insulation resistance of mated connectors shall not be less than 5000 Megohms initially and 1000 Megohms after environmental exposure. Measurements shall be in accordance with EIA 364-21.

The following details shall apply:

a. Test Voltage – 500 volts DC.

b. Electrification Time - 1 minutes, unless otherwise specified.

c. Points of Measurement - Between adjacent contacts.

6.3 Dielectric Withstanding Voltage

There shall be no evidence of arc-over, insulation breakdown when mated connectors are tested in accordance with EIA 364-20, Method B.

The following details shall apply:

a. Voltage application ramp rate: 500 V/sec.

b. Test Voltage - 1096 Volts DC.

c. Test Duration - 60 seconds.

d. Unless otherwise specified, the leakage current shall not exceed 1 mA

6.4 Current Rating

The temperature rise above ambient shall not exceed 30 deg C at any point in the system when all contacts are powered at specified amperes (refer to 3.2).

The following details shall apply:

a. Ambient Conditions – still air at lab room ambient.

b. Reference - EIA 364-70.

7.0 Mechanical Characteristics

7.1 Mating/Unmating Force

The force to mate a receptacle connector and compatible pin shall not exceed 55 Newtons. The unmating force shall not be less than 8 Newtons.

The following details shall apply:

a. Cross Head Speed – 25.4mm per minute.

b. Lubrication – No additional lubricant shall be added to production test samples.

c. Utilize free floating fixtures.

d. The Bus bar thickness is 6.00+/-0.40mm

e. Reference – EIA 364-13, Method A.

7.2 Welding contact tensile strength

a. EIA 364-13, Method A

b. Tensile strength: 390N Min for 1x6 AWG; 550N Min for 2x8 AWG;

7.3 Reseating

Manually un-mate/mate the interconnect system once.

a. Sample Size – Dependent upon current test group, refer to specific sample sizes in Table 1: note c.

b. Failure Criteria - No evidence of physical damage.

c. Requirement - Perform 1 cycle, no lubrication to be used during cycling.

7.4 Contact retention force

a. Axial loading of the cable 25.4mm per min.

b. Pull until contact features dislodge from housing.

c. Requirement - 50N Min when dislodge contact from housing.

8.0 Environmental Conditions

After exposure to the following environmental conditions in accordance with the specified test procedure and/or details, the product shall show no physical damage and shall meet the electrical and mechanical requirements per paragraphs 6.0 and 7.0 as specified in the Table 1 test sequences. Unless specified otherwise, assemblies shall be mated during exposure.

8.1 Thermal Shock – EIA 364-32 Method A, Test condition II.

a. Number of Cycles - 25

b. Temperature Range - Between -65℃ and +105℃

c. Time at Each Temperature - 30 minutes

d. Transfer Time - 5 minutes, maximum

8.2 Cyclic Temperature & Humidity – EIA 364-31, method IV, Duration B

a. Temperature and Relative Humidity - between 25ºC at 80% to 98% relative humidity, and 65ºC at 90% to 98% relative humidity, with step 7a cold shock.

b. Duration – 10 days

c. Omitting 7b vibration test

8.3 High Temperature Life – EIA 364-17, Method A, Test condition 4.

a. Test Temperature - 105± 2℃

b. Test Duration - 1008 hours

c. Pre-condition - Perform 20 cycles of durability for product

8.4 High Temperature Life(preconditioning)

a. Test Temperature - 105± 2℃

b. Test Duration - 75 hours

8.5 Mixed Flowing Gas corrosion (MFG) – EIA 364-65

a. Class - IIA

b. Duration - 14 days

c. ½ of samples mated for 336 hours, ½ of samples unmated for 168 hours, then mated for final 168 Hours.

d. After 7 days duration, test the LLCR. After 14 days duration, also test the LLCR.

8.6 Vibration (Random) – EIA 364-28

a. Test Condition - method V, letter C

b. Vibration Amplitude – 9.26 rms G

c. Duration – 2 hours along each of three orthogonal axes

d. Mounting - Rigidly mount assemblies

e. No discontinuities greater than 1 microseconds

8.7 Mechanical Shock – EIA 364-27

a. Condition - Test condition A (50G, 11 millisecond, half-sine pulse type)

b. Shocks - 3 shocks in both directions along each of three orthogonal axes (18 shocks total)

c. Mounting - Rigidly mount assemblies

d. No discontinuities greater than 1 microseconds.

8.8 Durability - EIA 364-09

a. Number Cycles - 50 cycles

b. Cycling Rate – 127mm per minute maximum

c. Use free floating fixtures

8.9 Durability (preconditioning) - EIA 364-09

a. Number Cycles - 20 cycles

b. Cycling Rate - 127mm per minute maximum

c. Use free floating fixtures

8.10 Dust - EIA 364-91

a. Dust Composition #1 (benign)

b. Duration: 1.0 hour

c. Unmated connector to be placed in the chamber

8.11 Disturb- Ref. GR-1217-CORE

Un-mate the fully seated connector from the Bus bar approximately 0.10mm (0.004 in) and reseat.

9.0 QUALITY ASSURANCE PROVISIONS

9.1 Equipment Calibration

All test equipment and inspection facilities used in the performance of any test shall be maintained in a calibration system in accordance with ANSI Z-540 and ISO 9000.

9.2 Inspection Conditions

Unless otherwise specified herein, all inspections shall be performed under the following ambient conditions:

a. Temperature: 25 +/- 5 deg C

b. Relative Humidity: 30% to 60%

c. Barometric Pressure: Local ambient

9.3 Sample Quantity and Description

The sample size and description is listed for each test in the appropriate section of this document.

9.4 Acceptance

9.4.1 Electrical and mechanical requirements placed on test samples as indicated in paragraphs 6.0 and 7.0 shall be established from test data using appropriate statistical techniques or shall otherwise be customer specified, and all samples tested in accordance with this product specification shall meet the stated requirements.

9.4.2 Failures attributed to equipment, test setup, or operator error shall not disqualify the product. If product failure occurs, corrective action shall be taken and samples resubmitted for qualification.

9.5 Qualification Testing

Qualification testing shall be performed on sample units produced with equipment and procedures normally used in production. The test sequences shall be as shown in the qualification test table. Data shall be provided with the samples noting production history: production lot codes for components and assemblies, components and assemblies produced to print revision, verification of plating composition and thickness, etc.

9.6 Re-Qualification Testing

If any of the following conditions occur, the responsible product engineer shall initiate requalification testing consisting of all applicable parts of the qualification test matrix.

a. A significant design change is made to the existing product which impacts the product form, fit or function. Examples of significant changes shall include, but not be limited to, changes in the plating material composition or thickness, contact force, contact surface geometry, insulator design, contact base material, or contact lubrication requirements.

b. A significant change is made to the manufacturing process which impacts the product form, fit or function.

c. A significant event occurs during production or end use requiring corrective action to be taken relative to the product design or manufacturing process.

9.7 Qualification Test Table

Test Sequence Table 1

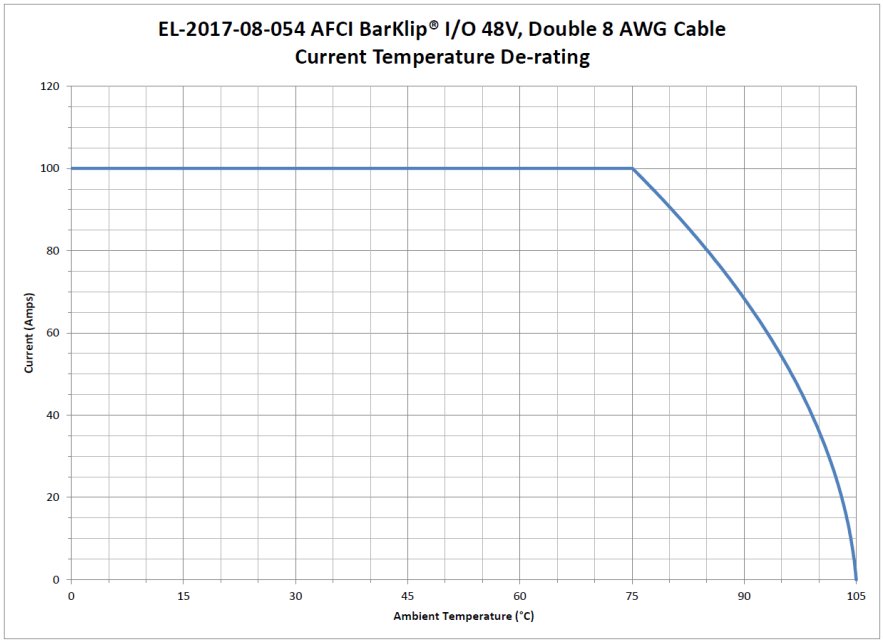
TEST GROUP ID:		1	2	3	4	5
TEST DESCRIPTION	**SECTION**	Temp Life	Thermal Shock & Humidity (Dielectric)	Vibration/Mech Shock/Current Rating	Mixed Flowing Gas (Mated/Un-Mated)	Contact Retention
VISUAL EXAMINATION	5.4	1,11	1,21	1,16	1,15	1,3
ELECTRICAL:						
CONTACT RESISTANCE AT SPECIFIED CURRENT	6.1	2,6,8,10	2,8,10,14,16,20	3,5,9,11,13,15	2,6,8,10,12,14	
INSULATION RESISTANCE	6.2		3,11,17			
DIELECTRIC WITHSTANDING VOLTAGE	6.3		4,12,18			
CURRENT RATING	6.4			2		
MECHANICAL:						
MATING / UNMATING FORCE	7.1	3,5	5,7	6,8	3,5	
WELDED CONTACT STRENGTH	7.2					4
RESEATING	7.3	9	19		13	
CONTACT RETENTION	7.4					2
ENVIRONMENTAL:						
THERMAL SHOCK	8.1		9			
CYCLICAL HUMIDITY & TEMP.	8.2		15			
TEMPERATURE LIFE	8.3	7				
TEMP LIFE PRECONDITON	8.4			4	7	
MIXED FLOWING GAS	8.5				9	
VIBRATION	8.6			12		
MECHANICAL SHOCK	8.7			14		
DURABILITY, 50 CYCLES	8.8			7		
DURABILITY, 20 CYCLES	8.9	4	6		4	
DUST CONT	8.10		13	10		
DISTURB	8.11				11	

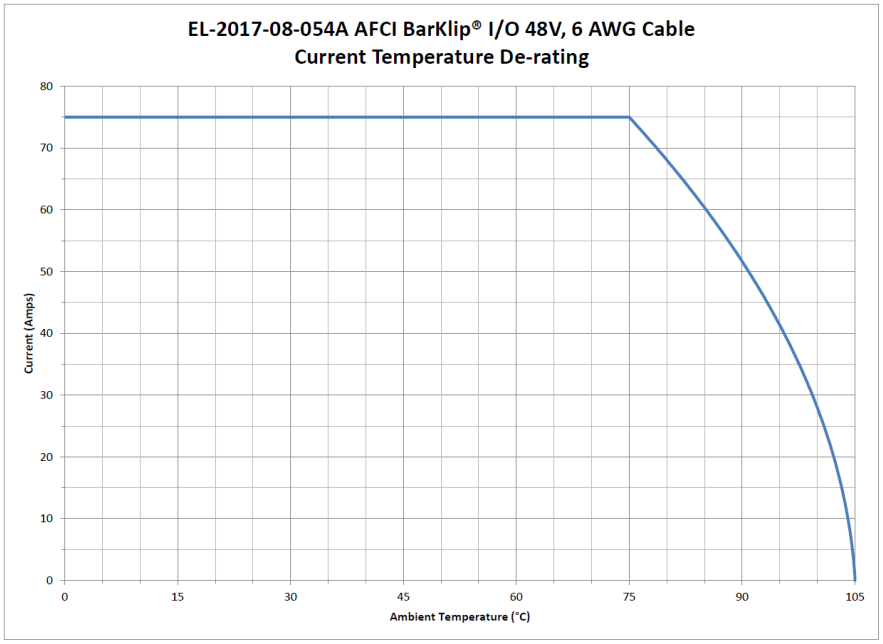
Notes:

a. Ultrasonic weld strength to be tested on virgin contact/cable components.
b. Test both options (1X6 AWG and 2X8 AWG)
c. Groups 1 thru 4 have 3 samples each and group 5 has 6 samples. Total = 18

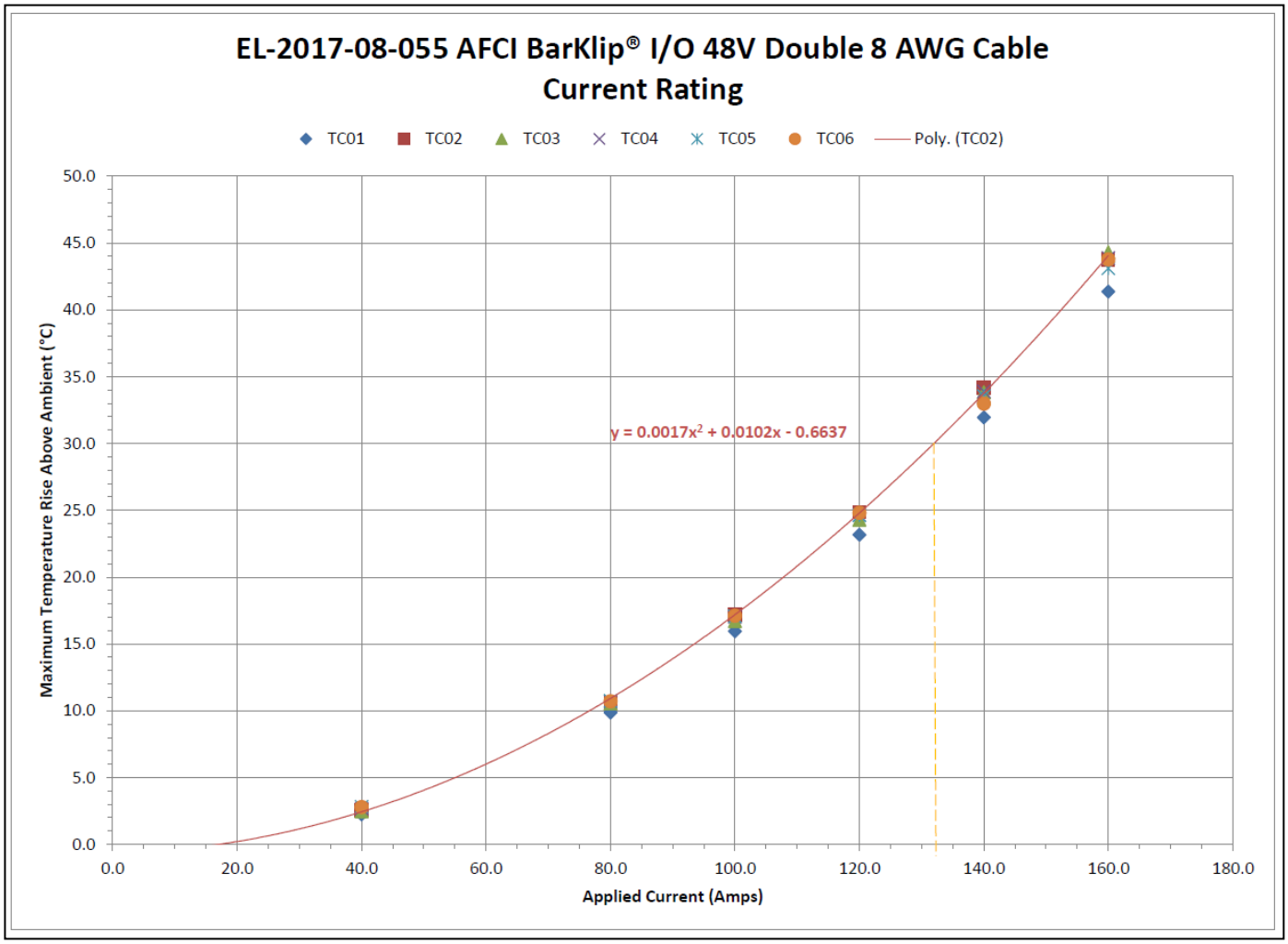
10.0 Appendix

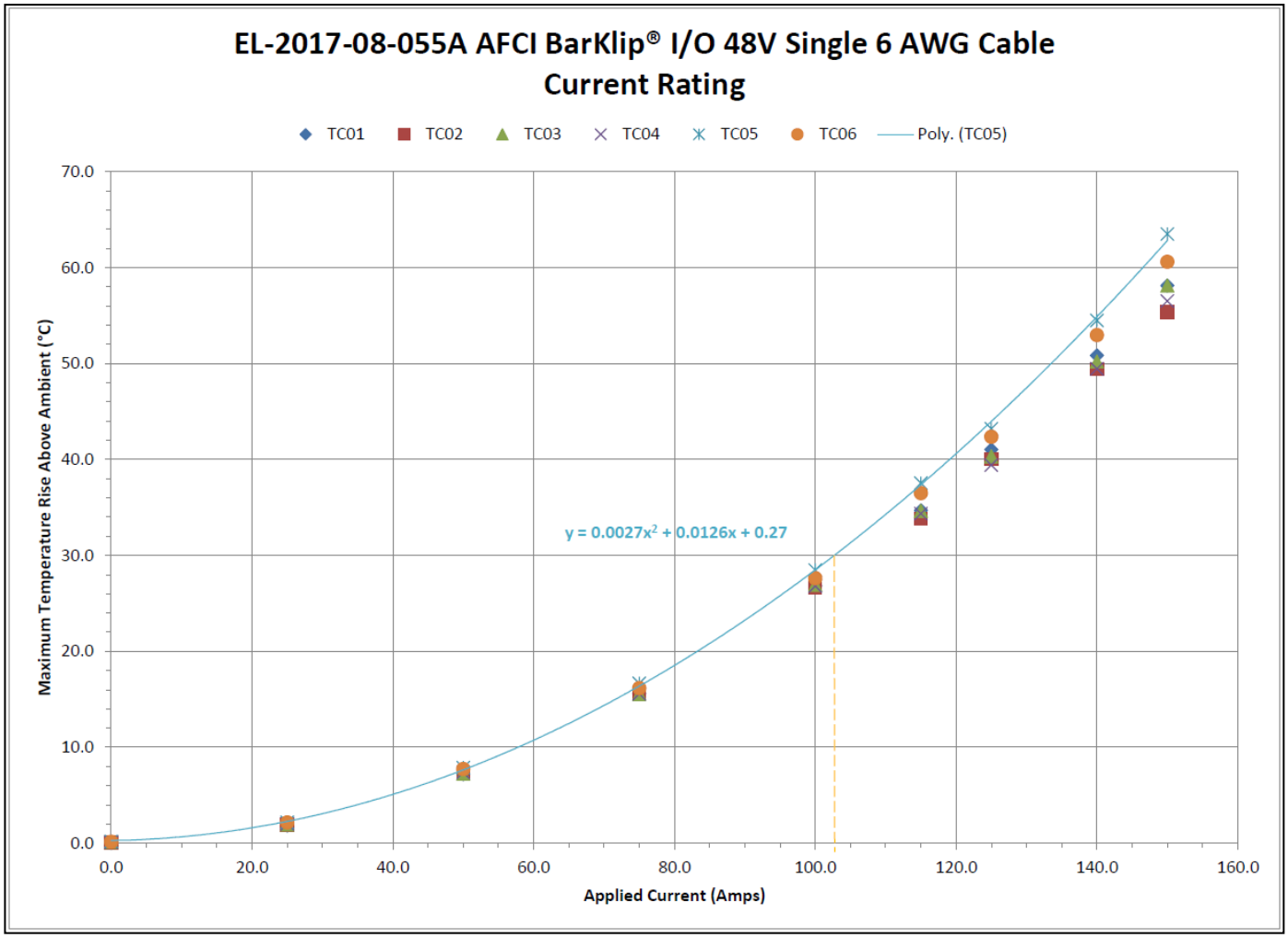
10.1 Current temperature de-rating curve:





10.2 Temperature rise vs. current curve:





Notes: Above rating is for reference only. Appropriate de-rating is required per ambient conditions, bus bar size to achieve thermal balance, gross heating from adjacent components, and other factors that influence connector performance.

REVISION RECORD

Rev	Page	Description	EC#	Date
A	All	Initial Release Rev A	NA	2018-01-02
B	3,4,10,11	Update Section 6,7,10 resistance Δ and mating/un-mating forces (Testing). Updated T-rise curves. Add UL file NO and Test #	ECN-ELX-V-30788	2018-07-26
C	1,4,5,6	Upgrade the operating voltage and update the test characteristic	ECN-ELX-DG-33725	2019-05-31