

# **BUS BAR CONNECTION SYSTEM**

"The product may not perform according to the product specification if precautions have not been taken in the application to provide mechanical stability of the connector in relation to its mating parts".

# 1 <u>SCOPE</u>

### 1.1 Content

This specification covers performance, test and quality requirements for a \*TE connectivity Bus bar connection system. The Bus bar system is designed to provide an easy configurable power supply for Electronic Modules inside a stationary equipment cabinet, for example to provide power to the Power Entry Modules (PEM) of an AdvancedTCA<sup>®</sup> Cabinet.

For application details and a description of the system architecture, please refer to application specification 144-19108.

This specification applies for the following components of the total system: Rapid locks, Covers, Bus bar, and Circuit Breaker Connector.

#### 1.2 Qualification

When tests are performed on subject product, procedures specified in this Product Specification shall be used. All inspections shall be performed using applicable inspection plan and product drawing.

### 2 APPLICABLE DOCUMENTS

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

#### 2.1 Tyco Documents

501-19115	Test report Bus bar connection system
108-3017	POSITIVE LOCK® Product Specification
108-20020	FASTIN-FASTON <sup>™</sup> Product Specification
ELCON 051660	Test report RAPID LOCK on bus bar
ELCON 981222	Test report swage pin into copper bus bar
114-19108	Application Specification Bus bar connection system

#### 2.2 Tyco Drawings

C- 1857561	Bus bar assembly
------------	------------------

- C- 1857147 Circuit Breaker Connector
- C- 1857316 PEM adapter kit
- C- 1820539 FASTON Cable assembly
- C- 1857547 RAPID LOCK R/A Socket 12 mm pin 95 mm2

DR. P. Jaeger	DATE 07 feb 2007	APVD : J. Broeksteeg	EC: First Release	DATE 09 Feb 2007
Tyco Electronics Nederland B.V. All international rights reserved Tyco Electronics	This information is confidential and propriety to Tyco Electronics and its worldwide subsidiaries and affiliate It may not be disclosed to anyone, other than Tyco Electronics personnel, without written authorization fr Tyco Electronics Competition Americana and the authorization for the approximate and the authorization for the authorization for the approximate and the approximate and the authorization for the approximate and the authorization for the authorization for the approximate and the approximate and the authorization for the approximate and the approximate and the approximate and the authorization for the approximate and the appr	This specification is change. Contact the the latest revision.	s a controlled document and subject to e Engineering Control Organization for	1 of 13
*Trademark R6-76 (Rev. 03-00)	ryoo zicoronioo corporation, manobarg, r onnoynan			LOC H



### 2.3 <u>Other Documents</u>

IEC 60950	Safety
EN 300 019-2-3	Stationary use Class 3.1
IEC 60512	Basic testing procedures and measuring methods for electromechanical
	components for electronic equipment.
IEC 60068	Basic environmental testing procedures.
IEC 61076	Connectors for Electronic Equipment (Level 3 connectors)
VDE 0470/1.61	Regeln für Prüfgeräte und Prüfverfahren

### 3 **REQUIREMENTS**

# 3.1 Design and Construction:

Products shall be of design, construction and physical dimensions as specified on the applicable customer and product drawing.

# 3.2 Material and Finish:

BU	S BAR	
	Conductors	Copper alloy, Nickel plated
	Pins	Copper alloy, Silver plated
	Nuts & washers	Stainless steel
	Extrusion	Polycarbonate, white, UL 94 V0
	Clips	PBT, red or blue, UL 94 V0
	Covers	PBT black UI 94 V0
	Flastomer	Neoprene
	Slidenuts	Stainless Steel
Circ	uit Breaker Connect	tor (CBC)
0	Main contact	Copper alloy, Gold plated
	Tobo	Proce Tip ploted
	Tabs	Brass, Tin plated
	Tab adaptors	Brass, Tin plated
	Housings	PC, black, UL 94 V0
	Nuts & Bolts	Steel, Zinc plated
	Bush	Brass
12 r	nm RAPID LOCKS	
	Socket body	Copper Alloy, silver plated
	Housing	PA 6/6, UL 94 V0
	Contacts	BeCu Copper Alloy, Silver plated
10 r	nm RING LUGS	
	Contacts	Copper Alloy, Tin over Nickel plated



# 3.3 Ratings:

- A. Voltage: 80 Volts
- B. Current: Current ratings per derating curves figure 2a 2c
- C. Operating temperature: -20℃ to 70℃
- D. Storage temperature: -20℃ to 55℃
- E. Durability: Breaker CBC 10 cycles POSITIVE LOCK – CBC 10 cycles RAPID LOCK – Bus bar 10 cycles CBC – Bus bar 30 cycles



#### Figure 2a. RAPID LOCK derating curve





Figure 2b. BUS BAR derating curve









Figure 2d. M10 Ring-Lug Temp rise vs Current (50mm<sup>2</sup> cable)







## 3.4 Performance and Test description

The product is designed to meet electrical, mechanical and environmental performance specified in this paragraph as tested per test sequence specified in para. 3.6.

Unless otherwise specified, all tests are performed at ambient environmental conditions per IEC specification 60068-1 clause 5.3. and are performed with connectors in mated condition.

	VISUAL							
Par.	Test Title	Performance / Severity Requirements	Procedure					
3.4.1	Examination of product	Meets applicable requirements specified on customer drawing, application specification and packaging specification.	Visual, dimensional and functional per applicable inspection plan. In acc. with IEC 60512-1-1 Magnification 10x					



	ELECTRICAL							
Par.	Test Title	Performance / Severity Requirements	Procedure					
3.4.2	MiliVolt drop CBC – Bus bar "See par.3.5.1"	400 mV Max. at testcurrent 30A Measuring points shall be as indicated in figure 3, ref. $V_1$	In acc. with IEC 60512-2-2					
3.4.3	Milivolt drop RAPID LOCK - Bus bar Milivolt drop RING LUG - Bus bar "See par. 3.5.1"	20 mV Max. at testcurrent 250 A Measuring points shall be as indicated in figure 3, ref. $V_2$	In acc. with IEC 60512-2-2					
3.4.4	Milivolt drop Bus bar system "See par. 3.5.1"	500 mV Max. at testcurrent 30 A Measuring points shall be as indicated in figure 3, ref. $V_3$	In acc. with IEC 60512-2-2					
3.4.5	Insulation resistance "See par. 3.5.1"	Test voltage 100V DC, mated. Duration: 1 minute. Measuring points shall be as indicated in figure 3, ref. V <sub>3</sub> , without shortening bar in CBC. <u>Requirement:</u> 10 M $\Omega$ min.	In acc. with IEC 60512-3-1					
3.4.6	Voltage proof "See par. 3.5.1"	Test voltage: 500 VAC, mated Duration 1 minute. Measuring points shall be as indicated in figure 3, ref. $V_{3}$ , without shortening bar in CBC. <u>Requirement:</u> no break- down or flash-over	In acc. with IEC 60512-4-1					
3.4.7	Current/temperature derating RAPID LOCK - Bus bar Current/temperature derating RING LUG - Bus bar	Curve will be added as figure in para 3.3 after testing.	In acc. with IEC 60512-5-2					
3.4.8	Current/temperature derating CBC - Busbar	Curve will be added as figure in para 3.3 after testing.	In acc. with IEC 60512-5-2					



	MECHANICAL							
Par.	Test Title	Performance / Severity Requirements	Procedure					
3.4.9	Breaker mating / unmating force	Mated and unmate breaker 10 cycles <u>Requirement</u> : mating force 80 N Max.	Force deflection curve IEC 60512-13-2					
3.4.10	CBC latch hold force	Pull CBC perpendicular from busbar without pressing the latch <u>Requirement</u> : Force to disengage is Min. 2 times breaker unmating force	Force deflection curve					
3.4.11	Mechanical operation CBC	Mate and unmate CBC with busbar Operation cycles: 30 Speed: 10 mm/s	In acc. with IEC 60512-9-1					
3.4.12	Mechanical operation Rapid Lock	Mate and unmate Rapid lock with busbar pin Operation cycles: 10 Speed: 10 mm/s	In acc. with IEC 60512-9-1					
3.4.13	CBC Main contact retention in housing "See par. 3.5.2"	30 N min retention-force per contact. Point of action see figure 4.	In acc. with IEC 60512-15-1					

	ENVIRONMENTAL						
Par.	Test Title	Procedure					
3.4.14	Rapid change of temperature	-25%85℃, 0,5 hrs / 0,5 hrs, 5 cycles (mated)	In acc. with IEC 60512-11-4				
3.4.15	Cold	Temperature -55℃ Duration 2 hrs <u>Requirement</u> : No functional damage	In acc. with IEC 60512-11-10				
3.4.16	Dry heat	Temperature: 85°C Duration: 16 hrs (mated)	In acc. with IEC 60512-11-9				
3.4.17	Damp/heat steady state	Temperature: 40°C. RH: 93%, Duration: 500 hrs. Requirement: No functional damage	In acc. with IEC 60512-11-3				
3.4.18	Corrosion industrial atmosphere	500 ppb SO <sup>2</sup> / 100 ppb H <sup>2</sup> S 4 days (unmated)	In acc. with IEC 60068-2-60, Ke				



### 3.5 Additional testing details

### 3.5.1 Set up for MiliVolt drop measurement / Voltage proof / Insulation resistance

Wire arrangement and measurements shall be as indicated in figure 3.



Figure 3

Positive lock shortening lead: 6mm2 wire, length 50 mm max. 95 mm2 wire: measuring points at 50 mm as indicated.

One  $V_3$  reference measurement to be done with CBC mated on bus bar on position 32, furthest from the rapid lock termination, to determine overall max. mV drop.

One  $V_4$  reference measurement to be done, to determine mV drop of one single CBC connection.



# 3.5.2 Set up for retention measurement CBC Main contact in housing

Force measurement set up shall be as indicated in figure 4.



Figure 4



# 3.6 <u>Product Qualification and Re-qualification Test Sequence</u>

	TEST-GROUP (a)						
Test or examination	1	2	3				
	TEST-SEQUENCE (b)						
Examination of product	1, 9	1, 8	1, 15				
MiliVolt drop CBC – Bus bar							
Milivolt drop RAPID LOCK	2, 7	2,7	2,8,10				
Milivolt drop Bus bar system			12				
Insulation resistance	3		3, 13				
Voltage proof	4		4, 14				
Current/Temp. derating curve rapid	5						
lock							
Current/Temp. derating curve CBC	6						
Breaker mating / unmating force		3					
CBC latch hold force		4					
Mechanical operation CBC		5					
Mechanical operation Rapid lock		6					
CBC Main contact retention in	8						
housing							
Rapid change of temperature			5				
Cold			6				
Dry heat			7				
Damp / heat steady state			9				
Corrosion Industrial atmosphere			11				

(a) See para. 4.1.A.

(b) Numbers indicate sequence in which tests are performed.

Sample description	Number of described samples in test groups						
	1	2	3				
Bus bar	5	5	5				
Circuit Breaker Connector	5	5	5				
RAPID LOCK	5	5	5				
RING LUG	See para. 3.7						



### 3.7 Product Qualification and Re-gualification Test Sequence (version with M10 ring lug)

	TEST-GROUP (a)						
Test or examination	4						
		TE	EST-S	EQUE	ENCE	(b)	
Examination of product	1, 8						
MilliVolt drop (Ring lug)	2, 4, 6						
Temperature rise vs current (Ring	7						
lug)							
Rapid change of temperature (Ring	3						
lug)							
Damp heat steady state (Ring lug)	5						

(a) See para. 4.1.A.

(b) Numbers indicate sequence in which tests are performed.

Sample description	Number of described samples in test groups						
	4						
Bus bar	4						
M10 Ring lug with 50 sq.mm cable	4						
M10 Ring lug with 95 sq.mm cable	4						

Test group 4 is added to this specification to qualify the performance of the connection between the M10 ring lugs and the bus bar.

Partnumbers of Ring Lugs:

- 710025-5 (XCT 50-10); Cable assembly 50mm<sup>2</sup> length 1,5m with ring lug on both ends.
- 709819-3 (XCT 95-10): Cable assembly 95mm<sup>2</sup> length 1,5m with ring lug on both ends.



### 4 QUALITY ASSURANCE PROVISIONS

### 4.1 **Qualification testing**

A. Sample selection

Samples shall be prepared in accordance with applicable instructions and shall be selected at random from current production.

#### B. Test sequence

Qualification inspection shall be verified by testing samples as specified in para. 3.6

#### 4.2 <u>Re-qualification testing</u>

If changes significantly affecting form, fit or function are made to product or manufacturing process, product assurance shall coordinate re-qualification testing, consisting of all or part of original testing sequence as determined by product, quality and reliability engineering.

#### 4.3 Acceptance

Acceptance is based upon verification that product meets requirements of para. 3.4. Failures attributed to equipment, test set-up, applied customer components or operator deficiencies shall not disqualify the product. When product failure occurs, corrective action shall be taken and samples resubmitted for requalification. Testing to confirm corrective action is required before re-submittal.

#### 4.4 **Quality conformance inspection**

Applicable Tyco quality inspection plan will specify sampling acceptable quality level to be used. Dimensional and functional requirements shall be in accordance with applicable product drawing and this specification.