



**FAKRA-Compliant Next Generation
Unsealed Inline Connector**

1. SCOPE

1.1. Contents

This specification covers performance, tests and quality requirements of TE FAKRA Next Generation unsealed inline connectors.

1.2. Qualification

When tests are performed on the subject product line, procedures specified in Sections 3.4 and 3.5 shall be used. All inspections shall be performed using the applicable inspection plan and product drawing.

1.3. Qualification Test Results

Successful qualification testing on the subject product line has not been completed. The Qualification Test Report number will be issued upon successful qualification testing.

2. APPLICABLE DOCUMENTS AND FORMS

The following documents and forms constitute a part of this specification to the extent specified herein. Unless otherwise indicated, the latest edition of the document applies.

2.1. TE Documents

- 114-32145: Application Specification
- 501-TBD: Qualification Test Report (TBD)

2.2. Industry Documents

- SAE/USCAR-2 Rev 6 Automotive testing specification
- SAE/USCAR-17 Rev 5 FAKRA testing specification

2.3. Reference Document

- [109-197](#) Test Specification (TE Test Specification vs EIA and IEC Test Methods)

3. REQUIREMENTS

3.1. Design and Construction

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

3.2. Ratings

Voltage	Current	Temperature
800 VAC	1 amp maximum	Connector: -40 to 125°C Max temp is cable dependent

3.3. Test Requirements and Procedures Summary

Unless otherwise specified, all tests shall be performed at ambient environmental conditions.

TEST DESCRIPTION	REQUIREMENT	PROCEDURE
Visual Inspection	Meets requirements of product drawing and Application Specification	SAE/USCAR-2 Rev 6, 5.1.8.3
Final examination of product	Meets visual requirements.	SAE/USCAR-2 Rev 6, 5.1.8.3
Crimp/Weld Integrity	Crimp heights meet application spec 114-32145 Rev A	SAE/USCAR-21 Rev 3
ELECTRICAL		
Contact Resistance	24mΩ maximum for signal contacts. 5mΩ initial maximum, 6mΩ maximum after environmental testing for ground contacts.	SAE/USCAR-17 Rev 5, 4.3.1.2
Circuit Continuity Monitoring	No loss of electrical continuity for > 1μs	SAE/USCAR-2 Rev 6, 5.1.9.3
Dielectric Withstanding Voltage	≥800VAC	SAE/USCAR-17 Rev 5, 4.3.2.2
Voltage Standing Wave Ratio (VSWR)	SWR ≤ 1.4 0 to 2 GHZ SWR ≤ 1.5 2 to 3 GHZ SWR ≤ 1.6 3 to 6 GHZ	SAE/USCAR-17 Rev 5, 4.4.2.2
Insertion Loss (IL)	IL ≤ 0.3 0 to 3 GHZ IL ≤ 0.45 3 to 6 GHZ	SAE/USCAR-17 Rev 5, 4.4.2.2
Insulation Resistance	>100MΩ	SAE/USCAR-17 Rev 5, 4.4.1.2
RF Leakage	Leakage ≤ 45 dB 0 to 3 GHZ Leakage ≤ 40 dB 3 to 6 GHZ	SAE/USCAR-17 Rev 5, 4.4.3.2
Capacitance	<6.0 pF for in-line connectors	SAE/USCAR-17 Rev 5, 4.4.4.2
MECHANICAL		
Terminal Bend Resistance (Center Contacts)	No tear or crack at 3N	SAE/USCAR-2 Rev 6, 5.2.2.3
Terminal to Connector Engage/Disengage	Engage without Retainer ≤ 30N Disengage without Retainer ≥ 45 N Disengage with Retainer ≥ 110 N Disengage w Retainer after conditioning ≥ 80 N Disengage w Retainer after vibration ≥ 70 N Disengage w Retainer after temp/humidity ≥ 70 N Disengage w Retainer after heat age ≥ 70 N	SAE/USCAR-2 Rev 6, 5.4.1
Connector to Connector Mating/Unmating	Mating Force ≤ 25 N (1 Position) Mating Force ≤ 45 N (2 Position) Connector Disengage with Lock ≥ 110 N Force to disengage lock ≥6N and ≤ 51N Unmating Force with Lock disengaged ≤ 75N	SAE/USCAR-2 Rev 6, 5.4.2
Mating with Wedge (Female, 2P Only) Mating with Wire Tie (Male, 2P Only)	Center conductor resistance <24mΩ Outer conductor resistance <5mΩ	SAE/USCAR-17 Rev 5, 4.2.2.2.3

Polarization Effectiveness	Force to achieve center contact continuity $\geq 80\text{N}$	SAE/USCAR-2 Rev 6, 5.4.4.3
Retainer Forces (Retainer = TPA)	Retainer Engage Force w Terminals: $15\text{N} \leq X \leq 60\text{N}$ Retainer Engage Force w/o Terminals: $\geq 15\text{N}$ Retainer Disengage Force: $15\text{N} \leq X \leq 60\text{N}$ Retainer removal force: $\geq 25\text{N}$	SAE/USCAR-2 Rev 6, 5.4.5.2.3
CPA Forces	CPA Locking Force Mated: $\leq 25\text{N}$ CPA Unlocking Force Mated: $10\text{N} \leq X \leq 30\text{N}$ CPA Closing Force Unmated: $\geq 80\text{N}$ CPA Removal Force: $\geq 60\text{N}$	SAE/USCAR-2 Rev 6, 5.4.5.2.3
Connector to Connector Audible Click	Information Only	SAE/USCAR-2 Rev 6, 4.4.7.3
Center Contact Retention	$\geq 10\text{N}$	SAE/USCAR-17 Rev 5, 4.2.5.3
Connector Drop Test	No physical damage	SAE/USCAR-2 Rev 6, 5.4.8.3
Cavity Damage	TPA must not seat with an applied 60N force	SAE/USCAR-2 Rev 6, 5.4.9
Connector Mounting Feature Mechanical Strength	Minimum force to break in direction F1 to F5 $> 50\text{N}$ Minimum force to break in direction F6 $> 110\text{N}$	SAE/USCAR-2 Rev 6, 5.4.11
Mechanical Pull	Force $\geq 110\text{N}$ Axial force, 5 second hold IL and VSWR, before and after. See Electrical section	SAE/USCAR-17 Rev 4, 4.2.1.2
Cable Resistance to Applied Torque	No discontinuities, see table 4.2.6.5 for pull out force	SAE/USCAR-17 Rev 5, 4.2.6.4
ENVIRONMENTAL		
Vibration/Mechanical Shock	No loss of electrical continuity VSWR/IL check before and after	SAE/USCAR-2 Rev 6, 5.4.6.3
Thermal Shock	No loss of electrical continuity VSWR/IL check before and after	SAE/USCAR-17 Rev 5, 4.5.1.4 Cycle from -40°C to Max, cable dependent
Temperature/Humidity Cycling	VSWR/IL check before and after	SAE/USCAR-2 Rev 6, 5.6.2.3 Cycle from -40°C to $+85^{\circ}\text{C}$
High Temperature Exposure	VSWR/IL check before and after	SAE/USCAR-2 Rev 6, 5.6.3.3 Max temperature is cable dependent

3.4. Product Qualification and Requalification Test Sequence – Mechanical

TEST OR EXAMINATION	Sequence ID (Per USCAR-17 rev 5)												
	A	B	G	H	IA	IB	J	Z	K	L	M	N	V
Initial examination of product/ Conditioning	1	1	1	1	1	1	1	1	1	1	1	1	1
Circuit Continuity Monitoring												3	
Voltage Standing Wave Ratio (VSWR)												2,4	
Insertion Loss (IL)												2,4	
Terminal Bend Resistance	2												
Terminal to Connector Engage (no TPA)		2a											
Terminal to Connector Disengage (no TPA)		2b											
Terminal to Connector Disengage (with TPA)		2c											
Terminal to Connector Disengage after Conditioning (with TPA)		2d											
Connector Engagement Force			2										
Connector Disengage with Lock Enabled			3a										
Force to Disengage Lock			3b										
Connector Disengage Force with Lock Disabled			3c										
Polarization Effectiveness				2									
Retainer Lock (Pre-lock to Lock)					2a								
Retainer Unlock (Lock to Pre-lock)					2b								
Retainer Removal (Pre-lock to Off)					2c								
CPA Locking Mated						2a							
CPA Unlocking Mated						2b							
CPA Locking Unmated						2c							
CPA Removal						2d							
Connector to Connector Audible Click							2						
Center Contact Retention								2					
Connector Drop Test									2				
Cavity Damage										2			
Connector Mounting Feature Mechanical Strength											2		
Mechanical Pull and Sideload												3	
Cable Resistance to Applied Torque													2
Final examination of product	3	3	4	3	3	3	3	3	3	3	3	5	3

Note: Numbers indicate sequence in which tests are performed.

3.5. Product Qualification and Requalification Test Sequence – Environmental

TEST OR EXAMINATION	Sequence ID (Per USCAR-17 rev 5)					
	O	P	Q	R	S	U
Initial examination of product/ Conditioning	1	1	1	1	1	1
Contact Resistance	2,4		2,4	2,4	2,4	
Circuit Continuity Monitoring	3		3			
Dielectric Withstanding Voltage	5		5	5	5	
Voltage Standing Wave Ratio (VSWR)	2,4		2,4	2,4	2,4	
Insertion Loss (IL)	2,4		2,4	2,4	2,4	
Vibration/Mechanical Shock	3					
RF Leakage		2				
Thermal Shock			3			
Temperature/Humidity Cycling				3		
High Temperature Exposure					3	
Capacitance						2
Terminal to Connector Disengage (with TPA)	6			6		
Final examination of product	7	3	6	7	6	3

Note: Numbers indicate sequence in which tests are performed.