molex

Space-Grade Interconnects

Part Number Modification Guidelines

Use this guide to better understand NASA requirements for selecting, screening, qualifying and de-rating interconnects.

AirBorn M Series

Micro-D Connectors with Spaceflight Heritage

Molex Airborn M Series Micro-D Connectors are designed for mission-critical applications where high-density and high-reliability are necessities, such as in applications destined for the vastness of space.

To obtain parts with screenings or qualifications for Level 1, Level 2 or Level 3, add the following suffixes to the end of the M Series catalog part number:

-E1S = Level 1 screening -E1Q = Level 1 qualification (includes Level 1 screening)

-E2S = Level 2 screening -E2Q = Level 2 qualification (includes Level 2 screening)

-E3S = Level 3 screening **-E3Q = Level 3 qualification (includes Level 3 screening)**

See the tables on subsequent pages for testing and code definitions.

Space-rated part number build-up examples:

- Ordering a part with Level 1 screening: MK-252-037-325-220S-E1S
- Ordering a part with Level 1 qualification: MK-252-037-325-220S-E1Q
- Part number identification (including the modification code) will be marked on the part and/or the packaging

For more information, please view the documents below on molex.com:

- EEE-INST-002: Instructions for EEE parts selection, screening, qualification and de-rating
- MIL-DTL-83513: Connectors, electrical, rectangular, microminiature, polarized shell and general specifications

Table 1: Screening Requirements for Airborn M Series Micro-D Connectors

Inspection/Test	Test Methods, Conditions and Requirements	Quantity (Acceptable No. of Failures)		
		Level 1 (-E1S)	Level 2 (-E2S)	Level 3 (-E3S)
Visual	Insert/insulator body	100%	100%	100%
	Contact positioning			
	Shell/body			
	Threads			
	Adhesives/molding material			
	Leads			
Mechanical	Dimensions per catalog	2 (0)	2 (0)	
Dielectric withstanding voltage (sea level)	MIL-DTL-83513, paragraph 4.5.6.1, EIA-364-20	100%	2 (0)	
Insulation resistance	MIL-DTL-83513, paragraph 4.5.7, EIA-364-21	2 (0)	2 (0)	
Temperature cycling	MIL-DTL-83513, paragraph 4.5.10, EIA-364-32, test condition 1	2 (0)**	2 (0)**	
Low-signal-level contact resistance	MIL-DTL-83513, paragraph 4.5.21, EIA-364-23	2 (0)	2 (0)	
Mating and un-mating force	MIL-DTL-83513, paragraph 4.5.4	2 (0)		
Solderability and resistance to soldering heat	MIL-STD-202-208, MIL-DTL-83513	2 (0)**		
Processing for outgassing	ASTM E595 (125°C, 24 hours)	*	*	*

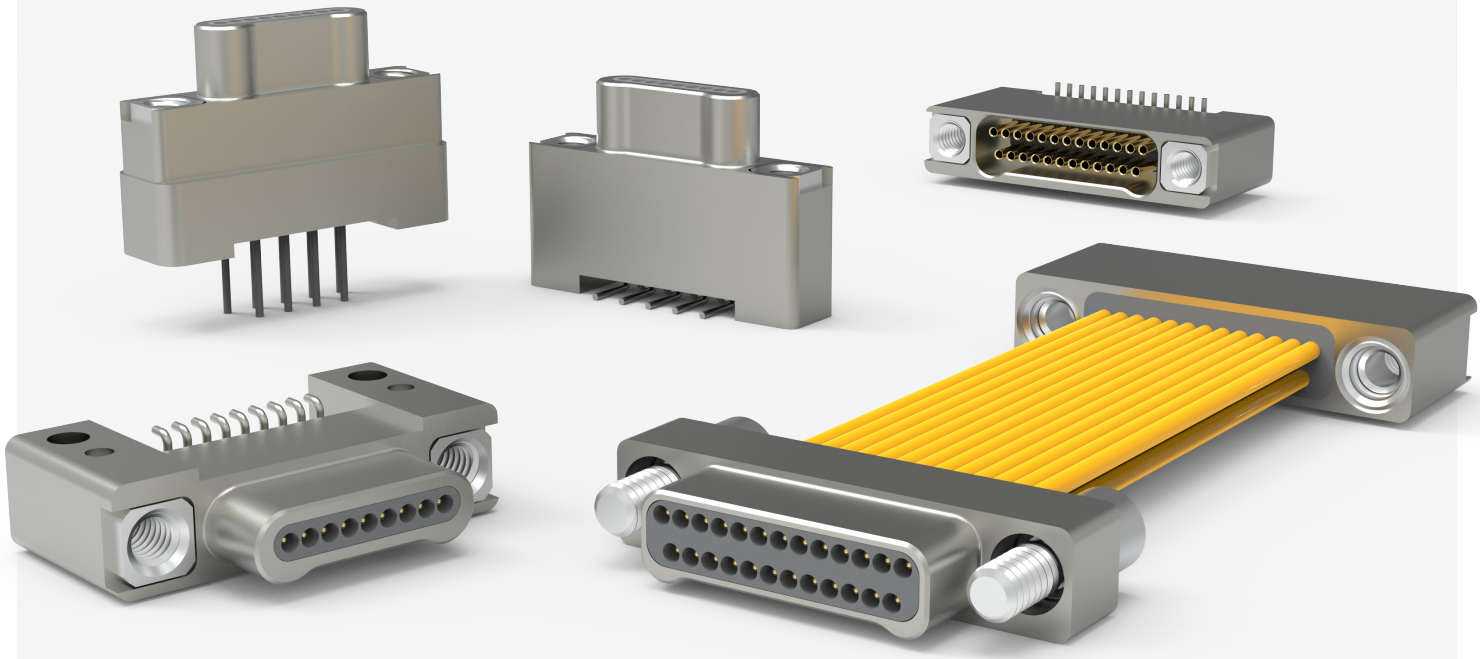
* Connectors within the scope of this document meet the outgassing requirements of M83513 and no additional baking is required.
** Destructive tests require additional samples which will be added to the order by Molex and identified.

Table 2: Qualification Requirements for AirBorn M Series Micro-D Connectors

Inspection/Test	Test Methods, Conditions and Requirements	Quantity (Acceptable No. of Failures)		
		Level 1 (-E1Q)	Level 2 (-E2Q)	Level 3 (-E3Q)
Visual (10X magnification)	Insert/insulator body	100%***	100%***	100%***
	Contact positioning			
	Shell/body			
	Threads			
	Adhesives/molding material			
	Leads			
Mechanical	Dimensions per catalog	3 (0)	2 (0)	
Dielectric withstanding voltage (sea level)	MIL-DTL-83513, paragraph 4.5.6.1, EIA-364-20	100%***	2 (0)	
Insulation resistance	MIL-DTL-83513, paragraph 4.5.7, EIA-364-21	3 (0)	2 (0)	
Temperature cycling	MIL-DTL-83513, paragraph 4.5.10, EIA-364-32, test condition 1	3 (0)**	2 (0)**	
Low-signal-level contact resistance	MIL-DTL-83513, paragraph 4.5.21, EIA-364-23	3 (0)	2 (0)	
Contact engagement and separation forces	MIL-DTL-83513, paragraph 4.5.9	3 (0)		
Contact retention/wire retention	MIL-DTL-83513, paragraph 4.5.5, EIA-364-29	3 (0)		
Solderability and resistance to soldering heat	MIL-STD-202-208, MIL-DTL-83513, EIA-364-56	3 (0)**	2 (0)**	
Mating and unmating force	MIL-DTL-83513, paragraph 4.5.4	3 (0)		
Shock	MIL-DTL-83513, paragraph 4.5.15, EIA-364-27	3 (0)**	2 (0)**	
Insert retention (metal shell types only)	MIL-DTL-83513, paragraph 4.5.19	3 (0)		
Vibration	MIL-DTL-83513, paragraph 4.5.14, EIA-364-28	3 (0)**		
Evaluation of material outgassing properties	ASTM E595 (125°C, 24 hours)	*	*	

*Connectors within the scope of this document meet the outgassing requirements of M83513 and no additional baking is required.
**Destructive tests require additional samples which will be identified and added to the order by Molex.
***Qualification includes screening. Performing screening with qualification potentially eliminates duplication of samples and testing. Visual becomes 100%.

AirBorn N Series



Nano-D Connectors with Spaceflight Heritage

Molex AirBorn N Series Nano-D Connectors are designed for mission-critical applications where high-density and high-reliability are necessities, such as in applications destined for the vastness of space.

To obtain parts with screenings or qualifications for Level 1, Level 2 or Level 3, add the following suffixes to the end of the N Series catalog part number:

-E1S = Level 1 screening -E1Q = Level 1 qualification (includes Level 1 screening)
-E2S = Level 2 screening -E2Q = Level 2 qualification (includes Level 2 screening)
-E3S = Level 3 screening -E3Q = Level 3 qualification (includes Level 3 screening)

See the tables on subsequent pages for testing and code definitions.

Space-rated part number build-up examples:

- Ordering a part with Level 1 screening: NM-222-051-261-THAA-E1S
- Ordering a part with Level 1 qualification: NM-222-051-261-THAA-E1Q
- Part number identification (including the modification code) will be marked on the part and/or the packaging

For more information, please view the document below on molex.com:

- EEE-INST-002: Instructions for EEE parts selection, screening, qualification and de-rating

Table 3: Screening Requirements for AirBorn N Series Nano-D Connectors

Inspection/Test	Test Methods, Conditions and Requirements	Quantity (Acceptable No. of Failures)		
		Level 1 (-E1S)	Level 2 (-E2S)	Level 3 (-E3S)
Visual	Insert/insulator body	100%	100%	100%
	Contact positioning			
	Shell/body			
	Threads			
	Adhesives/molding material			
	Leads			
Mechanical	Dimensions per catalog	2 (0)	2 (0)	
Dielectric withstanding voltage (sea level)	MIL-DTL-32139, paragraph 4.7.8.1, EIA-364-20, test condition 1	100%	2 (0)	
Insulation resistance	MIL-DTL-32139, paragraph 4.7.7, EIA-364-21	2 (0)	2 (0)	
Temperature cycling	MIL-DTL-32139, paragraph 4.7.13, EIA-364-32, test condition 1	2 (0)**		
Low-signal-level contact resistance	MIL-DTL-32139, paragraph 4.7.16, EIA-364-23	2 (0)	2 (0)	
Mating and unmating force	MIL-DTL-32139, paragraph 3.7.3	2 (0)		
Solderability and resistance to soldering heat	MIL-STD-202-208, MIL-DTL-32139, EIA-364-56	2 (0)**		
Processing for outgassing	ASTM E595 (125°C, 24 hours)	*	*	*

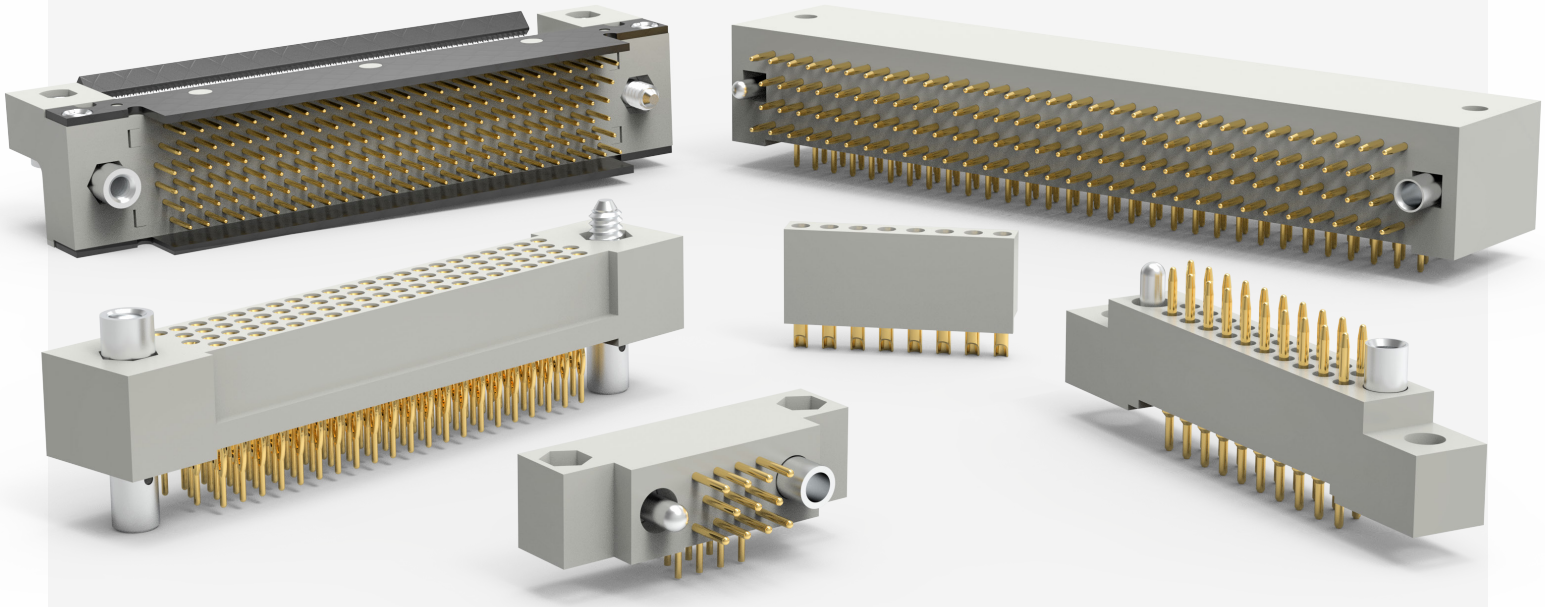
*Connectors within the scope of this document meet the outgassing requirements of M32139 and no additional baking is required.
**Destructive tests require additional samples which will be identified and added to the order by Molex.

Table 4: Qualification Requirements for AirBorn N Series Nano-D Connectors

Inspection/Test	Test Methods, Conditions and Requirements	Quantity (Acceptable No. of Failures)		
		Level 1 (-E1Q)	Level 2 (-E2Q)	Level 3 (-E3Q)
Visual (10X magnification)	Insert/insulator body	100%***	100%***	100%***
	Contact positioning			
	Shell/body			
	Threads			
	Adhesives/molding material			
	Leads			
Mechanical	Dimensions per catalog	3 (0)	2 (0)	
Dielectric withstanding voltage (sea level)	MIL-DTL-32139, paragraph 4.7.8.1, EIA-364-20, test condition 1	100%***	2 (0)	
Insulation resistance	MIL-DTL-32139, paragraph 4.7.7, EIA-364-21	3 (0)	2 (0)	
Temperature cycling	MIL-DTL-32139, paragraph 4.7.13, EIA-364-32, test condition 1	3 (0)**	2 (0)**	
Low-signal-level contact resistance	MIL-DTL-32139, paragraph 4.7.16, EIA-364-23	3 (0)	2 (0)	
Contact engagement and separation forces	MIL-DTL-32139, paragraph 4.7.5	3 (0)		
Contact retention/wire retention	MIL-DTL-32139, paragraph 4.7.18, EIA-364-29	3 (0)		
Solderability and resistance to soldering heat	MIL-STD-202-208, MIL-DTL-32139, EIA-364-56	3 (0)**		
Mating and unmating force	MIL-DTL-32139, paragraph 3.7.3	3 (0)		
Shock	MIL-DTL-32139, paragraph 4.7.11, EIA-364-27	3 (0)**	2 (0)**	
Vibration	MIL-DTL-32139, paragraph 4.7.10, EIA-364-28	3 (0)**		
Evaluation of material outgassing properties	ASTM E595 (125°C, 24 hours)	*	*	

*Connectors within the scope of this document meet the outgassing requirements of M32139 and no additional baking is required.
**Destructive tests require additional samples which will be identified and added to the order by Molex.
***Qualification includes screening. Performing screening with qualification potentially eliminates duplication of samples and testing. Visual becomes 100%.

AirBorn W Series/R Series



MIL-DTL-55302-Qualified Rectangular Connectors with Spaceflight Heritage

Molex AirBorn W Series and Molex AirBorn R Series both contain MIL-DTL-55302-Qualified Rectangular Connectors that are robust and operate with integrity, even in the most extreme environments.

To obtain parts with screenings or qualifications for Level 1, Level 2 or Level 3, add the following suffixes to the end of the W Series or R Series catalog part number:

-E1S = Level 1 screening -E1Q = Level 1 qualification (includes Level 1 screening)

-E2S = Level 2 screening -E2Q = Level 2 qualification (includes Level 2 screening)

-E3S = Level 3 screening -E3Q = Level 3 qualification (includes Level 3 screening)

See the tables on subsequent pages for testing and code definitions.

Space-rated part number build-up examples:

- Ordering a part with Level 1 screening: WTB30PR9SY-E1S
- Ordering a part with Level 1 qualification: WTB30PR9SY-E1Q
- Part number identification (including the modification code) will be marked on the part and/or the packaging

For more information, please view the document below on molex.com:

- EEE-INST-002: Instructions for EEE parts selection, screening, qualification and de-rating

Table 5: Screening Requirements for AirBorn W Series and AirBorn R Series Connectors

Inspection/Test	Test Methods, Conditions and Requirements	Quantity (Acceptable No. of Failures)		
		Level 1 (-E1S)	Level 2 (-E2S)	Level 3 (-E3S)
Visual	Insert/insulator body	100%	100%	100%
	Contact positioning			
	Shell/body			
	Threads			
	Adhesives/molding material			
	Leads			
Mechanical	Dimensions per catalog	2 (0)	2 (0)	
Dielectric withstanding voltage (Sea level)	MIL-DTL-55302, paragraph 4.5.7.1, EIA-364-20, method A	2 (0)	2 (0)	
Insulation resistance	MIL-DTL-55302, paragraph 4.5.8, EIA-364-21	2 (0)	2 (0)	
Contact engagement and separation forces	MIL-DTL-55302, paragraph 4.5.3, EIA-364-37, method A	2 (0)		
Mating and unmating force	MIL-DTL-55302, paragraph 4.5.4t	2 (0)		
Solderability	MIL-DTL-55302, paragraph 4.5.16, MIL-STD-202, method 208	2 (0)*		
Resistance to soldering heat	MIL-DTL-55302, paragraph 4.5.17, MIL-STD-202, method 210, test condition C	2 (0)*		
Low-signal-level contact resistance	MIL-DTL-55302, paragraph 4.5.12, EIA-364-23	2 (0)	2 (0)	

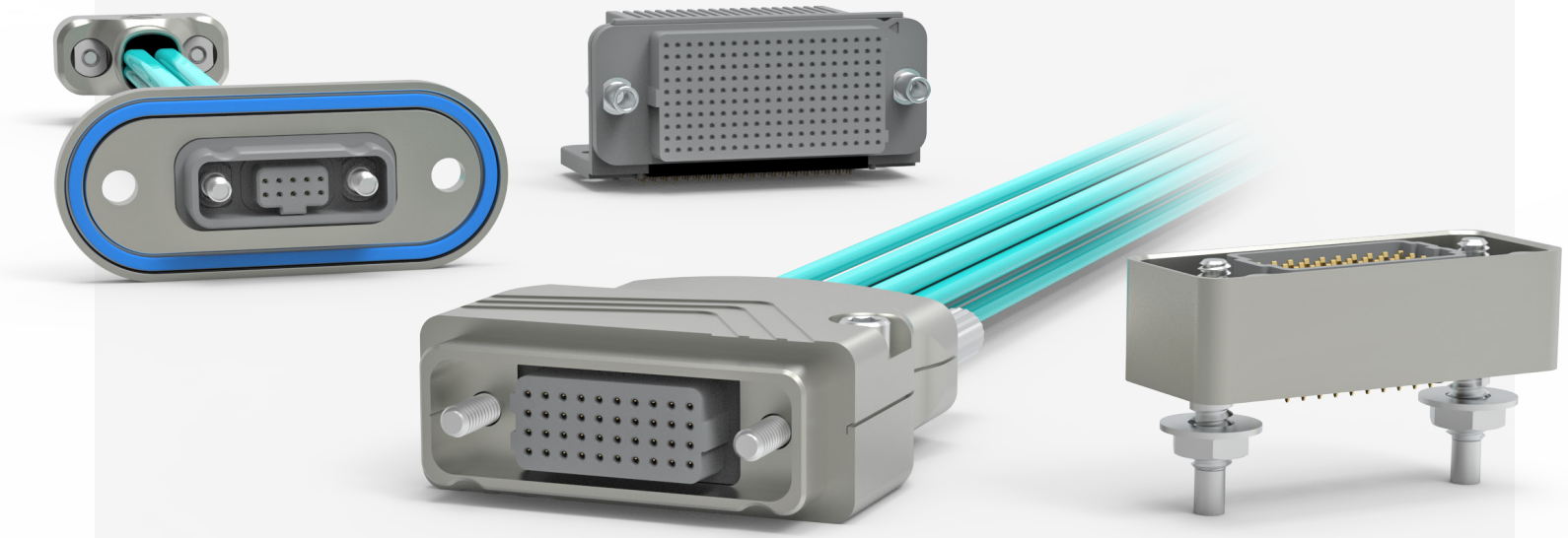
*Destructive tests require additional samples which will be identified and added to the order by Molex.

Table 6: Qualification Requirements for AirBorn W Series and AirBorn R Series Connectors

Inspection/Test	Test Methods, Conditions and Requirements	Quantity (Acceptable No. of Failures)		
		Level 1 (-E1Q)	Level 2 (-E2Q)	Level 3 (-E3Q)
Visual	Insert/insulator body	100%***	100%***	100%***
	Contact positioning			
	Shell/body			
	Thread			
	Adhesives/molding material			
	Leads			
Mechanical	Dimensions per catalog	3 (0)	2 (0)	
Dielectric withstanding voltage (sea level)	MIL-DTL-55302, paragraph 4.5.7.1, EIA-364-20, method A	3 (0)	2 (0)	
Insulation resistance	MIL-DTL-55302, paragraph 4.5.8, EIA-364-21	3 (0)	2 (0)	
Temperature cycling	MIL-DTL-55302, paragraph 4.7.13, EIA-364-32	3 (0)*	2 (0)*	
Vibration	MIL-DTL-55302, paragraph 4.5.10, EIA-364-28, test condition III	3 (0)*		
Shock	MIL-DTL-55302, paragraph 4.5.14, EIA-364-27, test condition G	3 (0)*	2 (0)*	
Contact engagement and separation forces	MIL-DTL-55302, paragraph 4.5.3, EIA-364-37, method A	3 (0)		
Solderability	MIL-DTL-55302, paragraph 4.5.16, MIL-STD-202, method 208	3 (0)*	1 (0)*	
Resistance to soldering heat	MIL-DTL-55302, paragraph 4.5.17, MIL-STD-202, method 210, test condition C	3 (0)*	1 (0)*	
Low-signal-level contact resistance	MIL-DTL-55302, paragraph 4.5.12, EIA-364-23	3 (0)	2 (0)	
Mating and unmating force	MIL-DTL-55302, paragraph 4.5.4	3 (0)	1 (0)	
Contact retention (push test-crimp removable contacts only)	MIL-DTL-55302, paragraph 4.5.6, EIA-364-29	3 (0)	1 (0)	

*Destructive tests require additional samples which will be identified and added to the order by Molex.
**Qualification includes screening. Performing screening with qualification potentially eliminates duplication of samples and testing. Visual becomes 100%.

AirBorn verSI Series



High-Speed, High-Density Versatile Signal Integrity Interconnects

Molex AirBorn verSI (versatile signal integrity) Series Connectors are designed to meet the requirements for high speed, high density signal integrity 100 Ω differential serial bus applications while still delivering the reliability customers expect. The open-pin field design allows flexibility in termination schemes. Single-ended, differential pair, power and ground are all available with verSI.

To obtain parts

n subsequent pages for testing and code definitions.

Space-rated part number build-up examples:

- Ordering a part with Level 1 screening: VSM-04-10-120-50-02-L-E1S
- Ordering a part with Level 1 qualification: VRW-04-10-50-03G-000-A030-E1Q
- Part number identification (including the modification code) will be marked on the part and/or the packaging

For more information, please view the documents below on molex.com:

- EEE-INST-002: Instructions for EEE parts selection, screening, qualification and de-rating
- MIL-DTL-83513: Connectors, electrical, rectangular, verSI, polarized shell and general specification
- Molex Catalog: Part numbering system

Table 7: Screening Requirements for AirBorn verSI Series Connectors

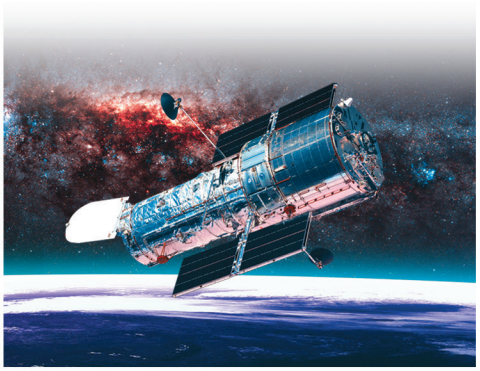
Inspection/Test	Test Methods, Conditions and Requirements	Quantity (Acceptable No. of Failures)		
		Level 1 (-E1S)	Level 2 (-E2S)	Level 3 (-E3S)
Visual	Insert/insulator body	100%	100%	100%
	Contact positioning			
	Shell/body			
	Threads			
	Adhesives/molding material			
	Leads			
Mechanical	Dimensions per catalog	2 (0)	2 (0)	
Dielectric withstanding voltage (sea level)	MIL-DTL-83513, paragraph 4.5.6.1 EIA-364-20	100%	2 (0)	
Insulation resistance	MIL-DTL-83513, paragraph 4.5.7 EIA-364-21	2 (0)	2 (0)	
Temperature cycling	MIL-DTL-83513, paragraph 4.5.10 EIA-364-32, test condition 1	2 (0)**	2 (0)**	
Low-signal-level contact resistance	EIA-364-23	2 (0)	2 (0)	
Mating and unmating force	MIL-DTL-83513, paragraph 4.5.4	2 (0)		
Solderability and resistance to soldering heat	MIL-STD-202-208, MIL-DTL-83513	2 (0)**	*	*
Processing for outgassing	ASTM E595 (125°C, 24 hours)	*	*	*

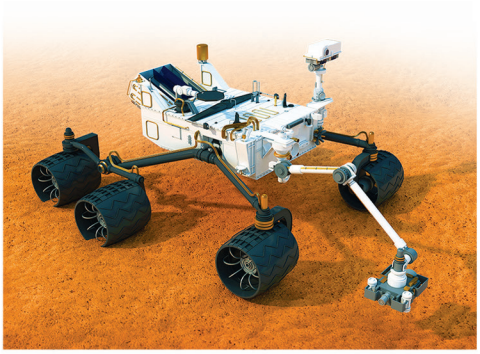
*Connectors within the scope of this document meet the outgassing requirements of M83513 and no additional baking is required.
**Destructive tests require additional samples which will be identified and added to the order by Molex.

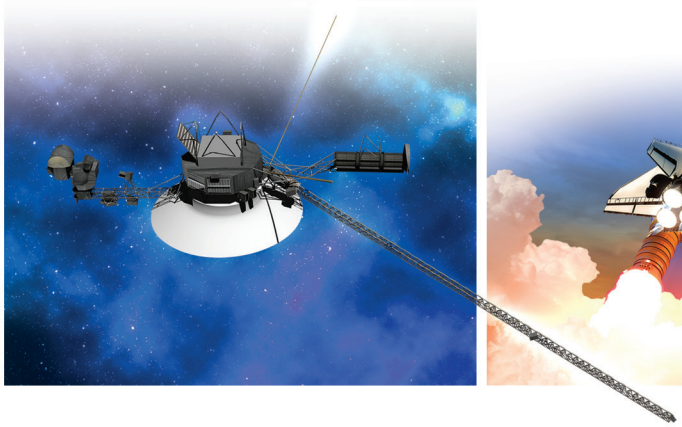
Table 8: Qualification Requirements for AirBorn verSI Series Connectors

Inspection/Test	Test Methods, Conditions and Requirements	Quantity (Acceptable No. of Failures)		
		Level 1 (-E1Q)	Level 2 (-E2Q)	Level 3 (-E3Q)
Visual	Insert/insulator body	100%***	100%***	100%***
	Contact positioning			
	Shell/body			
	Threads			
	Adhesives/molding material			
	Leads			
Mechanical	Dimensions per catalog	3 (0)	2 (0)	
Dielectric withstanding voltage (sea level)	MIL-DTL-83513, paragraph 4.5.6.1, EIA-364-20	100***	2 (0)	
Insulation resistance	MIL-DTL-83513, paragraph 4.5.7, EIA-364-21	3 (0)	2 (0)	
Temperature cycling	MIL-DTL-83513, paragraph 4.5.10, EIA-364-32, test condition 1	3 (0)**	2 (0)**	
Low-signal-level contact resistance	EIA-364-23	3 (0)	2 (0)	
Contact engagement and separation forces	MIL-DTL-83513, paragraph 4.5.9	3 (0)****	2 (0)*	
Contact retention/wire retention	MIL-DTL-83513, paragraph 4.5.5, EIA-364-29	3 (0)**		
Solderability and resistance to soldering heat	MIL-STD-202-208, EIA-364-56, MIL-DTL-83513, paragraph 4.5.12 & 4.5.13	3 (0)**	1 (0)*	
Mating and unmating force	MIL-DTL-83513, paragraph 4.5.4	3 (0)	1 (0)*	
Shock	MIL-DTL-83513, paragraph 4.5.15, EIA-364-27	3 (0)**	2 (0)	
Insert retention (metal shell types only)	MIL-DTL-83513, paragraph 4.5.19	3 (0)	1 (0)	
Vibration	MIL-DTL-83513, paragraph 4.5.14, EIA-364-28	3 (0)**	1 (0)	
Evaluation of material outgassing properties	ASTM E595 (125°C, 24 hours)	*		

*Connectors within the scope of this document meet the outgassing requirements of M83513 and no additional baking is required.
**Destructive tests require additional samples which will be identified and added to the order by Molex.
***Qualification includes screening. Performing screening with qualification potentially eliminates duplication of samples and testing. Visual becomes 100%.
****Applies to female connectors only; maximum test pin used for contact engagement force and minimum test pin used for contact separation force.

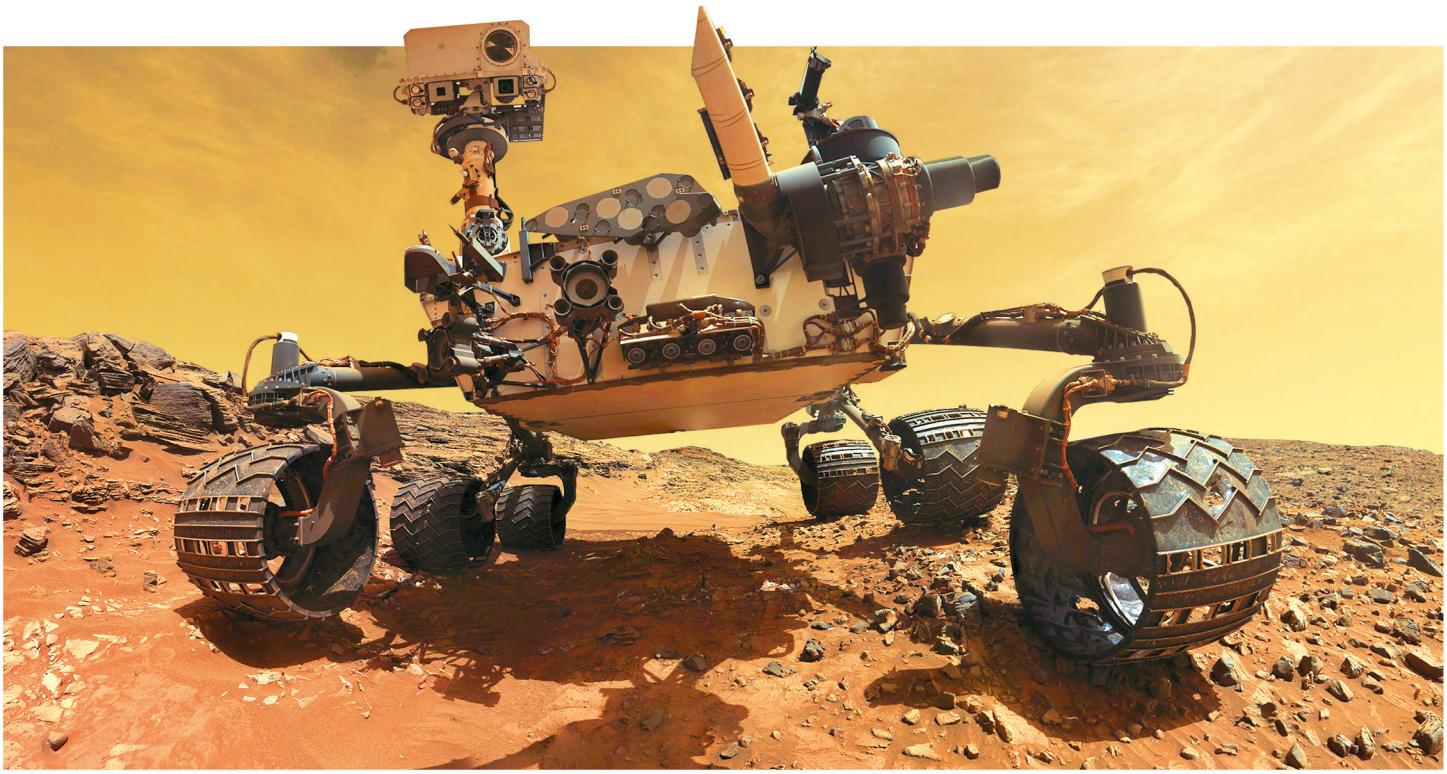






About Molex

Molex is a global electronics leader committed to making the world a better, more-connected place. With a presence in more than 38 countries, Molex enables transformative technology innovation in the consumer device, aerospace and defense, data center, cloud, telecommunications, transportation, industrial automation and healthcare industries. Through trusted customer and industry relationships, unrivaled engineering expertise, and product quality and reliability, Molex realizes the infinite potential of *Creating Connections for Life.*



Rugged and Reliable Interconnects

Molex AirBorn W Series, AirBorn R Series, Airborn M Series and AirBorn N Series connectors have all been aboard vehicles launched into the vastness of space—but the list won't end there. High-speed verSI connectors are ideal for high-vibration signal integrity applications and are being designed into future missions.

Key features and materials used in our interconnect design which make them ideal for the severities of space exploration include:

- All assemblies meet NASA out-gassing specifications
- Pure tin is never used in assemblies destined for space applications
- Ruggedized, multi-point contacts for extreme environments

These interconnects are designed to not only withstand space flight but also the rigors of launching, landing and operating on worlds beyond our own.

**Series 360 connectors are currently available in North America only.*

creating connections for life

SOURCE: NASAEEEB-3.25

molex.com

molex