



AEROSPACE STANDARD

AS8438™/1

Issued

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Terminus, Fiber Optic, Expanded Beam,
Single-Mode, Ball Lens, Removable, Rear Release Pin,
Size 16, Harsh Environment, General Specification

RATIONALE

AS8438/1 is intended to provide optical and physical intermatability and interoperability requirements for fiber optic expanded beam pin termini in for use in size 16 cavity, harsh environment connectors.

1. SCOPE

This slash sheet defines the design, performance, and interoperability requirements for fiber optic expanded beam, ball lens, single-mode pin termini installed in size 16 cavity connectors.

2. APPLICABLE DOCUMENTS

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AIR1351	Manufacturers' Identification of Aerospace Electrical and Electronic Wiring Devices and Accessories
AIR6031	Fiber Optic Cleaning
AIR6282	Fiber Optic Harsh Environment Test Methods Cross Reference Document
ARP6283	In-Service Fiber Optic Inspection, Evaluation, and Cleaning, Best Practices, Physical Contact Termini
AS8438	Terminus, Fiber Optic, Harsh Environment, General Specification
AS9133	Qualification Procedure for Aerospace Standard Products
AS81969	Installing and Removal Tools, Connector Electrical Contact, General Specification for

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SAE WEB ADDRESS:

Full document details: SAE AS8438_1

For more information on this standard, visit
<https://www.sae.org/standards/content/AS8438/1/>

Documents
Document Sharing Hub

2.2 ANSI Accredited Publications

Copies of these documents are available online at <http://webstore.ansi.org/>.

ANSI Z136.1-2000 American National Standard for Safe Use of Lasers

2.3 TIA Publications

Copies of these documents are available from Telecommunications Industry Association (TIA), 2500 Wilson Boulevard, Suite 300 Arlington, VA 22201.

TIA 455 Standard Test Procedures for Fiber Optic Fibers, Cables, Transducers, Sensors, Connecting and Terminating Devices and Other Fiber Optic Components

2.4 ECA Publications

Available from Electronic Component Association (ECA), 2500 Wilson Boulevard, Arlington, VA 22201-3834, Tel: 703-907-7500, www.eia.org.

EIA 364 Electrical Connector Test Procedures

2.5 CEN Publications

Copies of these documents are available from Avenue Marnix 17, B-1000 Brussels.

EN 2591 Elements of Electrical and Optical Connection - Test Methods

EN 9133 Aerospace Series - Quality Management Systems - Qualification Procedure for Aerospace Standard Parts

2.6 IEC Publications

Available from IEC Central Office, 3, rue de Varembe, P.O. Box 131, CH-1211 Geneva 20, Switzerland, Tel: +41 22 919 02 11, www.iec.ch.

IEC 61300 Fiber Optic Interconnecting Devices and Passive Components - Basic Test and Measurement Procedures

2.7 U.S. Government Publications

Copies of these documents are available online at <https://quicksearch.dla.mil>.

MIL-DTL-38999 Connectors Electrical, Circular, Miniature, High Density, Quick Connect (Bayonet, Threaded, and Breech Coupling), Environment Resistant, Removable Crimp and Hermetic Solder Contacts

MIL-STD-100 Engineering Drawing Practices
NOTE: This standard should only be used in lieu of ASTM Y14.100M where the necessity for a DoD design activity is fully justified and government logistics support is required.

MIL-STD-1678 Environmental Engineering Considerations and Laboratory Tests

MIL-STD-5530 Connectors, Electrical and Fiber Optic, Packaging of

2.8 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

2.8.1 ARINC IA Publications

Available from SAE ITC, ARINC Industry Activities, 16701 Melford Blvd, Suite 120, Bowie, MD 20715, Tel: +1 240-334-2578, <https://www.aviation-ia.com/>.

ARINC Report 801 Fiber Optic Connectors

ARINC Report 805 Fiber Optic Test Procedures

2.8.2 ISO Publications

Available from International Organization for Standardization, ISO Central Secretariat, 1, ch. de la Voie-Creuse, CP 56, CH-1211 Geneva 20, Switzerland, Tel: +41 22 749 01 11, www.iso.org.

ISO 11146 Lasers and Laser-Related Equipment - Test Methods for Laser Beam Widths, Divergence Angles and Beam Propagation Ratios

2.8.3 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AS5382 Aerospace Cable, Fiber Optic

AS5590 Connectors, Fiber Optic, Advanced, Circular or Rectangular, Plug and Receptacle, Environment Resistant, Removable Termini/Contacts, General Specification for

AS8050 Connectors, Fiber Optic, Advanced, Modular or Rectangular, Plug and Receptacle, Harsh Environment, Removable Termini, General Specification for

2.8.4 TIA Publications

Copies of these documents are available from Telecommunications Industry Association (TIA), 2500 Wilson Boulevard, Suite 300 Arlington, VA 22201.

TIA 604 Fiber Optic Connector Intermatability Standards (FOCIS)

2.8.5 U.S. Government Publications

Copies of these documents are available online at <https://quicksearch.dla.mil>.

MIL-PRF-29504 Termini, Fiber Optic Connector, Removeable, General Specification for

MIL-PRF-64266 Connectors, Fiber Optic Circular and Rectangular, Plug and Receptacle Style, Multiple Removeable Genderless Termini, Environment Resisting, General Specification for

MIL-STD-202 Electronic and Electrical Component Parts

MIL-STD-5530 Connectors, Electrical and Fiber Optic, Packaging of

3. EYE SAFETY

Permanent eye damage can occur if exposed to high-intensity light sources. Maintainers are unable to manually determine the nature or level of the optical power; therefore, the following practices should always be adopted:

- Under no circumstance should a fiber optic connector end-face, fiber optic terminus end-face, prepared optical fiber, or fractured optical fiber be viewed directly until it is confirmed that there is no transmitted power through the fiber.
- Do not inspect active fiber optic systems with optical magnifying scopes.
- Protective end caps and connector covers should always be kept on all unmated connectors.
- Wherever possible, protective eyewear should be worn when preparing optical fibers for termination.

Refer to ANSI Z136.4 for further information regarding eye safety and light source hazards.

Within expanded beam interconnects and depending upon the type of lens employed, the light is collimated as it exits the transmit lens, with a beam diameter of about 300 μm for single-mode fiber. As an example at a 20 cm distance, all the light will be within a 7 mm aperture (a highly collimated beam). Table 1 of ANSI Z136.1-2000 states that this EOC would be Class 1 regarding acceptable emission limit (AEL).

NOTE: The AEL is usually a maximum power (in watts) or energy (in joules) that can be emitted in a specified wavelength range and exposure time passing through a specified aperture stop at a specified distance.

4. FIBER OPTIC PIN TERMINUS, EXPANDED BEAM

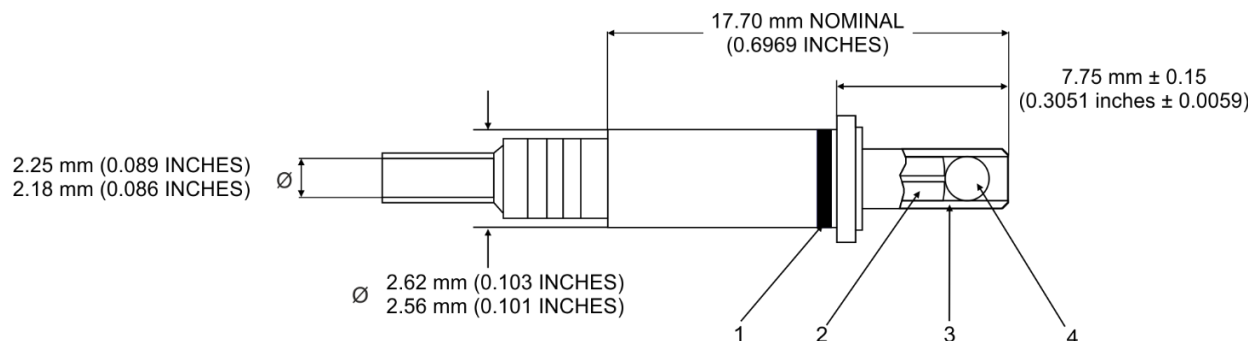
Environmental and mechanical requirements, as appropriate, are detailed in MIL-DTL-38999, Series III. Temperature ranges:

- Operating: -65 to +165 °C (-85 to +329 °F).
- For storage temperatures, see Section 14.

4.1 Terminus Intermatability Dimensions

Figure 1 provides general arrangement and details of the intermatability dimensions for the single-mode expanded beam pin.

Figure 2 details the retention clip positioning dimensions for the pin in a connector body.



1. Blue identifier band.
2. Split sleeve or another appropriate barrel. (Split sleeve diameters as per TIA/EIA 604-10A) mounted OD: 1.626/1.629 mm (0.640/0.0641 inch).
3. Ferrule or fiber guide (ferrule dimensions as per TIA/EIA 604-10A) mounted OD: 1.2483/1.2495 mm (0.0491/0.0492 inch).
4. Anti-reflective coated optical lens having a refractive index which combined with the fiber shall provide the required beam characteristics and return loss.

Figure 1 - Single-mode pin terminus general arrangement and intermatability dimensions

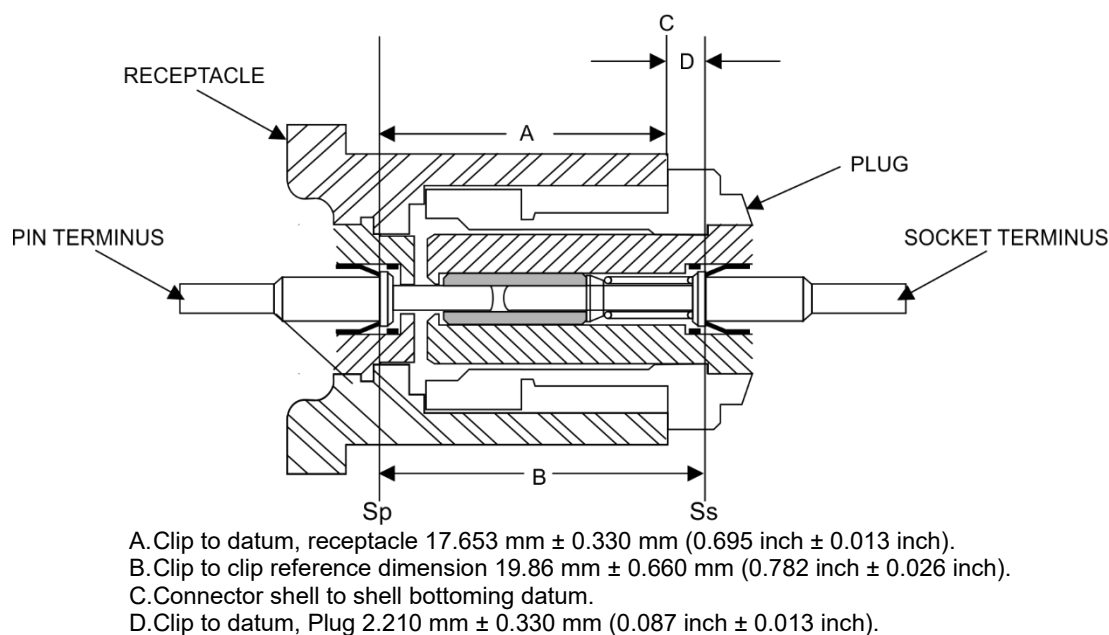


Figure 2 - Pin terminus retention clip positioning dimensions

4.2 Terminus Variants

The single-mode pin terminus is available in five variants. Table 1 details pin terminus identification codes

Table 1 -Terminus code general

Terminus Code AS8438/1-	Wavelength (nm) ± 30 Maximum	Description	Minimum Return Loss (RL) (Mated)	Maximum Insertion Loss (IL) (Mated)	Maximum IL Variation Rotation (Mated)	Maximum IL Variation Bi-Direction (Mated)
01P	1260 to 1620	Single-mode 9/125 μ m (0.0004/0.0049 inch)	26 dB	2.5 dB	0.5 dB	0.5 dB
02P	1310	Single-mode 9/125 μ m (0.0004/0.0049 inch)	30 dB	2.5 dB	0.5 dB	0.5 dB
03P	1310 & 1550	Single-mode 9/125 μ m (0.0004/0.0049 inch)	30 dB	2.5 dB	0.5 dB	0.5 dB
04P	1550	Single-mode 9/125 μ m (0.0004/0.0049 inch)	35 dB	2.5 dB	0.5 dB	0.5 dB
05P	1550	Single-mode 9/125 μ m (0.0004/0.0049 inch)	50 dB	2.5 dB	0.5 dB	0.5 dB

NOTE: Where required, IL and RL measurements shall be carried out in both directions of the mated termini under test.

4.3 Terminus Cable Interface

The terminus is compatible with buffered fiber, loose and tight structure simplex cables with a maximum outside diameter of 2.18 mm (0.1102 inch).

4.4 Optical Interface

The terminus-to-terminus interface key characteristics are defined in Table 2. Where applicable, the equipment used for measurement and the process reference is noted.