



AEROSPACE STANDARD

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Superseding AS5726

Interface Standard, Interface for Micro Munitions

RATIONALE

This standard was developed by SAE International. It defines implementation requirements for the electrical interface between Hosts and Micro Munitions. The intent of this standard is to minimize proliferation of electrical interfaces between Micro Munitions and associated Hosts and thereby promote interoperability of Micro Munitions across different programs and services. This document was revised to incorporate editorial and technical comments received and coordinated by SAE AS-1B1 Micro Munitions Interface Task Group.

AS5726A has been reaffirmed to comply with the SAE Five-Year Review policy.

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Documents

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1. SCOPE

This standard only defines interconnect, electrical and logical (functional) requirements for the interface between a Micro Munition and the Host. The physical and mechanical interface between the Micro Munition and Host is undefined. Individual programs will define the relevant requirements for physical and mechanical interfaces in the Interface Control Document (ICD) or system specifications. It is acknowledged that this does not guarantee full interoperability of Interface for Micro Munitions (IMM) interfaces until further standardization is achieved.

1.1 Purpose

The purpose of this standard is to minimize proliferation of divergent electrical interfaces between the Host and Micro Munitions to promote interoperability across different programs and services.

1.2 Application

This standard applies to all Hosts and Micro Munitions that electrically interface with each other. A Micro Munition is a weapon characterized by a mass up to 25 kg and a minimum outer diameter of 38 millimeters. Other munitions may use this standard.

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 General

The documents listed in this section are referenced in Sections 3, 4, and 5 of this standard. This section does not include documents cited in other sections of this standard or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in Sections 3, 4, and 5 of this standard, whether or not they are listed.

2.1.1 SAE Publications

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

AS5653 High Speed Network for MIL-STD-1760

AS39029/56 Contacts, Electrical Connector, Socket, Crimp Removable (For MIL-C-38999 Series I, III, and IV Connectors)

AS39029/58 Contacts, Electrical Connector, Pin, Crimp Removable (For MIL-C-24308, MIL-C-38999 Series I, II, III, and IV, and MIL-C-55302/69 and MIL-C-83733 Connectors)

2.1.2 ANSI Publications

Available from American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, NY 10036-8002, Tel: 212-642-4900, www.ansi.org.

FC-PI ANSI INCITS 352-2002 Fibre Channel - Physical Interfaces

2.1.3 U.S. Government Publications

Available from DLA Document Services, Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6396, <http://quicksearch.dla.mil/>.

MIL-DTL-38999L	Connectors, Electrical, Circular, Miniature, High Density, Quick Disconnect (Bayonet, Threaded, and Breech Coupling), Environment Resistant, Removable Crimp and Hermetic Solder Contacts, General Specification For
MIL-DTL-38999L Supplement 1	Connectors, Electrical, Circular, Miniature, High Density, Quick Disconnect (Bayonet, Threaded, and Breech Coupling), Environment Resistant, Removable Crimp and Hermetic Solder Contacts, General Specification For
MS27488N	Plug, End Seal, Electrical Connector
MIL-STD-1760E	Interface Standard For Aircraft/Store Electrical Interconnection System

2.2 Order of Precedence

In the event of a conflict between the text of this document and the 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.

3. DEFINITIONS

3.1 Definitions

Definitions applicable to this standard are as follows.

3.1.1 Host

Any system capable of carrying, interfacing with, and employing Micro Munitions. The term includes Platforms such as aircraft, ground vehicle (armored vehicles, trucks), armed man portable, installations, nautical vehicle (boat, ship or submersible), cruise missiles, and Micro Munition Carriage Systems.

3.1.2 Electrical Interface Types

The two electrical interface types for the Host/Micro Munition electrical interconnection system are specified below.

3.1.2.1 Micro Munition Host Interface (MMHI)

The electrical interface on the Host structure where the Micro Munition is electrically connected either directly (blind mate) or via an interconnecting umbilical cable.

3.1.2.2 Interface for Micro Munitions (IMM)

The electrical interface on the Micro Munition external structure or interconnecting umbilical cable that mates with an MMHI.

3.1.3 Micro Munition

A Micro Munition is a weapon typically characterized by a mass up to 25 kg and a minimum outer diameter of 38 mm.

3.1.4 Fibre Channel (FC)

FC is the name for a high-speed network standard defined by a series of ANSI INCITS standards.

3.1.5 Safety Critical

An interface operation (electrical, logical or a combination of both) at the MMHI or IMM is deemed safety critical when it causes the Micro Munition to perform functions that have the potential to generate Micro Munition behavior that may present a hazard to the Host, crew or ground handling personnel.

3.2 Acronyms and Abbreviations

The following acronyms and abbreviations are applicable.

AC	Alternating Current
ANSI	American National Standards Institute
dBV	Decibel voltage relative to 1 Volt
DC	Direct Current
DFC	Down Fibre Channel
ENB	Enable
F	Frequency
FC	Fibre Channel
FC-PI	Fibre Channel – Physical Interface
GHz	Gigahertz
ICD	Interface Control Document
IMM	Interface for Micro Munitions
INCITS	International Committee for Information Technology Standards
kg	Kilogram
kohm	Kilohm
MHz	Megahertz
MMHI	Micro Munition Host Interface
ms	Milliseconds
ns	Nanoseconds
mV	Millivolt
RD	Receive Data
TD	Transmit Data
UFC	Up Fibre Channel

μH Microhenry

V Volt

W Watt

4. GENERAL

4.1 Interface Set and Classes

The interface set, as shown in Figure 1, consists of interfaces for digital data transfer, discrete signals, and power. Data and power share the same physical interfaces. Detailed electrical requirements for each of these interfaces at the MMHI and IMM are specified in Section 5.

Two IMM classes are defined, providing different capabilities over the same set of physical interfaces:

Class I provides 28 V DC regulated power on the Operating Power interface, and the power available on this interface is 85 W continuous.

Class II provides 56 V DC regulated power on the Operating Power interface, and the power available on this interface is 200 W continuous.

For either Class I or Class II, Safety Enable Power is 28 V DC as further specified in 5.1.4.2.

This standard includes provisions to ensure that Class I Micro Munitions will not be damaged when connected to Class II Hosts.

Class II Micro Munitions may also operate with a full or diminished capability as Class I Micro Munitions.

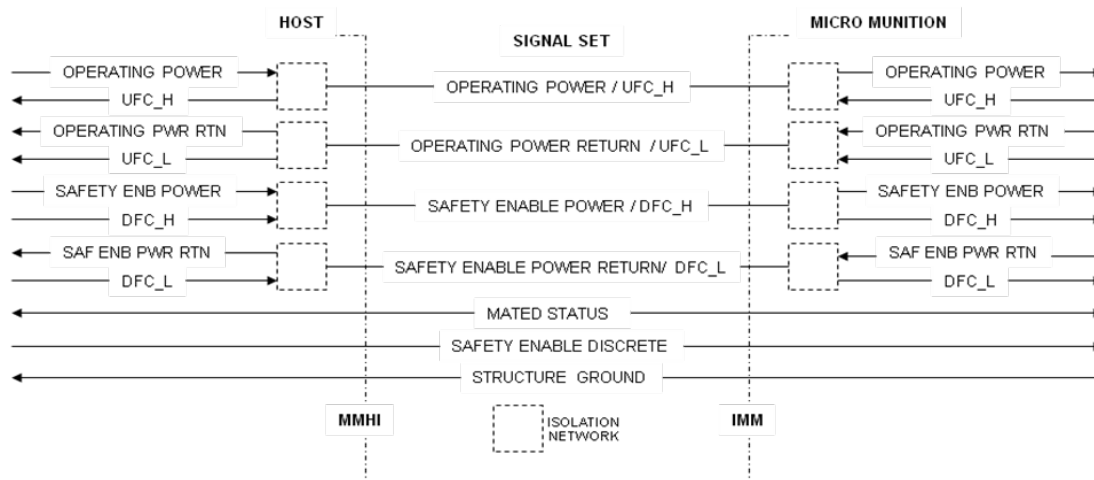


FIGURE 1 – INTERFACE SIGNAL SET

Figure 2 represents a concept schematic of the IMM signal set and of the interactions between Host and Micro Munition functional circuits.

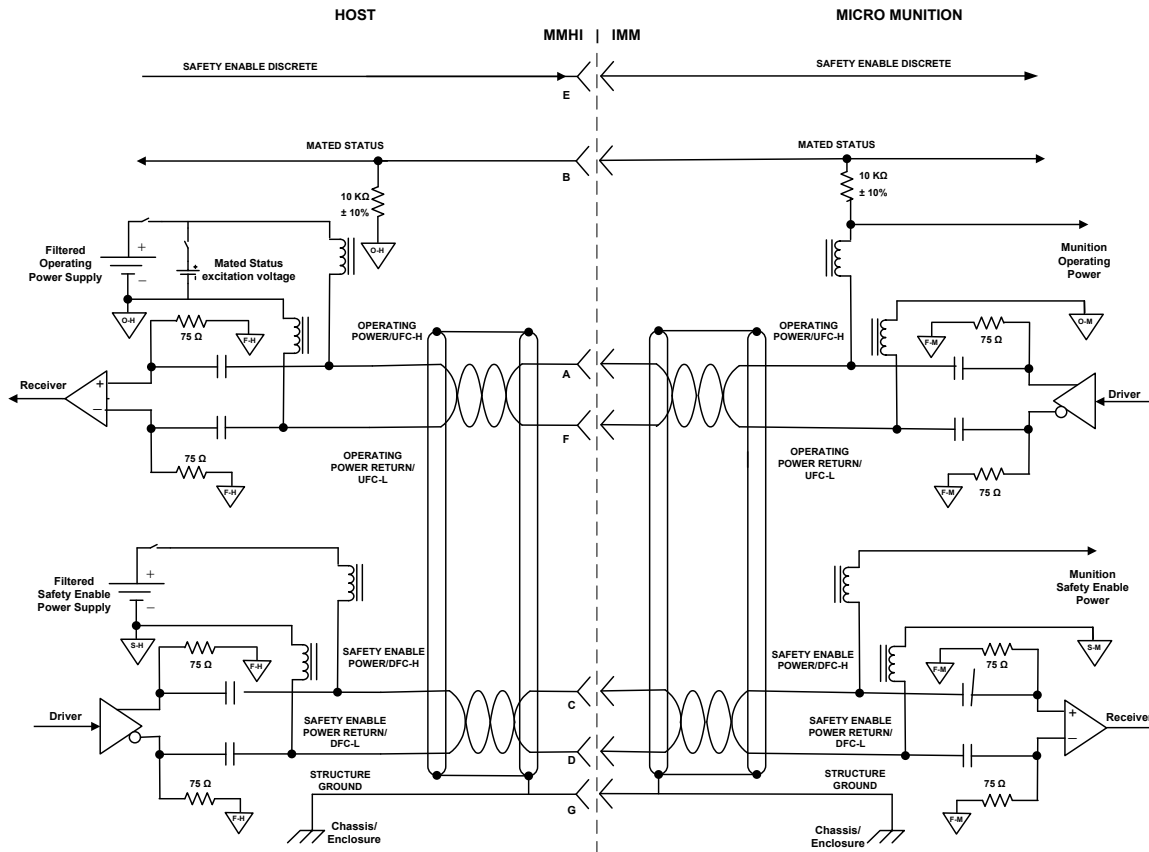


FIGURE 2 – DIGITAL DATA AND POWER INTERFACES SCHEMATIC

4.1.1 Overlay of Digital Data and Power Interfaces

This interface provides power and data to the Micro Munition on the same signal pair. Data from the Micro Munition is transferred on the same signal pair as Operating Power and Operating Power Return. Data to the Micro Munition is transferred on the same signal pair as Safety Enable Power and Safety Enable Power Return. This is accomplished by inserting a low pass filter on the DC path, and a high pass filter on the data path as exemplified in Figure 2.

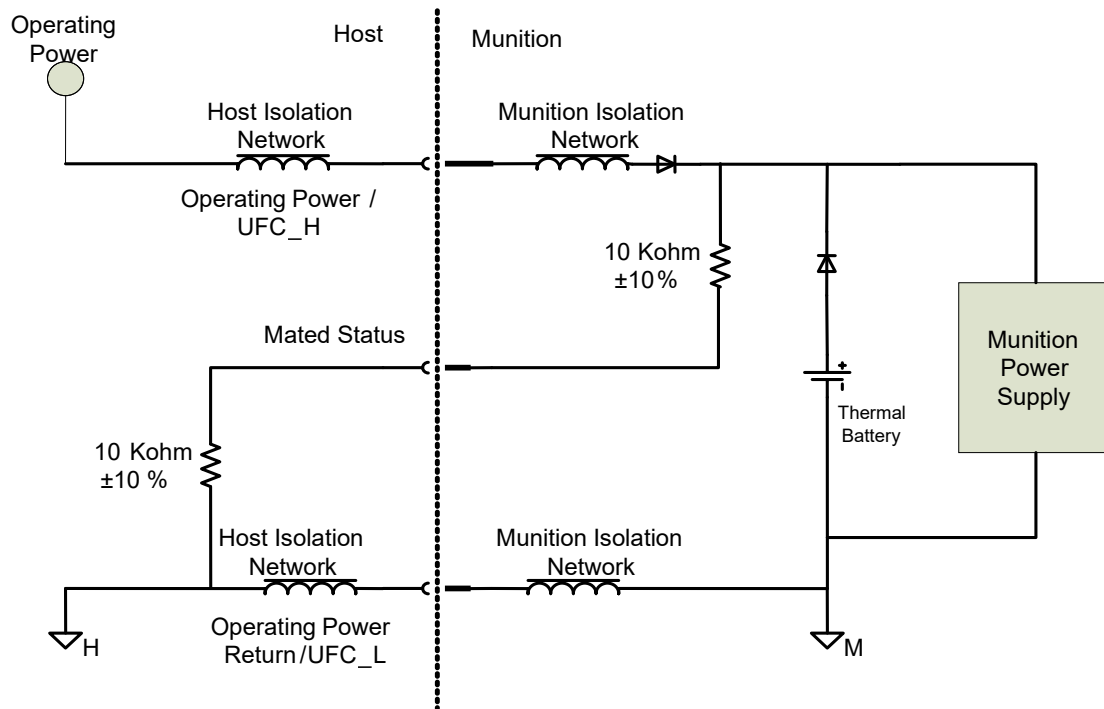
4.1.2 Digital Data Interfaces

The digital data interface consists of a high speed network (Down Fibre Channel (DFC) and Up Fibre Channel (UFC)) in accordance with AS5653 (High Speed Network for MIL-STD-1760) as modified by the requirements of Section 5 herein.

The Host assigns, controls, and routes FC messages to their proper destinations by means of the services provided by the FC protocol.

4.1.3 Mated Status Interface

The Mated Status interface is a discrete signal path available for both the Host and Micro Munition to monitor the electrically mated status of the other. Figure 3 depicts the use of the Mated Status interface.



Note: Only DC path of isolation networks shown. Diodes on the Munition side of the interface are assumed as part of a typical implementation, but not required by the standard.

FIGURE 3 – MATED STATUS INTERFACE SCHEMATICS

4.1.4 Safety Enable Discrete Interface

The Safety Enable Discrete interface is a low power discrete used only to enable and inhibit safety critical Micro Munition functions which are commanded via the DFC interface (see 4.1.2).

CAUTION

The Safety Enable Discrete interface is provided to enable a safety or irreversible function within the Micro Munition. The discrete should only be enabled when the Host determines that safety criteria for the Micro Munition safety or irreversible function have been met.

4.1.5 Power Interfaces

The Host supplies and controls all power to Micro Munitions through the MMHI. One Operating Power and one Safety Enable Power source are supplied through each interface. A dedicated power return is provided through the interface for each power source.

The Host may apply Operating Power at any time after sensing that the Micro Munition Mated Status is mated as defined in 5.1.2.

4.1.5.1 Operating Power

Operating Power is supplied to each Micro Munition by the Host for basic operation of Micro Munition internal electronics and performance of non-safety-critical functions.

Class I Hosts supply 28 V DC $\pm$ 5% on the Operating Power interface.

Class II Hosts supply 28 V DC followed by 56 V DC $\pm$ 5% on the Operating Power interface.

Both Class I and Class II Hosts may also supply a lower excitation voltage, prior to application of Operating Power, in order to test for the presence of a Micro Munition.

4.1.5.2 Safety Enable Power

Safety Enable Power is supplied by the Host to each Micro Munition as the power source for functions designated as safety critical. The Safety Enable Power will be energized by the Host for a maximum duration of 2 seconds per application.

4.1.6 Structure Ground interface

The Structure Ground interface provides an electrical connection between the Host and Micro Munition structures to minimize shock hazards to personnel.

5. REQUIREMENTS

5.1 Host requirements

The interface requirements for the Host are defined in the following sections.

5.1.1 Host: Mated Status Interface

The Host shall provide a connection for a Mated Status interface at the MMHI. The Mated Status interface shall be connected to the Operating Power Return node within the Host. The path between the Host Mated Status interface and the Operating Power Return node shall have a resistance of 10 kohm $\pm$ 10% when measured at the MMHI.

The Host shall interpret its status as mated when the voltage between Mated Status and Operating Power Return exceeds 20% of the voltage between Operating Power and Operating Power Return, when the operating power voltage complies with Class I, Class II, or Mated Status excitation voltage.

5.1.2 Host: Safety Enable Discrete Interface

The Host shall provide a Safety Enable Discrete interface at the MMHI for transferring an enable/inhibit signal to the connected Micro Munition. Safety Enable Discrete, when in the enabled state, shall indicate Host consent for the Micro Munition to perform safety-critical functions, including but not limited to Commit to Separate Store or Submunition function (bit D8) or the Fire, Launch or Release function (bit D10) of the Critical Control 1 data word in the Mission Store Control message (see Appendix B of MIL-STD-1760) when commanded over the DFC interface. If required by the system specification or ICD, other bits in the Critical Control 1 and Critical Control 2 words may also be interlocked with the release consent interface. When in the inhibited state, the Safety Enable Discrete at an MMHI shall be electrically isolated by a minimum 100 kohm at dc from the Safety Enable Discrete at all other MMHIs. The host shall require specific authorization command(s) to generate the enabled state of the Safety Enable Discrete.