NATO STANDARD

AEP-4695

SOLDIER POWER CONNECTOR - ELECTRICAL CONNECTIVITY STANDARDS BETWEEN NATO POWER SOURCES AND DISMOUNTED SOLDIER SYSTEMS (DSS)

Edition B, Version 1

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NATO LETTER OF PROMULGATION

14 October 2021

1. The enclosed Allied Engineering Publication AEP-4695, Edition B, version 1, SOLDIER POWER CONNECTOR - ELECTRICAL CONNECTIVITY STANDARDS BETWEEN NATO POWER SOURCES AND DISMOUNTED SOLDIER SYSTEMS (DSS), which has been approved by the nations in the NATO ARMY ARMAMENTS GROUP, is promulgated herewith. The agreement of nations to use this publication is recorded in STANAG 4695.

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4. This publication shall be handled in accordance with C-M(2002)60.

Dimitrios SIGOULAKIS
Major General, GRC (A)
Director, NATO Standardization Office

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RECORD OF RESERVATIONS

CHAPTER	RECORD OF RESERVATION BY NATIONS

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RECORD OF SPECIFIC RESERVATIONS

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CHAPTER 1 FOREWORD

The Allied Engineering Publication AEP-4695 defines the NATO standard interface between nation's dismounted soldier systems and (another) nation's energy sources such as batteries, fuel cells and small solar panels (or other renewables) (Figure 1). It may also be used to accept power from other sources such as vehicles as long as it has been conditioned to meet the requirements of this AEP. This External Energy Source Interface (EESI) enables a compliant national Dismounted Soldier System (DSS) to accept power from compliant energy sources, improving interoperability within NATO in the dismounted soldier domain.

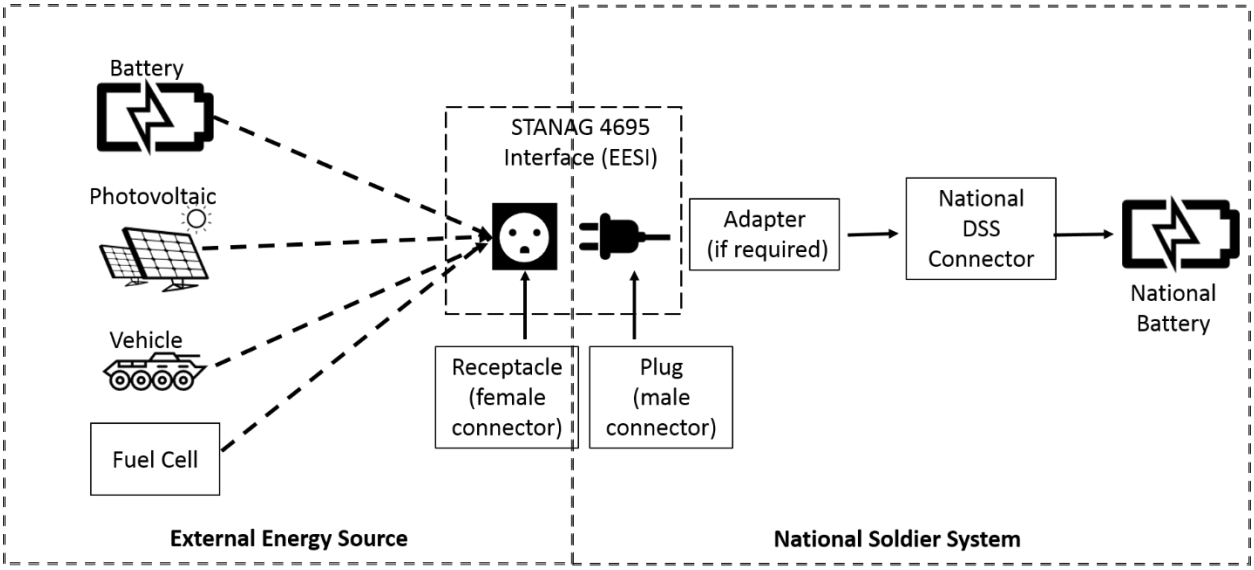

Figure 1: Schematic overview of the STANAG 4695 External Energy Source Interface (ESSI)

If the national soldier system or energy source has no NATO EESI, an adapter may be used to convert the nation soldier system or energy source specific interface to be EESI-compliant. It is a nation's responsibility to provide the adapter for its soldier system to enable it to obtain energy from a compliant energy source in a coalition environment. It is also recommended that a nation with a non-complaint energy source provides an adapter that would make it interoperable under STANAG 4695/AEP 4695.

The EESI defines the mechanical, electrical, data and environmental properties for the energy source and the dismounted soldier system sides of the interface to allow for interoperability.

In the EESI definition as shown in Figure 1, it is assumed that the energy source is external to the national system and is a source of energy to recharge a central battery and/or directly power the end-items in the nation's soldier system.

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CHAPTER 2. DEFINITIONS

Battery	A device that stores electrical energy through an (reversible) electrochemical reaction.
Nonrechargeable battery	A battery that cannot have its energy replenished and can be used to provide energy to a Dismounted Soldier System (DSS).
Rechargeable battery	A battery that can have its energy replenished through recharging and can be used to provide energy to a Dismounted Soldier System (DSS).
Commonality:	The state achieved when the same doctrine, procedures or equipment are used.
Compatibility:	The suitability of products, processes or services for use together under specific conditions to fulfil relevant requirements without causing unacceptable interactions.
Dismounted Soldier System:	Everything the soldier wears, carries and consumes to fulfil the soldiers tasks as individuals, as members of fighting teams and as parts of higher-level operational units.
Fuel cell	A device that converts a high energy density fuel into electrical energy through an electrochemical reaction.
Interoperability	The ability to act together coherently, effectively and efficiently to achieve Allied tactical, operational and strategic objectives.
Mobility Platforms	Any platform, such as aviation, maritime and ground transportation, which a dismounted soldier may use. This document does not address any national, platform specific requirements for using a different nation’s DSS.
Photovoltaic (solar panel)	A device that converts (sun) light photons into electrical energy through any form of a photovoltaic material.

Smart Battery	A battery that exposes a data interface to query its status (e.g. manufacturer, state of charge, temperature) and obtain instructions on how to charge (e.g. voltage, current) where the data protocol is specified in the Smart Battery Specification. The carrier protocol is SMBus.
SMBus	System Management Bus (SMBus) is a two wire data protocol that allows for information exchange by low-speed system management communications.
EESI	External Energy Source Interface. The interface that enable a STANAG 4695 compliant energy source to connect to an external interface.

CHAPTER 3. RELATED MILITARY AND COMMERCIAL STANDARDS

STANAG 4370	Environmental Testing
STANREC 4819 (Study)	NATO Interoperable Dismounted Battery Charging Interface

Smart Battery Data Specification revision 1.1, Dec 11, 1998

Smart Battery Data Specification errata rev 1.1a, June 7, 1999

Smart Battery Data Specification addendum for fuel cells, revision 1.02, April 11, 2007

System Management Bus (SMBus) Specification rev 3.0, Dec 20, 2014

NWPAN-WP-01112013 Nett Warrior Interconnect Architecture White Paper (this document is publicly available from the Defence Technical Information Center (https://apps.dtic.mil/docs/citations/AD1011122, https://apps.dtic.mil/dtic/tr/fulltext/u2/1011122.pdf)

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CHAPTER 4. PERFORMANCE REQUIREMENTS

4.1 General Requirements

The EESI mechanical interface is the push-pull connector used in the US ARMY Nett Warrior program managed by US Army Program Executive Office – Soldier. Related information can be obtained at http://www.peosoldier.army.mil/contactus/.

The nation's soldier system shall comprise a plug with pins arrangement. The energy source shall implement the receptacle with sockets. All EESI connecting cables conforming to this AEP shall be clearly marked with the wording "STANAG 4695"

Outlines of the in line push pull, 6 pin connector is shown Figure 2.

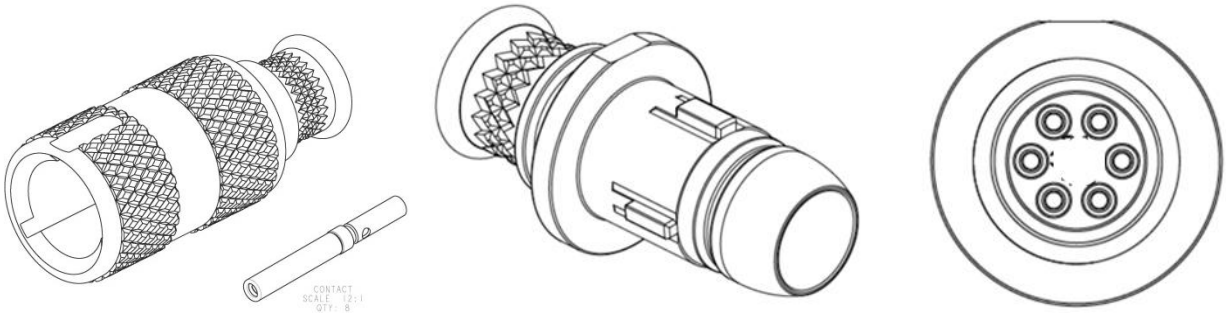

Figure 2: The receptacle is shown on the left, the plug in the centre and the pin layout on the right.

The assignment and description of the connector pins is defined in **Table 1** for a push-pull in-line (cable) plug with 6 pins.

Table 1: Mandatory Pin Reservations for NATO DSS Connector

CONTACT LOCATION	DESCRIPTION	TERMINAL MARKINGS
1	Power from energy source Positive	V +
2	Power Ground	V -
3[1]	Power to energy source Positive (for rechargeable power sources)	V + start
4	SMBus Data	Data
5	SMBus Clock	Clock
6	Safety signal [as per reference SBC section 6.1.1	SB ID
Shell[2]	System Ground	N/A

Qualified suppliers for this connector are listed in the Nett Warrior whitepaper which is updated by the Nett Warrior program office when new suppliers are qualified. Those part numbers listed in Table 2 and Table 3 below and referenced in the Nett Warrior whitepaper shall be backwards compatible with previous versions. For those nations that may choose to develop another source of supply, it is that nation's responsibility to assure that the connector is interoperable with those listed below.

The nation's soldier system and energy source shall both self-protect against foreseeable abuse through the EESI.

Table 2: Part numbers for Connector Plug with Pins

Connector Type	Glenair Inc.	TE Connectivity
Cable Mount Plug (angled)	8070-1676-06ZNU6-6PY	-
Cable Mount Plug (in line) Solder cup	807-309-06ZNU6-6PY	-
Cable Mount Plug (in line) crimped	807-871-06ZNU6-6PY	2226910-1
Bulkhead Mount Plug	8070-1153-XX[3]ZNU6-6ZZ[4]	-

Table 3: Part description for Connector Receptacle with Sockets.

Connector Type	Glenair Inc.	TE Connectivity
Cable Mount Receptacle (in line) solder cup	8070-1675-01ZNU6-6SY	-
Cable Mount Receptacle (in line) crimped	807-348-01ZNU6-6SY	2226920-1
Bulkhead Mount Receptacle	807-216-07ZNU6-6DY	-
Cable Mount Receptacle (in line) crimped	807-874-XX[5]-ZNU6-6SY	-

[1] Pin 3 is reserved for charging or putting power into the energy source while pin 1 is reserved for drawing energy from the power source. This is a safety mechanism to handle the case of a primary battery being mistakenly plugged into a charger. The primary wouldn't have pin 3 populated or connected.
[2] System ground is maintained through the outer shell of the connector
[3] denotes either Front (00) or Rear (07) chassis mounting
[4] denotes either PC Tail (PC) or Solder Cups (EC) for internal connection
[5] denotes either Front (00), In-line [cable] (01), or Rear (07) mounting optionsE

CHAPTER 5. Electrical Performance

5.1 Minimum Source requirements

A STANAG 4695 compliant energy source provides DC power at a voltage between 8 and 36 V. The energy source shall be capable of providing at least 1 A. For energy sources with limited power output, a too high current draw shall taper the voltage to below 8 V and/or be self-protected by a (resettable) fuse.

A STANAG 4695 compliant input port shall cope with the supplied DC power within the 8 to 36 V voltage window, shall draw no more than 5 A and shall limit its power draw for energy sources unable to provide up to 5 A at the provided voltage so as to protect from a shutdown of the energy source.

The output of the energy source shall be stable, e.g. at a constant voltage or drops slowly if it is a battery with a dropping state of charge.

5.2 Electrical-mechanical interface

The electrical interface is provided through the 6 contacts in the mechanical interface as shown in **Table 1**. Contacts 1 and 2 are mandatory, contacts 3-6 are for the optional extensions to allow for the use of advanced energy sources such as smart batteries, fuel cells and solar panels.

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CHAPTER 6. ENVIRONMENTAL SPECIFICATION

The EESI shall have environmental performance such that it is interoperable with the connectors specified in Table 2 and Table 3 under expected operational conditions e.g. C2 to A1.

This includes environmental conditions as described through NATO STANAG 4370 in Allied Environmental Conditions and Test Publication, AECTP 500, MIL-STD-810 or equivalent national standard and EMC conditions as tested through NATO AECPT-500, MIL-STD-461 or equivalent national standard.

6.1 Electromagnetic compatibility

For EMC, the EESI shall not prevent the soldier system and energy source meeting the requirements for army ground applications. tailored for proximity to transmitting and receiving antennas. (for example land class A in UK Defence standard 59-411; land mobile mil std 461G, AECTP 501, test NRE02, limit A),

6.2 Environmental conditions

For environmental conditions, the EESI connector (as qualified by the US Army Nett Warrior program) has been validated for the environmental conditions likely to be experienced by a dismounted soldier.

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CHAPTER 7. OPTIONAL CAPABILITIES

With the requirements stated in the preceding chapters, batteries and mobility platforms will be able to provide energy to a soldier system. The requirements in this document are based on energy sources that are already known to be widely available to the dismounted soldier (such as batteries). As new energy sources are identified (such as fuel cells) there may be additional capabilities that must be placed on the EESI to allow the use of these energy sources.

Some energy sources provide information on their status, such as smart batteries and certain fuel cells. STANAG 4695 compliant energy sources should provide this information through the Smart Battery data format as defined in the Smart Battery System architecture and transferred through pins 4 (data) and 5 (clock). For fuel cells, an additional set of commands is defined in the Smart Battery fuel cell addendum. Compliant soldier systems should have the capability to read out the information provided and handle further distribution and processing.

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