



AEROSPACE STANDARD

AS5391™

REV. A

Issued 2002-12
Revised 2016-06
Reaffirmed 2022-03

Superseding AS5391

(R) Helicopter Health and Usage Monitoring System Accelerometer Interface Specification

RATIONALE

This document defines interface requirements for accelerometers and associated interfacing electronics for use in a helicopter Health and Usage Monitoring System (HUMS). The purpose is to standardize the accelerometer-to-electronics interface with the intent of increasing interchangeability among HUMS sensors/systems and reducing the cost of HUMS accelerometers as the result of economy of scale. Additionally, the goal is to provide a set of high level requirements for HUMS accelerometers for system designers and integrators.

TABLE OF CONTENTS

1.	SCOPE.....	3
1.1	Classification	3
1.2	Specification Terminology.....	3
2.	REFERENCES.....	4
2.1	Applicable Documents	4
2.1.1	SAE Publications.....	4
2.2	Definitions	4
3.	REQUIREMENTS AND RECOMMENDATIONS.....	5
3.1	HUMS Airframe Accelerometers.....	5
3.1.1	Definition	5
3.1.2	Characteristics	5
3.2	HUMS Drive Train Accelerometers.....	11
3.2.1	Definition	11
3.2.2	Characteristics	11
3.3	HUMS Engine Accelerometers	17
3.3.1	Definition	17
3.3.2	Characteristics	17
4.	Notes	21
4.1	Cable Tie Down for Performance Testing.....	21
4.2	Revision Indicator.....	22

SAE Executive Standards Committee Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be revised, reaffirmed, stabilized, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2022 SAE International

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of SAE.

TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
http://www.sae.org

SAE WEB ADDRESS:

For more information on this standard, visit
<https://www.sae.org/standards/content/AS5391A/>

FIGURE 1	EXAMPLE OF ACCELEROMETERS LOCATION.....	3
FIGURE 2	AIRFRAME ACCELEROMETER	5
FIGURE 3	ALLOWABLE AIRFRAME ACCELEROMETER AMPLITUDE RESPONSE	6
FIGURE 4	ALLOWABLE AIRFRAME ACCELEROMETER RELATIVE PHASE RESPONSE	7
FIGURE 5	DONUT STYLE ACCELEROMETER	8
FIGURE 6	SPARK STYLE ACCELEROMETER	9
FIGURE 7	ARINC STD STYLE ACCELEROMETER.....	9
FIGURE 8	EXAMPLES OF ARINC STYLE ACCELEROMETER	11
FIGURE 9	ALLOWABLE DRIVE TRAIN ACCELEROMETER AMPLITUDE RESPONSE	12
FIGURE 10	ALLOWABLE DRIVE TRAIN ACCELEROMETER RELATIVE PHASE RESPONSE	13
FIGURE 11	HOT SECTION ENGINE ACCELEROMETER	17
FIGURE 12	ALLOWABLE ENGINE ACCELEROMETER AMPLITUDE RESPONSE	18
FIGURE 13	ALLOWABLE ENGINE ACCELEROMETER RELATIVE PHASE RESPONSE	19
FIGURE 14	CABLE TIE DOWN FOR "DONUT" STYLE ACCELEROMETER	21
FIGURE 15	CABLE TIE DOWN FOR "SPARK PLUG" STYLE ACCELEROMETER.....	21
TABLE 1	AIRFRAME ACCELEROMETER CONNECTOR PIN ASSIGNMENTS OPTION #1	10
TABLE 2	AIRFRAME ACCELEROMETER CONNECTOR PIN ASSIGNMENTS OPTION #2	10
TABLE 3	AIRFRAME ACCELEROMETER CONNECTOR PIN ASSIGNMENTS OPTION #3	10
TABLE 4	DRIVE TRAIN ACCELEROMETER CONNECTOR PIN ASSIGNMENTS OPTION #1	16
TABLE 5	DRIVE TRAIN ACCELEROMETER CONNECTOR PIN ASSIGNMENTS OPTION #2	16

1. SCOPE

Accelerometers are transducers, or sensors, that convert acceleration into an electrical signal that can be used for airframe, drive, and propulsion system vibration monitoring and analysis within vehicle health and usage monitoring systems.

This document defines interface requirements for accelerometers and associated interfacing electronics for use in a helicopter Health and Usage Monitoring System (HUMS). The purpose is to standardize the accelerometer-to-electronics interface with the intent of increasing interchangeability among HUMS sensors/systems and reducing the cost of HUMS accelerometers. Although this interface was specified with an internally amplified piezoelectric accelerometer in mind for Airframe and Drive Train accelerometers, this does not preclude the use of piezoelectric accelerometer with remote charge amplifier or any other sensor technology that meets the requirements given in this specification.

This SAE HUMS Accelerometer Interface Specification includes the minimal interface and performance requirements for commonality. Compliance with this Interface Specifications can be referenced in more comprehensive procurement and device specifications.

1.1 Classification

Accelerometers used in current HUMS fall into three distinct categories, they are:

- a. Airframe accelerometers (generally used for rotor track and balance performance),
- b. Drive train accelerometers, and
- c. Engine accelerometers.

This document is divided into three sections in recognition of this common industry classification.

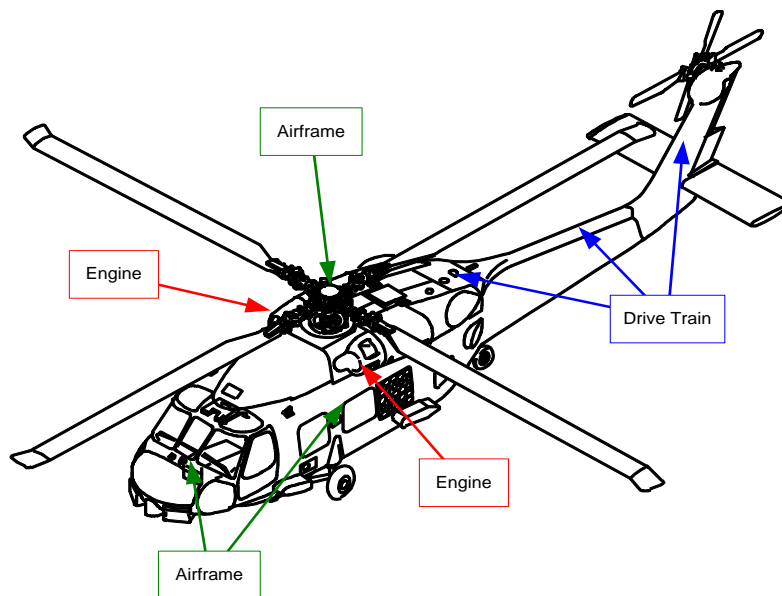


Figure 1 – Example of accelerometers location

1.2 Specification Terminology

The terms "shall" and "should" within this specification observe the following rules:

- a. The word "shall" expresses a mandatory requirement of the specification.
- b. The word "should" expresses a recommendation or advice on implementing the specification or actions expected of users of the system.