



AEROSPACE RECOMMENDED PRACTICE

ARP691™

REV. A

Issued 1964-08
Reaffirmed 2018-05
Cancelled 2026-05

Superseded by AIR46C

Recommended Ice Bath for Reference Junctions

RATIONALE

ARP691 has been superseded by AIR46C. AIR46C consolidates the contents of this document plus AIR65 and ARP690. As such, AIR46C provides a comprehensive document for testing and calibrating thermocouple components for use in gas turbine engines making the contents of AIR65, ARP690, and ARP691 redundant and unnecessary. This document consolidation strategy was agreed to by the SAE E-32 Aerospace Propulsion Systems Health Management Committee as part of the committee's master plan.

CANCELLATION NOTICE

This technical report has been declared "CANCELLED" as of May 2026 and has been superseded by AIR46. By this action, this document will remain listed in the respective index, if applicable. Cancelled technical reports are available from SAE.

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 © 2026 SAE International

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, or used for text and data mining, AI training, or similar technologies, without the prior written permission of SAE.

TO PLACE A DOCUMENT ORDER: Tel: 1-877-606-7323 (U.S. and Canada only)
Tel: 1-724-776-4970 (outside U.S. and Canada)
Fax: 724-776-0790
Email: CustomerService@sae.org
<http://www.sae.org>

SAE WEB ADDRESS:

Full document details: SAE ARP691A

For more information on this standard, visit
<https://www.sae.org/standards/content/ARP691A/>

Documents

Standard Sharing Hub

1. SCOPE - The ice bath recommended herein is similar to that described in SAE AIR 46.* Some material not presented in AIR 46, including preferred dimensions, has been added.

2. REQUIREMENTS

- 2.1 A mixture of shaved ice and water provides a convenient and easily reproducible bath at 0°C (32°F) for reference junctions. The ice bath of the accompanying sketch is recommended as one that will provide reference junctions that are near enough to 0°C for practically all engineering applications. A large-mouthed Dewar flask (preferably one quart or larger) is filled with shaved or finely cracked clear ice, and enough water is added to make a slush, but not enough to float the ice. Any potable water and ice are sufficiently pure to provide a bath that is 0°C to within a few hundredths of a degree. When a closer approach to 0°C is desired, the bath should be made with distilled water ice or distilled water; and, for highest accuracy, both distilled water ice and distilled water should be used. Any materials in contact with the water-ice slush of the bath should, of course, be insoluble. Care should be taken that there is ice down to the bottom of the Dewar when the bath is prepared.
- 2.2 For each junction to be kept at the ice point a glass tube with as thin walls and small diameter as is practical, closed at the bottom, and flared at the top, is inserted through a hole in the cork of the Dewar. Enough mercury is placed within each tube so that the depth is about 3/4 inch with the thermocouple and lead wires in place. The tubes should be long enough so that when inserted in the slush, the upper surface of the mercury is at least 4-1/2 inches below the top surface of the slush. For wires of 12 gage and larger this distance should be not less than 60 diameters. The tubes should be not less than 1/2 inch from the side of the Dewar.
- 2.3 The actual reference junctions are made by inserting a thermo-element and a copper wire, each polished with a file or sandpaper for a length such that electrical contact between them is made only below the mercury. The junctions may be made by hard soldering or welding the thermocouple wires to copper, but the excellent thermal and electrical contact provided by the mercury makes the mercury connection preferable. There must be no electrical contact between the wires above the mercury, because no other point is sure to be at the known reference temperature. The insides of the glass tubes must be kept clean and dry; condensed moisture must not be allowed to accumulate. An adequate seal at the open ends of the tubes can be made with universal wax, paraffin, or other similar material before inserting the tubes in the ice bath.

*SAE Aerospace Information Report No. 46, THE PREPARATION AND USE OF CHROMEL-ALUMEL THERMOCOUPLES FOR TURBOJET ENGINES, prepared by Committee AE-2, Temperature Measurement Sensing, March 15, 1956