

INTERNATIONAL
STANDARD

ISO
4233

First edition
2023-03

**Reactor technology — Nuclear
fusion reactors — Hot helium leak
testing method for high temperature
pressure-bearing components in
nuclear fusion reactors**

Technologie du réacteur — Réacteurs à fusion nucléaire — Méthode de contrôle d'étanchéité par détection de fuite d'hélium à chaud pour les composants sous pression à haute température de réacteurs à fusion nucléaire



Reference number
ISO 4233:2023(E)

© ISO 2023



COPYRIGHT PROTECTED DOCUMENT

© ISO 2023

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

	Page
Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Symbols	2
5 Principles and techniques of detection	2
6 Personnel	5
7 Apparatus	5
7.1 General	5
7.2 Test component and vacuum chamber	7
7.3 The vacuum pumping system	7
7.4 Heating and temperature control system	7
7.5 Temperature uniformity requirement	7
7.6 Reference leak	7
7.7 Tracer gas leak detector	8
7.8 Other equipment	8
8 Test component preparation	8
8.1 Preliminary tests before hot helium leak test	8
8.2 Vacuum baking	9
9 Calibration	9
9.1 General	9
9.2 Response and cleanup time measurements	9
9.3 Leak detector validation and determination of minimum detectable leakage rate	9
10 Testing procedures	11
10.1 Installation of the component into the test system	11
10.2 Initial set-up of the leak testing system	11
10.3 Initial helium leak testing	11
10.4 Helium leak testing at elevated temperature	11
10.5 Cyclic hot helium leak testing	12
10.6 Final cold helium leak testing	12
11 Test report	12