INTERNATIONAL STANDARD

ISO 16084

First edition
2017-10

Balancing of rotating tools and tool systems

Équilibrage pour outils rotatifs et systèmes d'outillage

Reference number
ISO 16084:2017(E)

© ISO 2017

COPYRIGHT PROTECTED DOCUMENT

© ISO 2017, Published in Switzerland

All rights reserved. Unless otherwise specified, 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
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

Page

Foreword ... **iv**

Introduction ... **v**

1 Scope ... **1**

2 Normative references ... **1**

3 Terms, definitions, symbols and abbreviated terms ... **1**
3.1 Terms and definitions ... 1
3.2 Symbols and abbreviated terms ... 3

4 Requirements ... **6**
4.1 General ... 6
4.1.1 Clamping inaccuracies ... 6
4.1.2 Influence of balancing machines ... 6
4.1.3 Effects and frequent consequences of permissible residual unbalances according to ISO 1940-1 ... 7
4.1.4 Inherent properties of machine tools and components ... 7
4.2 Balancing requirements based on the spindle load ... 7
4.2.1 General ... 7
4.2.2 Determination of the balancing requirements ... 10
4.2.3 Measuring accuracy of balancing machines, influence of run-out and repeatability of measuring results ... 14
4.2.4 Application criterion of static and dynamic balancing ... 15
4.2.5 Permissible residual dynamic unbalances ... 15
4.2.6 Balancing requirements for tool systems with guidance ... 20
4.2.7 Influence of the HSK (hollow taper shank) on the dynamic unbalance ... 22
4.3 Safety-related unbalance limitations (G40) according to ISO 15641 ... 23
4.4 Graphic visualization of the balancing requirements ... 23
4.5 Special tools with asymmetric body shapes ... 25

5 Balancing of tool systems ... **25**
5.1 General ... 25
5.2 Balancing of tool system components ... 27
5.3 Influence of the angular orientation of component unbalances ... 29
5.4 Influence of clamping dislocations ... 29
5.5 Integration of tool system components balanced according to ISO 1940-1 ... 30
5.6 Calculation of the permissible rotational speed depending on actual unbalance ... 30
5.7 Determination and calculation of the position of the centre of gravity ... 31
5.7.1 Experimental determination of the centre of gravity ... 31
5.7.2 Calculation of the centre of gravity of a modular tool system ... 31
5.8 Balancing of tools and components with alternative interfaces ... 32
5.9 HSK adapters with rotationally symmetrical tools ... 32
5.10 Remarks for setup and balancing of tool systems ... 33

6 Data representation and exchange ... **34**

Annex A (informative) **Permissible residual unbalances — Theoretical approach and calculation examples** ... **36**

Annex B (informative) **Calculation examples of tool systems** ... **61**

Annex C (normative) **XML file structure for the documentation of balancing information** ... **66**

Annex D (informative) **Fundamental unbalance formula, correlations and practical advice** ... **68**

Bibliography ... **71**

© ISO 2017 – All rights reserved