

DIN ISO 16084:2021-06 (E)

Balancing of rotating tools and tool systems (ISO 16 084:2017)

Contents		Page
National foreword	.....	3
National Annex NA (informative) Bibliography	.....	4
Foreword	.....	5
Introduction	.....	6
1 Scope	.....	7
2 Normative references	.....	7
3 Terms, definitions, symbols and abbreviated terms	.....	7
3.1 Terms and definitions	.....	7
3.2 Symbols and abbreviated terms	.....	9
4 Requirements	.....	12
4.1 General	.....	12
4.1.1 Clamping inaccuracies	.....	12
4.1.2 Influence of balancing machines	.....	12
4.1.3 Effects and frequent consequences of permissible residual unbalances according to ISO 1940-1	.....	13
4.1.4 Inherent properties of machine tools and components	.....	13
4.2 Balancing requirements based on the spindle load	.....	13
4.2.1 General	.....	13
4.2.2 Determination of the balancing requirements	.....	16
4.2.3 Measuring accuracy of balancing machines, influence of run-out and repeatability of measuring results	.....	20
4.2.4 Application criterion of static and dynamic balancing	.....	21
4.2.5 Permissible residual dynamic unbalances	.....	21
4.2.6 Balancing requirements for tool systems with guidance	.....	26
4.2.7 Influence of the HSK (hollow taper shank) on the dynamic unbalance	.....	28
4.3 Safety-related unbalance limitations (G40) according to ISO 15641	.....	29
4.4 Graphic visualization of the balancing requirements	.....	29
4.5 Special tools with asymmetric body shapes	.....	31
5 Balancing of tool systems	.....	31
5.1 General	.....	31
5.2 Balancing of tool system components	.....	33
5.3 Influence of the angular orientation of component unbalances	.....	35
5.4 Influence of clamping dislocations	.....	35
5.5 Integration of tool system components balanced according to ISO 1940-1	.....	36
5.6 Calculation of the permissible rotational speed depending on actual unbalance	.....	36
5.7 Determination and calculation of the position of the centre of gravity	.....	37
5.7.1 Experimental determination of the centre of gravity	.....	37
5.7.2 Calculation of the centre of gravity of a modular tool system	.....	37
5.8 Balancing of tools and components with alternative interfaces	.....	38
5.9 HSK adapters with rotationally symmetrical tools	.....	38
5.10 Remarks for setup and balancing of tool systems	.....	39
6 Data representation and exchange	.....	40
Annex A (informative) Permissible residual unbalances — Theoretical approach and calculation examples	.....	42
Annex B (informative) Calculation examples of tool systems	.....	67
Annex C (normative) XML file structure for the documentation of balancing information	.....	72
Annex D (informative) Fundamental unbalance formula, correlations and practical advice	.....	74
Bibliography	.....	77