

ISO 16089:2025-02 (E)

Machine tools - Safety - Stationary grinding machines

Contents		Page
Foreword		v
Introduction		vi
1	Scope	1
2	Normative references	1
3	Terms and definitions, types of grinding machines, and symbols	3
3.1	Terms and definitions	3
3.1.1	General terms	3
3.1.2	Terms related to parts of grinding machines	5
3.1.3	Terms related to modes of safe operation (MSO)	6
3.1.4	Terms related to speeds and axes speed	7
3.2	Types and groups of grinding machines described in this document	8
3.2.1	General	8
3.2.2	Group 1: Manually controlled grinding machine without power operated axes and without numerical control (see Figure 2)	10
3.2.3	Group 2: Manually controlled grinding machine with power operated axes and, if applicable, with limited numerically controlled capability (see Figure 3)	11
3.2.4	Group 3: Numerically controlled grinding machine (see Figures 4 and 5)	11
3.3	Symbols	13
4	List of significant hazards	15
4.1	General	15
4.2	Main hazard zones	15
4.3	Significant hazards and hazardous situations covered by this document	15
5	Safety requirements and/or measures	19
5.1	General requirements	19
5.1.1	General	19
5.1.2	Requirements for guards for all groups of grinding machines	19
5.2	Specific requirements resulting from mechanical hazards identified in Table 2, Nos 1.1 to 1.4, 1.6 and 1.7	20
5.2.1	Group 1 machines, manually controlled grinding machines without power operated axes and without numerical control	20
5.2.2	Group 2 machines, manually controlled grinding machines with power operated axes and, if applicable, with limited numerically controlled capability	22
5.2.3	Group 3 machines, numerically controlled grinding machines	23
5.2.4	Tool holding device	24
5.2.5	Workpiece holding	25
5.2.6	Vertical or slant axes under gravity	25
5.2.7	Modes of machine operation	26
5.2.8	Optional or additional equipment for grinding machines	30
5.3	Specific requirements resulting from electrical hazards	32
5.4	Specific requirements resulting from noise hazards	32
5.5	Specific requirements resulting from vibration hazards	33
5.6	Specific requirements resulting from radiation hazards	33
5.7	Specific requirements resulting from materials or substance hazards	33
5.7.1	General	33
5.7.2	Devices for the use of metalworking fluids	34
5.7.3	Measures against fire and explosion hazards	35

5.8	Specific requirements resulting from neglect of ergonomic principles hazards	36
5.9	Specific requirements resulting from unexpected start-up, over-run or over-speed hazards	38
5.10	Specific requirements resulting from variation in the rotational speed hazards	39
5.11	Specific requirements resulting from failure of the power supply hazards	40
5.12	Specific requirements resulting from failure of the control circuit hazards	40
5.13	Specific requirements resulting from ejected fluids or objects hazards	43
5.13.1	General requirements	43
5.13.2	Guards to prevent ejection in the event of abrasive product breakage	43
5.13.3	Devices protecting against ejection of workpieces and workpiece parts	44
5.14	Specific requirements resulting from loss of stability hazards	45
5.15	Specific requirements resulting from slips, trips and fall of persons hazards	45
6	Verification of the safety requirements and/or protective measures	45
7	Information for use	47
7.1	Marking	47
7.2	Instruction for use	47
7.2.1	General	47
7.2.2	Tooling	50
7.2.3	Workpiece holding	50
7.2.4	Machine functions accessible from the NC panel	50
7.2.5	Restart	50
7.2.6	Noise	51
7.2.7	Vibration	51
7.2.8	Ancillary handling devices	52
7.2.9	Residual risks to be addressed by the machinery user	52
7.2.10	Installation instructions for the grinding machine	53
7.2.11	Cleaning instruction for the machine	53
Annex A (normative)	Abrasive product guards, work zone enclosures and their combinations	54
Annex B (informative)	Impact test for guards -- Bursting test	90
Annex C (informative)	Impact test for guards -- Projectile impact	93
Annex D (normative)	Clamping methods for abrasive products and safety requirements for tool holding devices	97
Annex E (informative)	Noise reduction	107
Annex F (normative)	Noise test code	108
Annex G (normative)	Requirements for grinding machines for the machining of materials generating flammable and explosive dusts	113
Annex H (informative)	Measures for the use of flammable metal working fluids	116
Annex I (informative)	Examples for the integration of extraction and fire extinguishing systems when using flammable metal working fluids	119
Annex J (informative)	Functional safety -- Example for rotational speed limit monitoring of the wheel spindle	121
Annex K (informative)	MSO 3 optional special mode for manual intervention under restricted operating conditions -- Examples	124
Bibliography	129