

ISO 14119:2024-09 (E)

Safety of machinery - Interlocking devices associated with guards - Principles for design and selection

Contents		Page
Foreword		v
Introduction		vi
1	Scope	1
2	Normative references	1
3	Terms and definitions	2
4	Symbols	9
5	Operating principles and types of interlocking devices associated with guards	10
5.1	General	10
5.2	Principles of guard interlocking without guard locking	13
5.3	Principles of guard interlocking with guard locking	13
5.3.1	General	13
5.3.2	Interlocking device with guard locking	14
6	Requirements for the design and the arrangements of interlocking devices with and without guard locking	16
6.1	General	16
6.2	Arrangement and fastening of position switches, bolt locks and access locks	16
6.3	Arrangement and fastening of actuators	17
6.3.1	General	17
6.3.2	Cams	17
6.4	Actuation modes of interlocking devices	17
6.5	Mechanical stop	18
6.6	Additional requirements on guard-locking devices	18
6.6.1	General	18
6.6.2	Locking force	19
6.6.3	Electromechanical guard-locking device	19
6.6.4	Electromagnetic guard-locking device	20
6.7	Additional requirements on access locks	21
6.7.1	General	21
6.7.2	Locking force	21
6.8	Whole body access	22
6.9	Supplementary releases	22
6.9.1	Escape release of guard locking	22
6.9.2	Auxiliary release of guard locking	22
6.9.3	Emergency release of guard locking	23
6.10	Interlock blocking	23
7	Selection of an interlocking device	23
7.1	General	23
7.2	Selection of a guard-locking device	24
7.2.1	Overall system response time and access time	24
7.2.2	Specific requirements for selection of guard-locking devices	24
7.2.3	Selection of supplementary guard-locking releases	25
7.3	Environmental conditions considerations	26
7.3.1	General	26

7.3.2	Influence of dust on Type 2 and Type 5 interlocking devices	26
7.4	Considerations for the application of trapped key interlocking systems	26
8	Design to minimize the motivation to defeat	26
8.1	System design	26
8.2	Methodology procedure	27
8.3	Additional measures to minimize possibility of defeat	28
8.4	Additional measures to minimize possibility of defeat for Type 5 devices	32
8.4.1	General	32
8.4.2	Key retention	32
8.4.3	Reproduction of keys	33
9	Requirements for the control system	33
9.1	General	33
9.2	Assessment of faults and fault exclusions	33
9.2.1	Assessment of faults	33
9.2.2	Fault exclusion	34
9.2.3	Examples for measures to prevent common cause failures through direct and non-direct mechanical action of the position switches of Type 1 interlocking devices	36
9.2.4	Energy source diversity	38
9.3	Release of guard-locking device	38
9.4	Series connection of electro-mechanical interlocking devices	38
9.5	Electrical and environmental conditions	38
9.5.1	General	38
9.5.2	Performance considerations	39
9.5.3	Immunity from disturbance	39
9.5.4	Electrical operating conditions	39
9.5.5	Clearances and creepage distances	39
10	Information for use	39
10.1	General	39
10.2	Information for use given by the manufacturer of interlocking devices	39
10.2.1	Marking	39
10.2.2	Instructions	40
10.3	Information for use given by the manufacturer of the machine	41
Annex A (informative)	Type 1 interlocking device -- Examples	42
Annex B (informative)	Type 2 interlocking device -- Examples	47
Annex C (informative)	Type 3 interlocking device -- Example	49
Annex D (informative)	Type 4 interlocking devices -- Examples	51
Annex E (informative)	Example of guard-locking devices	54
Annex F (informative)	Application examples of interlocking devices used within a safety function ..	59
Annex G (informative)	Motivation to defeat interlocking devices (defeating of protective devices) ...	65
Annex H (informative)	Examples for maximum static action forces	69
Annex I (normative)	Test procedures	71
Annex J (normative)	Evaluation of fault masking in series connections of interlocking devices with potential free contacts	73
Annex K (normative)	Trapped key interlocking systems	89
Bibliography	106