



MD TEST REPORT

Report No.: STE24080711S

Product: 3D Printer

Model No.: Anycubic Kobra S1, (others refer to page 2)

Prepared for: Shenzhen Anycubic Technology Co.,Ltd

Address: 1201-1314, Unit B, Block 3, Vanke Times Square, No. 85 Longcheng Avenue, Shangjing Community, Longcheng Subdistrict, Longgang District, Shenzhen, China

Prepared by: Shenzhen STE Testing Laboratory Co., Ltd.

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TEST REPORT

EN ISO 12100

Safety of machinery — General principles for design — Risk assessment and risk reduction

Report Number.....: STE24080711S

Tested by (name + signature).....: Plum Xiao / Test engineer

Approved by (name + signature).....: Awen Huang / Project manager

Date of issue.....: August 13, 2024

Total number of pages.....: 58

Testing Laboratory: Shenzhen STE Testing Laboratory Co., Ltd.

Address: 3/F, Building 9, Hongde Factory, No. 63 Yuchang Road, Niuhe Community, Guanlan Street, Longhua District, Shenzhen, China

Applicant's name.....: Shenzhen Aincubic Technology Co.,Ltd

Address.....: 1201-1314, Unit B, Block 3, Vanke Times Square, No. 85 Longcheng Avenue, Shangjing Community, Longcheng Subdistrict, Longgang District, Shenzhen, China

Manufacturer's name.....: Shenzhen Aincubic Technology Co.,Ltd

Address.....: 1201-1314, Unit B, Block 3, Vanke Times Square, No. 85 Longcheng Avenue, Shangjing Community, Longcheng Subdistrict, Longgang District, Shenzhen, China

Test specification:

Standard.....: EN ISO 12100: 2010

Test procedure.....: Type test

Non-standard test method.....: N/A

Test Report Form No.....: EN_ISO_12100B

Test Report Form(s) Originator.....: STE

Master TRF.....: Dated: 2019-03

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Test item description.....: 3D Printer

Model/ Type reference.....: **Aincubic Kobra S1**, Kobra S1, Aincubic Kobra S1 Combo, Kobra S1 Combo

Trade Mark.....: ANYCUBIC

Ratings.....: Input: 100-240V~, 50/60Hz, Max.6.9A



Summary of testing:

Testing location:

Shenzhen STE Testing Laboratory Co., Ltd.

3/F, Building 9, Hongde Factory, No. 63 Yuchang Road, NiuHu Community, Guanlan Street, Longhua District, Shenzhen, China

Tests performed (name of test and test clause):

- EN ISO 12100: 2010
- Machinery Directive (2006/42/EC) Annex 1: Risk assessment Report: Essential health and safety requirements

Copy of marking plate:

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.



Remarks:

1. Height of CE mark is 5mm or more, height of WEEE symbol is 7mm or more, height of other marks is 5mm or more, height of letters and numerals is 2mm or more.

TEST ITEM PARTICULARS:

Equipment mobility.....: Transportable

Classification of installation and use.....: Class I

Supply Connection.....: Detachable power cord

Operating condition.....: [x] continuous
[] rated operating / resting time:

Possible test case verdicts:

- test case does not apply to the test object.....: N or N/A (Not Applicable)

- test object does meet the requirement.....: P (Pass)

- test object does not meet the requirement.....: F (Fail)

Testing.....:

Date of receipt of test item.....: March 25, 2024

Date(s) of performance of tests.....: March 25, 2024 to August 13, 2024

General remarks:

The test results presented in this report relate only to the object tested.
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"(see Enclosure #)" refers to additional information appended to the report.
"(see appended table)" refers to a table appended to the report.

Throughout this report a ☐ comma / ☒ point is used as the decimal separator.

Manufacturer's Declaration per sub-clause 4.2.5 of IEC 60335-1:

The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided.....:

☐ Yes

☒ Not applicable

General product information

1, The product is incorporated motor and power units.

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict
6	Risk reduction		-
6.1	General		-
	The objective of risk reduction can be achieved by the elimination of hazards, or by separately or simultaneously reducing each of the two elements that determine the associated risk: - severity of harm from the hazard under consideration; - probability of occurrence of that harm.	This requirement is complied with.	P
	All protective measures intended for reaching this objective shall be applied in the following sequence, referred to as the three-step method (see also Figures 1 and 2).		P
6.2	Inherently safe design measures		-
6.2.1	General		--
	Inherently safe design measures are the first and most important step in the risk reduction process because protective measures inherent to the characteristics of the machine are likely to remain effective, whereas experience has shown that even well-designed safeguarding may fail or be violated and information for use may not be followed.	Appropriate machine design has been performed by the manufacturer.	P
	Inherently safe design measures are achieved by avoiding hazards or reducing risks by a suitable choice of design features of the machine itself and/or interaction between the exposed persons and the machine. NOTE See 6.3 for safeguarding and complementary measures that can be used to achieve the risk reduction objectives in the case where inherently safe design measures are not sufficient (see 6.1 for the three-step method).	Appropriate machine design has been performed by the manufacturer.	P
6.2.2	Consideration of geometrical factors and physical aspects		--
6.2.2.1	Geometrical factors		--
	Such factors include the following.		--
	a) The form of machinery is designed to maximize direct visibility of the working areas and hazard zones from the control position — reducing blind spots, for example — and choosing and locating means of indirect vision where necessary (mirrors, etc.) so as to take into account the characteristics of human vision, particularly when safe operation requires permanent direct control by the operator,	Reducing blind spots	P

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict
	for example: - the travelling and working area of mobile machines; - the zone of movement of lifted loads or of the carrier of machinery for lifting persons; - the area of contact of the tool of a hand-held or hand-guided machine with the material being worked. The design of the machine shall be such that, from the main control position, the operator is able to ensure that		
	b) The form and the relative location of the mechanical components parts: for instance, crushing and shearing hazards are avoided by increasing the minimum gap between the moving parts, such that the part of the body under consideration can enter the gap safely, or by reducing the gap so that no part of the body can enter it (see ISO 13854 and ISO 13857).	By increasing the minimum gap between the moving parts or by reducing the gap.	P
	c) Avoiding sharp edges and corners, protruding parts: in so far as their purpose allows, accessible parts of the machinery shall have no sharp edges, no sharp angles, no rough surfaces, no protruding parts likely to cause injury, and no openings which can "trap" parts of the body or clothing. In particular, sheet metal edges shall be deburred, flanged or trimmed, and open ends of tubes which can cause a "trap" shall be capped.	No sharp edges, no sharp angles, no rough surfaces, no protruding parts.	P
	d) The form of the machine is designed so as to achieve a suitable working position and provide accessible manual controls (actuators).	Suitable working position, accessible manual controls.	P
6.2.2.2	Physical aspects		--
	Such aspects include the following:		--
	a) limiting the actuating force to a sufficiently low value so that the actuated part does not generate a mechanical hazard;	The actuating force has been limited to be a sufficiently low value so that the actuated part does not generate a mechanical hazard.	P
	b) limiting the mass and/or velocity of the movable elements, and hence their kinetic energy;	The mass and/or velocity of the movable elements, and hence their kinetic energy have been limited.	P
	c) limiting the emissions by acting on the	The emissions by acting on the	P

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict
	characteristics of the source using measures for reducing 1) noise emission at source (see ISO/TR 11688-1), 2) the emission of vibration at source, such as redistribution or addition of mass and changes of process parameters [for example, frequency and/or amplitude of movements (for hand-held and hand-guided machinery, see CR 1030-1)], 3) the emission of hazardous substances, including the use of less hazardous substances or dust-reducing processes (granules instead of powders, milling instead of grinding), and 4) radiation emissions, including, for example, avoiding the use of hazardous radiation sources, limiting the power of radiation to the lowest level sufficient for the proper functioning of the machine, designing the source so that the beam is concentrated on the target, increasing the distance between the source and the operator or providing for remote operation of the machinery [measures for reducing emission of non-ionizing radiation are given in 6.3.4.5 (see also EN 12198-1 and EN 12198-3)].	characteristics of the source have been limited.	
6.2.3	Taking into account the general technical knowledge regarding machine design		P
	This general technical knowledge can be derived from technical specifications for design (e.g. standards, design codes, calculation rules). These should be used to cover :		--
	a) mechanical stresses such as		--
	- stress limitation by implementation of correct calculation, construction and fastening methods as regards, e.g. bolted assemblies, welded assemblies	The appropriate technical knowledge of mechanical has been taken into account.	P
	- stress limitation by overload prevention, (e.g. "fusible" plugs, pressure-limiting valve, breakage points, torque-limiting devices);	The appropriate technical knowledge of mechanical has been taken into account.	P
	- avoiding fatigue in elements under variable stresses (notably cyclic stresses);	The appropriate technical knowledge of mechanical has been taken into account.	P
	- static and dynamic balancing of rotating elements;	The appropriate technical knowledge of mechanical has been taken into account.	P
	b) materials and their properties such as		--
	- resistance to corrosion, ageing, abrasion and wear;	The materials have been treated by appropriate methods.	P

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict
	- hardness, ductility, brittleness;		P
	- homogeneity;		P
	- toxicity;		P
	- flammability.		P
	c) emission values for :		--
	- noise;		P
	- vibration;		P
	- hazardous substances;	No hazardous substances will result in hazard in this machine	P
	- radiation.	No hazardous substances will result in hazard in this machine	P
	When the reliability of particular components or assemblies is critical for safety (e.g. ropes, chains, lifting accessories for lifting loads or persons), stress values shall be multiplied by appropriate working coefficients.	Appropriate working coefficients have been taken into account during design and calculation.	P
6.2.4	Choice of an appropriate technology		--
	One or more hazards can be eliminated or risks reduced by the choice of the technology to be used in certain applications, e.g. :		--
	a) on machines intended for use in explosive atmospheres: - fully pneumatic or hydraulic control system and machine actuators; - "intrinsically safe" electrical equipment (see IEC 60079-11)		N
	b) for particular products to be processed such as a solvent: equipment assuring that the temperature will remain far below the flash point.		N
	c) alternative equipment to avoid high noise level, e.g.: - electrical instead of pneumatic equipment - in certain conditions, water cutting instead of mechanical equipment.		N
6.2.5	Applying the principle of the positive mechanical action		P
	Positive mechanical action is achieved when a moving mechanical component inevitably moves another component along with it, either by direct contact or via rigid elements. An example of this is positive opening operation of switching devices in an electrical circuit (see IEC 60947-5-1 and ISO 14119).		P

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Clause	Requirement + Test	Result - Remark	Verdict
6.2.6	Provisions for stability		P
	Machines shall be designed to have sufficient stability to allow them to be used safely in their specified conditions of use.	These machines have been designed to have sufficient stability to allow them to be used safely in their specified conditions of use	P
	Factors to be taken into account include		--
	- geometry of the base;	The factor has been taken into account during design.	P
	- weight distribution, including loading;	The factor has been taken into account during design.	P
	- dynamic forces due to movements of parts of the machine, of the machine itself, or of elements held by the machine which may result in an overturning moment;	The factor has been taken into account during design.	P
	- vibration	The factor has been taken into account during design.	P
	- oscillations of the centre of gravity;		N
	- characteristics of the supporting surface in case of travelling or installation on different sites (e.g. ground conditions, slope);	The factor has been taken into account during design.	P
	- external forces (e.g. wind pressure, manual forces)		P
	Stability shall be considered in all phases of the life of the machine, including handling, travelling, installation, use, de-commissioning and dismantling.		P
	Other protective measures for stability relevant to safeguarding are given in 6.3.2.6		P
6.2.7	Provision for maintainability		--
	When designing a machine, the following maintainability factors shall be taken into account:		--
	- accessibility, taking into account the environment and the human body measurements, including the dimensions of the working clothes and tools used;	The factor has been taken into account during design.	P
	- ease of handling, taking into account human capabilities;		P
	- limitation of the number of special tools and equipment;		P
6.2.8	Observing ergonomic principles		--
	Ergonomic principles shall be taken into account in	Appropriate ergonomic	P

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict
	designing machinery to reduce mental or physical stress and strain of the operator.	principles have been taken into account in designing machinery to reduce mental or physical stress and strain of the operator.	
	These principles shall be considered when allocating functions to operator and machine (degree of automation) in the basic design.	These principles have been taken into account during allocating functions to operator and machine.	P
	Account shall be taken of body sizes likely to be found in the intended user population, strengths and postures, movement amplitudes, frequency of cyclic actions (see ISO 10075 and ISO 10075-2)	All these factors have been taken into account during design.	P
	All elements of the "operator-machine" interface such as controls, signaling or data display elements, shall be designed to be easily understood so that clear and unambiguous interaction between the operator and the machine is possible.(see EN 614-1, ISO 6385, EN 13861 and IEC 61310-1)	All arrangement and design of manual controls have been checked in compliance with.	P
	Designer's attention is especially drawn to following ergonomic aspects of machine design		--
	a) Avoiding stressful postures and movements during use of the machine (e.g. by providing facilities to adjust the machine to suit the various operators).	Stressful postures and movements during use of the machine have been avoided.	P
	b) Designing machines, and more especially hand-held and mobile machines to enable them to be operated easily taking into account human effort, actuation of controls and hand, arm and leg anatomy.	This machine has been adjusted to the human strength and convenient movement.	P
	c) Limit as far as possible noise, vibration and thermal effects such as extreme temperatures.	This machine has been designed with low noise, vibration.	P
	d) Avoid linking the operator's working rhythm to an automatic succession of cycles.	This situation has been avoided.	P
	e) Providing local lighting on or in the machine for the illumination of the working area and of adjusting, setting-up, and frequent maintenance zones when the design features of the machine and /or its guards render the ambient lighting inadequate. Flicker, dazzling, shadows and stroboscopic effects shall be avoided if they can cause a risk. If the position of the lighting source has to be adjusted, its location shall be such that it does not cause any risk to persons making the adjustment.	Without lighting device	N

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Clause	Requirement + Test	Result - Remark	Verdict
	f) Select, locate and identify manual controls (actuators) so that		--
	- they are clearly visible and identifiable and appropriately marked where necessary (see 6.4.4)	All design and arrangement of the control logic have been checked in compliance with this requirement.	P
	- they can be safely operated without hesitation or loss of time and without ambiguity (e.g. a standard layout of controls reduces the possibility of error when an operator changes from a machine to another one of similar type having the same pattern of operation)	All design and arrangement of the control logic have been checked in compliance with this requirement.	P
	- their location (for push-buttons) and their movement (for levers and handwheels) are consistent with their effect (see IEC 61310-3)	All the function has been checked in compliance with this requirement.	P
	- their operation cannot cause additional risk		P
	Where a control is designed and constructed to perform several different actions, namely where there is no one-to-one correspondence (e.g. keyboards), the action to be performed shall be clearly displayed and subject to confirmation where necessary.		N
	Controls shall be so arranged that their layout, travel and resistance to operation are compatible with the action to be performed, taking account of ergonomic principles.	All the arrangement of the control logic have been checked in compliance with this requirement.	P
	Constraints due to the necessary or foreseeable use of personal protective equipment (such as footwear, gloves) shall be taken into account.	The necessary or foreseeable use of personal protective equipment have been checked in compliance with this requirement.	P
	g) Select, design and locate indicators, dials and visual display units so that		--
	- they fit within the parameters and characteristics of human perception		P
	- information displayed can be detected, identified and interpreted conveniently, i.e. long lasting, distinct, unambiguous and understandable with respect to the operator's requirements and the intended use;	All the information displayed comply with this requirement.	P
	- the operator is able to perceive them from the control position		P
6.2.9	Preventing electrical hazard		--

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Clause	Requirement + Test	Result - Remark	Verdict
	For the design of the electrical equipment of machines IEC 60204-1 gives general provisions, especially in clause 6 for protection against electric shock.	See EN 60204-1 test report	P
	For requirements related to specific machines, see corresponding IEC standards (e.g. series of IEC 61029, IEC 60745, IEC 60335).	Please also make reference to EN 60204-1 test report.	P
6.2.10	Preventing and hydraulic hazards		--
	Pneumatic and hydraulic equipment of machinery shall be designed so that :		--
	- the maximum rated pressure cannot be exceeded in the circuits (e.g. by means of pressure limiting devices)		N
	- no hazard results from pressure surges or rises, pressure losses or drops or losses of vacuum;		N
	- no hazardous fluid jet or sudden hazardous movement of the hose (whiplash) results from leakage or component failures;		N
	- air receivers, air reservoirs or similar vessels (e.g. in gas loaded accumulators) comply with the design rules for these elements;		N
	- air elements of the equipment, and especially pipes and hoses, be protected against harmful external effects;		N
	- as far as possible, reservoirs and similar vessels (e.g. in gas loaded accumulators) are automatically depressurized when isolating the machine from its power supply (see 6.3.5.4) and, if it is not possible, means are provided for their isolation, local depressurizing and pressure indication (see also ISO 14118:2000, clause 5)		N
	- all elements which remain under pressure after isolation of the machine from its power supply be provided with clearly identified exhaust devices, and a warning label drawing attention to the necessity of depressurizing those elements before any setting or maintenance activity on the machine. See also ISO 4413 and ISO 4414		N
6.2.11	Applying inherently safe design measures to control system		--
6.2.11.1	General		--
	The design measures of the control system shall be chosen so that their safety-related performance provides a sufficient amount of risk reduction (see	Inherently safe design measures to control system	P

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict
	ISO 13849-1 or IEC 62061)	have applied.	
	The correct design of machine control systems can avoid unforeseen and potentially hazardous machine behaviour.	Inherently safe design measures to control system have applied.	P
	Typical causes of hazardous machine behavior are :		--
	- an unsuitable design or modification (accidental or deliberate) of the control system logic;	No this kind of hazard in this machine	N
	- a temporary or permanent defect or a failure of one or several components of the control system;		N
	- a variation or a failure in the power supply of the control system;		N
	- inappropriate selection, design and location of the control devices;		N
	Typical examples of hazardous machine behaviour are :		--
	- unintended/unexpected start-up(see ISO 14118)		N
	- uncontrolled speed change;	Speed monitor	P
	- failure to stop moving parts;	Emergency stop devices	P
	- dropping or ejection of a mobile part of the machine or of a workpiece clamped by the machine;		P
	- machine action resulting from inhibition (defeating or failure) of protective devices	No this kind of hazard in this machine	N
	In order to prevent hazardous machine behaviour and to achieve safety functions, the design of control systems shall comply with the principles and methods presented in this subclause 6.2.11 and in 6.2.12.		P
	In order to prevent hazardous machine behaviour and to achieve safety functions, the design of control systems shall comply with the principles and methods presented in this subclause 6.2.11 and in 6.2.12.	The design of control systems comply with the related principles and methods	P
	These principles and methods shall be applied singly or in combination as appropriate to the circumstances (see ISO 13849-1 and IEC 60204-1and IEC 62061).	See the test report of EN 60204-1	P
	Control systems shall be designed to enable the operator to interact with the machine safely and easily; this requires one or several of the following solutions;		--
	- systematic analysis of start and stop conditions;	Systematic analysis have been applied.	P

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict
	- provision for specific operating modes (e.g. start-up after normal stop, restart after cycle interruption or after emergency stop, removal of the workpieces contained in the machine, operation of a part of the machine in case of a failure of a machine element)	Enough provisions have been provided.	P
	- clear display of the faults;		P
	- measures to prevent accidental generation of unexpected start commands (e.g. shrouded start device) likely to cause dangerous machine behaviour (see ISO14118:2000, figure 1)	Main switch with lock and related devices are provided.	P
	- maintained stop commands(e.g. interlock) to prevent restarting that could result in dangerous machine behaviour (see ISO 14118:2000, figure 1)	This requirement is complied with.	P
	An assembly of machines may be divided into several zones for emergency stopping, for stopping as a result of protective devices and/or for isolation and energy dissipation.		P
	The different zones shall be clearly defined and it shall be obvious which parts of the machine belong to which zone.		P
	Likewise it shall be obvious which control devices (e.g. emergency stop devices, supply disconnecting devices)and/or protective devices belong to which zone.		P
	Control systems shall be designed to limit the movements of parts of the machinery, the machine itself, or workpieces and/or loads held by the machinery, to the safe design parameters(e.g. range, speed, acceleration, deceleration, load capacity). Allowance shall be made for dynamic effects (e.g. the swinging of loads).	The max. speed	P
	For example:		--
	- the traveling speed of mobile pedestrian controlled machinery other than remote-controlled shall be compatible with walking speed.		N
	- the range, speed, acceleration and deceleration of movements of the person-carrier and carrying vehicle for lifting persons shall be limited to non-hazardous values, taking into account the total reaction time of the operator and the machine.		N
	- the range of movements of parts of machinery for lifting loads shall be kept within specified limits.		P
	When machinery is designed to use synchronously		N

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict
	different elements which can also be used independently the control system shall be designed to prevent risks due to lack of synchronization.		
6.2.11.2	Starting of internal power source/switching on an external power supply		P
	The starting of an internal power source or switching-on of an external power supply shall not result in a hazardous situation. For example: - starting the internal combustion engine shall not lead to movement of a mobile machine; - connection to mains electricity supply shall not result in the starting of working parts of a machine. See IEC 60204-1:2005, 7.5 (see also Annexes A and B).	Not result in the starting of working parts of a machine	P
6.2.11.3	Starting/ stopping of a mechanism		P
	The primary action for starting or accelerating the movement of a mechanism should be performed by application or increase of voltage or fluid pressure, or, if binary logic elements are considered, by passage from state 0 to state 1(if state 1 represents the highest energy state)	This requirement has been taken into account during design.	P
	The primary action for stopping or slowing down should be performed by removal or reduction of voltage or fluid pressure, or, if binary logic elements are considered, by passage from state 1 to state 0 (if state 1 represents the highest energy state).	The type of stopping of this machine belongs to state 1 and state 0.	P
	When, in order for the operator to maintain permanent control of deceleration, this principle is not observed (e.g. a hydraulic braking device of a self-propelled mobile machine), the machine shall be equipped with a means of slowing and stopping in case of failure of the main braking system	No such situation exist.	N
6.2.11.4	Restart after power interruption		--
	If it may generate a hazard, the spontaneous restart of a machine when it is re-energized after power interruption shall be prevented (e.g. by use of a self-maintained relay, contactor or valve).	A self-maintained relay	P
6.2.11.5	Interruption of power supply		--
	Machinery shall be designed to prevent hazardous situations resulting from interruption or excessive fluctuation of the power supply. At least the following requirements shall be met:	The hazardous situations resulting from interruption or excessive fluctuation of the power supply has been prevented.	P

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict
	- the stopping function of the machinery shall remain;		P
	- all devices whose permanent operation is required for safety shall operation an effective way to maintain safety (e.g. locking, clamping devices, cooling or heating devices, power-assisted steering of self-propelled mobile machinery);		P
	- parts of machinery or workpieces and/or loads held by machinery which are liable to move as a result of potential energy shall be retained for the time necessary to allow them to be safely lowered.	No such situation exists.	P
6.2.11.6	Use of automatic monitoring		--
	Automatic monitoring is intended to ensure that a safety function(s) implemented by a protective measure do(es) not fail to be performed if the ability of a component or an element to perform its function is diminished, or if the process conditions are changed in such a way that hazards are generated.	Appropriate automatic monitoring has been used.	P
	Automatic monitoring either detects a fault immediately or carries out periodic checks so that a fault is detected before the next demand upon the safety function.	Appropriate automatic monitoring has been used.	P
	In either case, the protective measure can be initiated immediately or delayed until a specific event occurs (e.g. the beginning of the machine cycle.) The protective measures may be , e.g.:	Appropriate automatic monitoring has been used.	P
	- the stopping of the hazardous process;		P
	- preventing the re-start of this process after the first stop following the failure;	Reset before restart is necessary.	P
	- the triggering of an alarm		P
6.2.11.7	Safety functions implemented by programmable electronic control systems		--
6.2.11.7.1	General		--
	A control system including programmable electronic equipment (e.g. programmable controllers) can be used to implement safety functions t machinery.		N
	Where a programmable electronic control system is used it is necessary to consider its performance requirements in relation to the requirements for the safety functions.		N
	The design of the programmable electronic control system shall be such that the probability of random		N

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict
	hardware failures and the likelihood of systematic failures that can adversely affect the performance of the safety-related control function(s) are sufficiently low.		
	Where a programmable electronic control system performs a monitoring function, the system behaviour on detection of a fault shall be considered (see also IEC 61508 series for further guidance)		N
	The programmable electronic control system should be installed and validated to ensure that the specified performance (e.g. safety integrity level (SIL) in IEC 61508 series) for each safety function has been achieved.		N
	Validation comprises testing an analysis (e.g. static, dynamic or failure analysis) to show that all parts interact correctly to perform the safety function and that unintended functions do not occur.		N
6.2.11.7.2	Hardware aspects		
	The hardware (including e.g. sensors, actuators, logic solvers) shall be selected (and/or designed) and installed to meet both the functional and performance requirements of the safety function(s) to be performed, in particular, by means of :	The hardware has been selected and installed to meet both the functional and performance requirements of the safety functions to be performed.	P
	- architectural constraints (e.g. the configuration of the system, its ability to tolerate faults, its behaviour on detection of a fault);	Appropriate devices are provided.	P
	- selecting (and/or designing) equipment and devices with an appropriate probability of dangerous random hardware failure;	Appropriate devices are provided.	P
	- Incorporating measures and techniques within the hardware to avoid systematic failures and control systematic faults.	Appropriate devices are provided.	P
6.2.11.7.3	Software aspects		P
	The software (including internal operating software (or system software) and application software) shall be designed so as to satisfy the performance specification for the safety functions (see also IEC 61508-3)		P
	Application software		P
	Application software should not be re-programmable by the user.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	This may be achieved by use of embedded software in a non re-programmable memory (e.g. micro-controller, application specific integrated circuit (ASIC)		N
	When the application requires reprogramming by the user, the access o the software dealing with safety functions should be restricted e.g. by : - locks; - passwords for the authorized persons		N
6.2.11.8	Principles relating to manual control		
	a) Manual control devices shall be designed and located according to the relevant ergonomic principles given in 6.2.8		P
	b) A stop control device shall be placed near each start control device. Where the start/stop function is performed by means of a hold-to-run control, a separate stop control device shall be provided when a risk can result from the hold-to-run control device failing to deliver a stop command when released.	A stop control device has been placed near each start control device.	P
	c) Manual controls shall be located out of reach of the danger zones (see IEC 61310-3), except for certain controls where, of necessity, they are located within a danger zone, such as emergency stop or teach pendant.	Manual controls have been located out of reach of the danger zones.	P
	d) Whenever possible, control devices and control positions shall be located so that the operator is able to observe the working area or hazard zone.	The control devices and control positions have been located so that the operator is able to observe the working area or hazard zone.	P
	The driver of a ride-on mobile machine shall be able to actuate all control devices required to operate the machine from the driving position, except for functions which can be controlled more safely from other positions.		N
	On machinery intended for lifting persons, controls for lifting and lowering and, if appropriate, for moving the carrier, shall generally be located in the carrier. If safe operation requires controls to be situated outside the carrier, the operator in the carrier shall be provided with the means of preventing hazardous movements.		N
	e) if it is possible to start the same hazardous element by means of several controls, the control		N

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Clause	Requirement + Test	Result - Remark	Verdict
	circuit shall be so arranged that only one control is effective at a given time. This applies especially to machines which can be manually controlled by means among others of a portable control unit (teach pendant, for instance), with which the operator may enter danger zones.		
	f) Control actuators shall be designed or guarded so that their effect, where a risk is involved, cannot occur without intentional operation (see ISO 9355-1 and ISO 447)	Control actuators have been designed or guarded so that their effect, where a risk is involved, cannot occur without intentional operation.	P
	g) For machine functions whose safe operation depends on permanent, direct control by the operator, measures shall be taken to ensure the presence of the operator at the control position , e.g. by the design and location of control devices.		N
	h) For cableless control an automatic stop shall be performed when correct control signals are not received, including loss of communication (see IEC 60204-1)		P
6.2.11.9	Control mode for setting, teaching, process changeover, fault-finding, cleaning or maintenance		P
	Where, for setting, teaching, process changeover, fault-finding, cleaning or maintenance of machinery, a guard has to be displaced or removed and/or a protective device has to be disabled, and where it is necessary for the purpose of these operations for the machinery or part of the machinery to be put in operation, safety of the operator shall be achieved using a specific control mode which simultaneously:		N
	- disables all other control modes;		N
	- permits operation of the hazardous elements only by continuous actuation of an enabling device, a hold-to-run control device or a two-hand control device;		N
	- permits operation of the hazardous elements only in reduced risk conditions (e.g. reduced speed, reduced power/force, step-by-step operation, e.g. with a limited movement control device)		N
	prevents any operation of hazardous functions by voluntary or involuntary action on the machine's sensors.		N
	This control mode shall be associated with one or more of following measures:		P
	- restriction of access to the danger zone as far as possible.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	- emergency stop control within immediate reach of the operator;		P
	- portable control unit (teach pendant) and/or local controls allowing sight of the controlled elements.(see IEC 60204-1)		P
6.2.11.10	Selection of control and operating modes		P
	If machinery has been designed and built to allow for its use in several control or operating modes requiring different protective measures and/or work procedures (e.g. to allow for adjustment , setting, maintenance, inspection), it shall be fitted with a mode selector which can be locked in each position.	Fitted with a mode selector which can be locked in each position.	P
	Each position of the selector shall be clearly identifiable and shall exclusively allow one control or operating mode.	This requirement is complied with.	P
	The selector may be replaced by another selection means which restricts the use of certain functions of the machinery to certain categories of operators (e.g. access codes for certain numerically controlled functions).		N
6.2.11.11	Applying measures achieve electromagnetic compatibility (EMC)		P
	For guidance on electromagnetic compatibility, see IEC 60204-1:2006,6.2.4.2 and IEC 61000-6 series.	EN 61000-6 series	P
6.2.11.12	Provision of diagnostic systems to aid fault-finding		P
	Diagnostic systems to aid fault finding should be included in the control system so that there is no need to disable any protective measure.		P
6.2.12	Minimizing the probability of failure of safety functions		P
	Safety of machinery is not only dependent on the reliability of the control system but also on the reliability of all parts of the machine.		P
	The continued operation of the safety functions is essential for the safe use of use of the machine. This can be achieved by:		P
6.2.12.1	Use of reliable components “reliable components” means components which are capable of withstanding all disturbances and stresses associated with the usage of the equipment in the conditions of intended use, for the period of time or the number of operations fixed for the use, with a low probability of failures generating a hazardous		P

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Clause	Requirement + Test	Result - Remark	Verdict
	malfunctioning of the machine. Components shall be selected taking into account all factors mentioned above.		
6.2.12.2	Use of "oriented failure mode" components		P
	"oriented failure mode" components or systems are those in which the predominant failure mode is known in advance and which can be used to that such a failure leads to a non-hazardous alteration of the machine function.		P
	The use of such components should always be considered, particularly in cases where redundancy is not employed.		P
6.2.12.3	Duplication(or redundancy) of components or subsystems		P
	In the design of safety-related parts of the machine, duplication (or redundancy) of components may be used so that, if one component fails, another component (or redundancy) continue(s) to perform its (their) function, thereby ensuring that the safety function remains available.		P
	In order to allow the proper action to be initiated, component failure shall be preferably detected by automatic monitoring (see 6.2.11.6) or in some circumstances by regular inspection, provided that the inspection interval is shorter than the expected lifetime of the components.		P
	Diversity of design and/or technology can be used to avoid common cause failures or common mode failures.		P
6.2.13	Limiting exposure to hazards through reliability of equipment		P
	Increased reliability of all component parts of machinery reduces the frequency of incidents requiring rectification, thereby reducing exposure to hazards.		P
	This applies to power systems as well as to control systems, to safety functions as well as to other functions of machinery.		P
	Safety-critical components with a known reliability shall be used,		P
	The elements of guards and of protective devices shall be particularly reliable, as their failure can expose persons to hazards, and also as poor		P

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Clause	Requirement + Test	Result - Remark	Verdict
	reliability would encourage attempts to defeat them.		
6.2.14	Limiting exposure to hazards through mechanization or automation of loading (feeding)/unloading (remove) operations		P
	Mechanization and automation of machine loading/unloading operations and more generally of handling operations(of work pieces, materials, substances) limit the risk generated by these operations by reducing the exposure of persons to hazards at the operating points.		P
	Automation can be achieved e.g. by robots, handling devices, transfer mechanisms, air blast equipment.		N
	Mechanization can be achieved, e.g. by feeding slides, push rods, hand-operated indexing tables.		N
	While automatic feeding and removal devices have much to offer in preventing accidents to machine operators, they can create danger when any fault are being rectified.		N
	Care shall be taken to ensure that the use of these devices does not introduce further hazards (e.g. trapping, crushing) between the devices and parts of the machine or workpieces /materials being processed.		N
	Suitable safeguards shall be provided if this can not be ensured.		N
	Automatic feeding and removal devices with their own control systems and the control system of the associated machine shall be interconnected after thoroughly studying how all safety functions are performed in all control and operation modes of the whole equipment		P
6.2.15	Limiting exposure to hazards through location of the setting and maintenance points outside of danger zones		N
	The need for access to danger zones shall be minimized by locating maintenance, lubrication and setting points outside these zones.		N

6.3	Safeguarding and complementary protective measures		P
6.3.1	General		P
	Guards and protective devices shall be used to	Appropriate guards and	P

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Clause	Requirement + Test	Result - Remark	Verdict
	protect persons whenever inherently safe design does not reasonably make it possible either to remove hazards or to sufficiently reduce risks.	protective devices have been used to protect persons	
	Complementary protective measures involving additional equipment (e.g. emergency stop equipment) may have to be taken (see ISO 120100-1:12003, 6.3.4).	fixed guard is used.	P
	The different kinds of guards and protective devices are defined in ISO 12100:2003, 3.25 and 3.26.		P
	Certain safeguards may be used to avoid exposure to more than one hazard (e.g. a fixed guard preventing access to a mechanical hazard is present being used to reduce noise level and collect toxic emissions).		P
6.3.2	Selection and implementation of guards and protective devices		P
6.3.2.1	General		P
	This subclause gives guidelines for the selection and the implementation of guards and protective devices the primary purpose of which is to protect persons against hazards generated by moving parts, according to the nature of those parts (see figure 1) and to the need for access to the danger zone(s).		P
	The exact choice of safeguard for a particular machine shall be made on the basis of the risk assessment for that machine.		P
	In selecting an appropriate safeguard for a particular type of machinery or hazard zone, it shall be borne in mind that a fixed guard is simple and shall be used where access of an operator to the danger zone is not required during normal operation of the machinery.		P
	As the need for frequency of access increases this inevitably leads to the fixed guard not being replaced. This requires the use of an alternative protective measure.		P
	A combination of safeguards may sometimes required. For example, where, in conjunction with a fixed guard, a mechanical loading device is used to feed a workpiece into a machine, thereby removing the need for access to primary hazard zone, as trip device may be required to protect against the secondary drawing-in or shearing hazard between the mechanical loading device, when reachable, and the fixed guard.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Consideration shall be given to the enclosure of control positions or intervention zones to provide combined protection against several hazards which may include:		P
	-hazards from falling or ejected objects		P
	-emissions hazards;		P
	-hazards due to the environment;		P
	-hazards due to tipping over or rolling over of machinery;		N
	The design of such enclosed work stations shall take into account ergonomic principles concerning visibility, lighting, atmospheric conditions, access, posture.		N
6.3.2.2	Where access to the hazard zone is not required during normal operation		P
	Where access to the hazard zone is not required during normal operation of the machinery, safeguards should be selected from the following:		--
	a) fixed guard (see also ISO 14120);	Fixed guards are provided	P
	b) interlocking guard with or without guard locking;		N
	c) self-closing guard;		P
	d) sensitive protective equipment, e.g. electro-sensitive protective equipment.		N
6.3.2.3	Where access to the hazard zone is required during normal operation.		P
	Where access to the hazard zone is required during normal operation of the machinery, safeguards should be selected from the following:		--
	a) interlocking guard with or without guard locking;		N
	b) sensitive protective equipment, e.g. electro-sensitive protective equipment;		N
	c) adjustable guard;		N
	d) self-closing guard		N
	e) interlocking guard with a start function.		N
6.3.2.4	Where access to the hazard zone is required for machine setting, teaching, process changeover, fault finding, cleaning or maintenance		P
	As far as possible, machines shall be designed so that the safeguards provided for the protection of the production operator may ensure also the		P

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Clause	Requirement + Test	Result - Remark	Verdict
	protection of personnel in charge of setting, teaching, process changeover, fault finding, cleaning or maintenance without hindering them in performing their task.		
	Such tasks shall be identified and considered in the risk assessment as parts of the use of machine.		P
6.3.2.5	Selection and implementation of sensitive protective equipment		N
6.3.2.5.1	Selection		N
	Due to the great diversity of the technologies on which their detection function is based, all types of sensitive protective equipment are far from being equally suitable for safety applications.		N
	The following provisions are intended to provide the designer with criteria for selecting , for each application , the most suitable device(s).		N
	Types of sensitive protective equipment include, e.g.:		N
	- light curtains;		N
	- scanning devices as, e.g. laser scanners;		N
	- pressure sensitive mats;		N
	- trip bars, trip wires.		N
	Sensitive protective equipment can be used:		N
	- for tripping purposes;		N
	- for presence sensing;		N
	- for both tripping and presence sensing		N
	- to re- initiate machine operation, a practice which is subject to stringent conditions.		N
	The following characteristics of the machinery, among others, can preclude the sole use of sensitive protective equipment:		N
	- tendency for the machinery to eject materials or component parts;		N
	- necessity to guard against emissions (noise, radiation, dust, etc.)		N
	- erratic or excessive machine stopping time;		N
	- inability of a machine to stop part-way through a cycle.		N
6.3.2.5.2	Implementation		N

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Clause	Requirement + Test	Result - Remark	Verdict
	consideration should be given to :		N
	a) - size, characteristics and positioning of the detection zone (see ISO 13855, which deals with the positioning of some types of sensitive protective equipment)		N
	b) - reaction of the device to fault conditions (see IEC 61496 for electro-sensitive protective equipment)		N
	c)- possibility of circumvention		N
	d)- detection capability and its variation over the course of time (e.g. as a result of its susceptibility to different environmental conditions such as the presence of reflecting surfaces, other artificial light sources, sunlight or impurities in the air.		N
	sensitive protective equipment shall be integrated in the operative part and associated with the control system of the machine so that:		N
	- a command is given as soon as a person or part of a person is detected;		N
	- the withdrawal of the person or part of a person detected does not, by itself, restart the hazardous machine function (s); therefore, the command given by the sensitive protective equipment shall be maintained by the control system until a new command is given;		N
	- restarting the hazardous machine function(s) results from the voluntary actuation , by the operator, of a control device placed outside the hazard zone, where this zone can be observed by the operator;		N
	- the machine cannot operate during interruption of the detection function of the sensitive protective equipment, except during muting phases,;		N
	- the position and the shape of detection field prevents, ,possibly together with fixed guards, a person or part of a person from entering the hazard zone, or being present in it, without being detected.		N
6.3.2.5.3	Additional requirements for sensitive protective equipment when used for cycle initiation.		N
	In this exceptional application, starting of the machine cycle is initiated by the withdrawal of a person or of the detected part of a person from the sensing field of the sensitive protective equipment,		N

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Clause	Requirement + Test	Result - Remark	Verdict
	without any additional start command, hence deviating from the general requirement given in the second point of the dashed list in 6.3.2.5.2, above. After switching on the power supply, or when the machine has been stopped by the tripping function of the sensitive protective equipment, the machine cycle shall be initiated only by voluntary actuation of a start control.		
	Cycle initiation by sensitive protective equipment shall be subject to the following conditions:		N
	a) only active optoelectronic protective devices (AOPDs) complying with IEC 61496 series shall be used;		N
	b) the requirements for an AOPD used as a tripping and presence- sensing device (see IEC 61496) are satisfied — in particular, location,		N
	minimum distance (see ISO 13855), detection capability, reliability and monitoring of control and braking systems;		N
	c) the cycle time of the machine is short and the facility to re- initiate the machine upon clearing of the sensing field is limited to a period commensurate with a single normal cycle;		N
	d) entering the sensing field of the AOPD(s) or opening interlocking guards is the only way to enter the hazard zone;		N
	e) if there is more than one AOPD safeguarding the machine, only one of the AOPD (s) is capable of cycle re- initiation;		N
	f) with regard to the higher risk resulting from automatic cycle initiation, the AOPD and the associated control system comply with a higher safety- related performance than under normal conditions.		N
6.3.2.6	Protective measures for stability		P
	If stability cannot be achieved by inherently safe design measures such as weight distribution(see4.6), it will be necessary to maintain it by protective measures such as the use of :		P
	- anchorage bolts;		P
	- locking devices;		P
	- movement limiters or mechanical stops;		N

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Clause	Requirement + Test	Result - Remark	Verdict
	- acceleration or deceleration limiters;		N
	- load limiters;		N
	- alarms warning of the approach to stability or tipping limits.		N
6.3.2.7	Other protective devices		--
	When a machine requires continuous control by the operator and an error of the operator can generate a hazardous situation, this machine shall be equipped with the necessary devices to enable the operation to remain within specified limits, in particular		N
	Automatic protective measures triggered by such devices which take operation of the machinery out of the control of the operator should be preceded or accompanied by a warning signal to enable the operator to take appropriate action.		N
6.3.3	Requirements for the design of guards and protective devices		P
6.3.3.1	General requirements		P
	Guards and protective devices shall be designed to be suitable for the intended use, taking into account mechanical and other hazards involved.	Guards and protective devices have been appropriately designed.	P
	Guards and protective devices shall be compatible with the working environment of the machine and designed so that they can not be easily defeated.		P
	They shall provide the minimum possible interference with activities during operation and other phases of machine life, in order to reduce any incentive do defeat them.		P
	Guards and protective devices shall:		--
	- be of robust construction;	Steel	P
	- not give rise to any additional hazard;	No additional hazard	P
	- not be easy to by- pass or render non-operational;	not be easy to by-pass	P
	- be located at an adequate distance from the danger zone(see ISO13852,ISO13853 and ISO13855);	an adequate distance from the danger zone	P
	- cause minimum obstruction to be view of the production process;		P
	- enable essential work to be carried out on installation and/or replacement of tools and also for maintenance by allowing access only to the area		P

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Clause	Requirement + Test	Result - Remark	Verdict
	where the work has to be done, if possible without the guard or protective device having to be move		
	For openings in the guards see ISO13852 and ISO13853.		P
6.3.3.2	Requirements of guards		P
6.3.3.2.1	Functions of guards		P
	The functions that guards can achieve are:		--
	- prevention of access to the space enclosed by guard and/or -containment/capture of materials, workpieces, chips, liquids which may be ejected or dropped by the machine and reduction of emissions(noise, radiation, hazardous substances such as dust, fumes, gases) which may be generated by the machine.	The space enclosed. Containment of workpieces, chips, liquids which may be ejected by the machine	P
	Additionally, they may need to have particular propertied relating to electricity, temperature, fire, explosion, vibration, visibility(see ISO 14120) and operator position ergonomics(e.g. usability, operator's movements, posture, repetitive movements).		P
6.3.3.2.2	Requirements for fixed guards		--
	Fixed guards shall be securely held in place:		--
	- either permanently(e.g. by welding);		N
	- or by means of fasteners making removal/opening impossible without using tools, they should not remain closed without their fasteners.	All the fixed guards are securely held in place by appropriate fasteners.	P
6.3.3.2.3	Requirements for movable guards		--
	a) movable guards which provide protection against hazards generated by moving transmission parts shall:		--
	- as far as possible remain fixed to the machinery or other structure when open;	by means of guides or hinges	P
	- be interlocking guards(with guard locking when necessary)		N
	b) movable guards against hazards generated by non- transmission moving parts shall be design and associated with the machine control system so that:		N
	- moving parts cannot start up while they are within the operator's reach and the operator cannot reach moving parts once they have started up; this can be achieved by interlocking guards, with guard locking when necessary;		N

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Clause	Requirement + Test	Result - Remark	Verdict
	- they can be adjusted only by an intentional action, such as the use of a tool or a key;		N
	- the absence or failure of one of their components prevents starting of the moving parts or stops them; this can be achieved by automatic monitoring.		N
6.3.3.2.4	Requirements for adjustable guards		N
	Adjustable guards may only be used where the hazard zone cannot for operational reasons be completely enclosed.		N
	They shall:		N
	- be designed so that the adjustment remains fixed during a given operation;		N
	- be readily adjustable without the use of tools.		N
6.3.3.2.5	Requirements for interlocking guards with a start Function (control guards)		--
	An interlocking guard with a start function may be used only when all the following requirements are met:		N
	- all requirements for interlocking guards are satisfied;		N
	- the cycle time of the machine is short;		N
	- the maximum opening time of the guard is preset to a low value. When this time is exceeded, the hazardous function(s) cannot be initiated by the closing of the interlocking guard with a start function and resetting is necessary before restarting the machine;		N
	- the dimensions or shape of the machine do not allow a person, or part of a person, to stay in the hazard zone or between the hazard zone and the guard while the guard is closed;		N
	- all other guard whether fixed(removable type) or movable are interlocking guards;		N
	- the interlocking device associated with the interlocking guard with a start function is designed in such a way- e.g. by duplication of position detectors and use of automatic monitoring- that its failure cannot lead to an unintended/unexpected start- up;		N
	- the guard is securely held open such that it cannot initiate a start while falling by its own weight.		N
6.3.3.2.6	Hazards from guards		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Care shall be taken to prevent hazard which might be generated by:		--
	- the guard construction	No harp edges and corners.	P
	- the movements of the guards		N
6.3.3.3	Technical characteristics of protective devices		P
	Protective devices shall be selected of designed and connected to the control system so as to ensure correct implementation of their safety function(s).		P
	Protective devices shall be either selected as meeting the appropriate product standard or designed according to one or several of the principles formulated in ISO 13849- 1.		P
	Protective devices shall be installed and connected to the control system so that they can not be easily defeated.		P
6.3.3.4	Provisions for alternative types of safeguards		N
	Provisions should be made to facilitate the fitting of alternative types of safeguards on machinery where it is known that this fitting will be necessary because the work to be done on it will vary.		N
6.3.4	Safeguarding for reducing emissions		P
6.3.4.1	General		P
	If the measures for the reduction of emission at source mentioned in 4.2.2 are not adequate, the machine shall be provided with additional protective measures.		P
6.3.4.2	Noise		P
	Additional protective measures include, for example:		P
	- enclosures(see ISO 15667);	Enclosures	P
	- screens fitted to the machine;		N
	- silencers(see ISO 14163).		N
6.3.4.3	Vibration		N
	Additional protective measures include, for example, damping devices for vibration isolation between the source and the exposed person such as resilient mounting or suspended seats.		N
	For measures for vibrationisolation of stationary industrial machinery see EN1299.		N

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Clause	Requirement + Test	Result - Remark	Verdict
6.3.4.4	Hazardous substances		P
	Additional protective measures include, for example:		--
	— encapsulation of the machine(enclosure with negative pressure);		P
	— local exhaust ventilation with filtration;		N
	— wetting with liquids;		N
	— special ventilation in the area of the machine(air curtains, cabins for operators).		N
6.3.4.5	Radiation		N
	Additional protective measures include, for example:		N
	— use of filtering and absorption;		N
	— use of attenuating screens or guards.		N
6.3.5	Complementary protective measures		P
6.3.5.1	General		P
	Protective measures which are neither inherently safe design measures, nor safeguarding (implementation of guards and/or protective devices), nor information for use may have to be implemented as required by the intended use and the reasonably foreseeable misuse of the machine.		P
	Such measures include, but are not limited to, the ones dealt with in 6.3.5.2 to 6.3.5.6.		P
6.3.5.2	Components and elements to achieve the emergency stop function		P
	If following a risk assessment, a machine needs to be fitted with components and elements to achieve an emergency stop function to enable actual or impending emergency situations to be averted, the following requirements apply:		--
	— the actuators shall be clearly identifiable, clearly visible and readily accessible;		P
	— the hazardous process shall be stopped as quickly as possible without creating additional hazards. If this is not possible or the risk cannot be reduced, it should be questioned whether implementation of an emergency stop function is the best solution;		N
	— the emergency stop control shall trigger or permit the triggering of certain safeguard movements where necessary.		P
	Once active operation of the emergency stop device		P

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	has ceased following an emergency stop command, the effect of this command shall be sustained until it is reset.		
	This reset shall be possible only at that location where the emergency stop command has been initiated.		P
	The reset of the device shall not restart then machinery, but only permit restarting.		P
	More details for the design and selection of electrical components and elements to achieve the emergency stop function are provided in IEC 60204 series.		P
6.3.5.3	Measures for the escape and rescue of trapped persons		P
	Measures for the escape and rescue of trapped persons may consist, e.g. of:		--
	— escape routes and shelters in installations generating operator- trapping hazards;		P
	— arrangements for moving some elements by hand, after an emergency stop;		N
	— arrangements for reversing the movement of some elements;		N
	— anchorage points for descender devices;		N
	— means of communication to enable trapped operators to call for help.		P
6.3.5.4	Measures for isolation and energy dissipation		P
	Especially with regard to their maintenance and repair, machines shall be equipped with the technical means to achieve the isolation from power supply(ies) and dissipation of stored energy as a result of following actions:		N
	a) isolating (disconnecting, separating) the machine (or defined parts of the machine) from all power supplies;		P
	b) locking (or otherwise securing) all the isolating units in the isolating position;		P
	c) dissipating or, If this is not possible or practicable, restraining (containing) any stored energy which may give rise to a hazard;		N
	d) verifying, by means of a safe working procedure, that the actions taken according to a),b)and c) above have produced the desired effect.		P
6.3.5.5	Provisions for easy and safe handling of machines and their heavy component parts		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Machines and their component parts which cannot be moved or transported by hand shall be provided or capable of being provided with suitable attachment devices for transport by means of lifting gear.	Provided with suitable attachment devices for transport by means of lifting gear.	P
	These attachments may be, e.g.:		--
	— standardized lifting appliances with slings, hooks, eyebolts, or tapped holes for appliance fixing;	slings	P
	— appliances for automatic grabbing with a lifting hook when attachment is not possible from the ground;		N
	— guiding grooves for machines to be transported by a fork truck;		N
	— lifting gear and appliances integrated into the machine.		N
	Parts of machinery which can be removed manually in operation shall be provided with means for their safe removal and replacement.		N
6.3.5.6	Measures for safe access to machinery		P
	Machinery shall be so designed as to enable operation and all routine tasks relating to setting and/or maintenance, to be carried out, as far as possible, by a person remaining at ground level.		P
	Where this is not possible, machines shall have built-in platforms, stairs or other facilities to provide safe access for those tasks, but care should be taken to ensure that such platforms or stairs do not give access to danger zones of machinery.		N
	The walking areas shall be made from materials which remain as slip resistant as practicable under working conditions and, depending on the height from the ground, suitable guard- rails		P
	In large automated installations, particular attention shall be given to safe means of access such as walkways, conveyor bridges or crossover points.		N
	Means of access to parts of machinery located at a height shall be provided with collective means of protection against falls (e.g. guard- rails for stairways, stepladders and platforms and/or safety cages for ladders).		N
	As necessary, anchorage points for personal protective equipment against falls from a height shall also be provided (e.g. in carriers of machinery		N

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Clause	Requirement + Test	Result - Remark	Verdict
	for lifting persons or with elevating control stations).		
	Openings shall whenever possible open towards a safe position. They shall be designed to prevent hazards due to unintended opening.		N
	The necessary aids for access shall be provided(e.g. steps, handholds). Control devices shall be designed and located to prevent their being used as aids for access.		N
	When machinery for lifting goods and/or persons includes landings at fixed levels, these shall be equipped with interlocking guards preventing falls when the platform is not present at the level.		P
	Movement of the lifting platform shall be prevented while the guards are open.		P
	For detailed provisions see ISO 14122- 1, ISO 14122- 2, ISO 14122- 3 and ISO 14122- 4.		N

6.4	Information for use		P
6.4.1	General requirements		--
6.4.1.1	Drafting information for use is an integral part of the design of a machine (see ISO 12100- 1:2003, figure 1).		P
	Information for use consists of communication links, such as texts, words, signs, signals, symbols or diagrams, used separately or in combination to convey information to the user.	All the information is stated in the appropriate place	P
	It is directed to professional and/or nonprofessional users.	All the information is stated in the appropriate place	P
6.4.1.2	Information shall be provided to the user about the intended use of the machine, taking into account, notably, al its operating modes.	See the instruction	P
	It shall contain all directions required to ensure safe and correct use of the machine.	See the instruction	P
	With this in view, it shall inform and warn the user about residual risk.		P
	The information shall indicate:		--
	— if training is needed;	See the instruction	P
	— if personal protective equipment is needed;		P
	— the possible need for additional guards or protective devices(see ISO 12100- 1:2003. figure 1,	See the instruction	P

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict
	note 4).		
	It shall not exclude uses of the machine that can reasonably be expected from its designation and description and shall also warn about the risk which would result from using the machine in other ways than the ones described in the information, especially considering its reasonably foreseeable misuse.	See the instruction	P
6.4.1.3	Information for use shall cover, separately or in combination, transport, assembly and installation, commissioning, use (setting, teaching/programming or process changeover, operation, cleaning, fault finding and maintenance) of the machine, and, if necessary, de- commissioning, dismantling and disposal.	See the instruction	P
6.4.2	Location and nature of the information for use		P
	Depending on the risk, the time when the information is needed by the user and the machine design, it shall be decided whether the information- or parts thereof- are to be given:		P
	— in/on the machine itself (see 6.4.3 and 6.4.4);		P
	— in accompanying documents (in particular user manual, see 6.4.5);	Adequate information is stated in the accompanying documents	P
	— on the packaging;	Adequate information is stated on the packaging	P
	— by other means such as signals and warnings outside the machine.	Adequate information is stated	P
	Standardized phrases shall be considered where important messages such as warnings need to be given (see also IEC 62079).	This requirement is considered	P
6.4.3	Signals and warning devices		P
	Visual signals (e.g. flashing lights) and audible signals (e.g. sirens) may be used to warn of an impending hazardous event such as machine start-up or overspeed.	Signals and warning devices are provided.	P
	Such signals may also be used to warn the operator before the triggering of automatic protective measures (see last paragraph of 5.2.7).		P
	It is essential that these signals:		--
	— are emitted before the occurrence of the hazardous event;		P

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict
	— are unambiguous;		P
	— can be clearly perceived and differentiated from all other signals used;		P
	— can be clearly recognized by the operator and other persons.		P
	The warning devices shall be designed and located such that checking is easy.		N
	The information for use shall prescribe regular checking of warning devices.		P
	The attention of designers is drawn to the risks from “sensorial saturation” which results from too many visual and/or acoustic signals, which may also lead to defeating the warning devices.		P
6.4.4	Markings, signs(pictograms), written warnings		P
	Machinery shall bear all markings which are necessary:		P
	a) for its unambiguous identification, at least:		P
	— name and address of the manufacturer,	See label copy	P
	— designation of series or type;	Adequate information provided	P
	— serial number, if any;		P
	b) in order to indicate its compliance with mandatory requirements:		P
	— marking;		P
	— written indications(e.g. for machines intended for use in potentially explosive atmosphere);		P
	c) for its safe use, e.g.:		P
	— maximum speed of rotating parts;		N
	— maximum diameter of tools;		N
	— mass (expressed in kilograms) of the machine itself and/or of removable parts;		P
	— maximum working load;		P
	— necessity of wearing personal protective equipment;		N
	— guard adjustment data;		P
	— frequency of inspection.	See the instruction	P
	Information printed directly on the machine should be permanent and remain legible throughout the	Permanent and remain legible	P

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Clause	Requirement + Test	Result - Remark	Verdict
	expected life of the machine.		
	Signs or written warnings only saying “danger” shall not be used.		P
	Markings, signs and written warnings shall be readily understandable and unambiguous, especially as regards the part of the function(s) of the machine which they are related to.	All the markings are standard	P
	Readily understandable signs (pictograms) should be used in preference to written warnings		P
	Signs and pictograms should only be used if they are understood in the culture in which the machinery is to be used.		P
	Written warnings shall be drawn up in the language(s) of the country in which the machine will be used for the first time and , on request, in the language(s) understood by operators.		P
6.4.5	Accompanying documents (in particular, User manual)		P
6.4.5.1	Contents		P
	The user manual or other written instructions (e.g. on the packaging) shall contain among others:		P
	a) information relating to transport, handling and storage of the machine, e.g.:	All the related information is stated in the user manual	P
	— storage conditions for the machine;		P
	— dimensions, mass value(s), position of the centre(s) of gravity;		P
	— indications for handling (e.g. drawings indicating application points for lifting equipment);		P
	b) information relating to installation and commissioning of the machine, e.g.:	All the related information is stated in the user manual	P
	— fixing/anchoring and vibration dampening requirements;		P
	— assembly and mounting conditions;		P
	— space needed for use and maintenance;		P
	— permissible environmental conditions (e.g. temperature, moisture, vibration, electromagnetic radiation);		P
	— instructions for connecting the machine to power supply (particularly about protection against electrical overloading);		P

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict
	— advice about waste removal/ disposal;		P
	— if necessary, recommendations about protective measures which have to be taken by the user, e.g. additional safeguards (see ISO 12100- 1:2003, figure 1,NOTE 4), safety distances, safety signs and signals;		P
	c) information relating to the machine itself, e.g.:	All the related information is stated in the user manual	P
	— detailed description of the machine, its fittings, its guards and/or protective devices;		P
	— comprehensive range of applications for which the machine is intended, including prohibited usages, if any, taking into account variations of the original machine if appropriate;		P
	— diagrams (especially schematic representation of safety functions);		P
	— data about noise and vibration generated by the machine, about radiation, gases, vapours ,dust emitted by it ,with reference to the measuring methods used;		P
	— technical documentation about electrical equipment(see IEC 60204 series)		P
	— documents attesting that the machine complies with mandatory requirements;		P
	d) information relating to the use of the machine, e.g. about:	All the related information is stated	P
	— intended use;		P
	— description of manual controls (actuators);		P
	— setting and adjustment;		P
	— modes and means for stopping (especially emergency stop);		P
	— risks which could not be eliminated by the protective measures taken by the designer;		P
	— particular risks which may be generated by certain applications, by the use of certain fittings, and about specific safeguards which are necessary for such applications;		P
	— reasonably foreseeable misuse and prohibited usages;		P
	— personal protective equipment which need to be		P

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Clause	Requirement + Test	Result - Remark	Verdict
	used and training required;		
	e) information for maintenance, e.g.:	All the related information is stated	P
	— nature and frequency of inspections for safety functions;		P
	— instructions relating to maintenance operations which require a definite technical knowledge or particular skills and hence should be carried out exclusively by skilled persons (e.g. maintenance staff, specialists);		P
	- instructions relating to maintenance actions (e.g. replacement of parts) which do not require specific skills and hence may be carried out by users (e.g. operators);		P
	— drawings and diagrams enabling maintenance personnel to carry out their task rationally (especially fault-finding tasks);		P
	f) information relating to de-commissioning, dismantling and disposal;	All the related information is stated	P
	g) information for emergency situations, e.g.:		N
	— type of fire-fighting equipment to be used;		N
	— warning about possible emission or leakage of harmful substance(s), and if possible , indication of means to fight their effects;		N
	h) maintenance instructions provided for skilled persons second dash in e)) and maintenance instructions provided for unskilled persons(third dash in e)), that should appear clearly separated from each other.		P
6.4.5.2	Production of the user manual		P
	a) Type and size of print shall ensure the best possible legibility. Safety warnings and/or cautions should be emphasized by the use of colours, symbols and/or large print.	Legibility.	P
	b) Information for use shall be given in the language(s) of the country in which the machine will be used for the first time and in the original version. If more than one language are to be used, each language should be readily distinguished from the other(s), and efforts should be made to keep the translated text and the relevant illustration together.	English	P
	c) Whenever helpful to the understanding, text	See the User manual.	P

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Clause	Requirement + Test	Result - Remark	Verdict
	should be supported by illustrations. illustrations should be supplemented with written details enabling, for instance, manual controls (actuators) to be located and identified; they should not be separated from the accompanying text and should follow sequential operations		
	d) Consideration should be given to presenting information in tabular form where this will aid understanding. Tables should be adjacent to the relevant text.	See the User manual.	P
	e) the use of colours should be considered, particularly in relation to components requiring quick identification.		N
	f) When information for use is lengthy, a table of contents and/or an index should be given.		P
	g) Safety-relevant instructions which involve immediate action should be provided in a form readily available to the operator.		P
6.4.5.3	Advice for drafting and editing information for use		P
	a) Relationship to model: the information shall clearly relate to the specific model of machine.	See the difference between the models	P
	b) Communication principles: when information for use is being prepared, the communication process "see-thing-use" should be followed in order to achieve the maximum effect and should follow sequential operations. The questions "how?" and "why?" should be anticipated and the answers provided.		P
	c) Information for use shall be as simple and as brief as possible, and should be expressed in consistent terms and units with a clear explanation of unusual technical terms.		P
	d) When it is foreseen that a machine will be put to non-professional use, the instructions should be written in a form that is readily understood by the non-professional users. If personal protective equipment is required for the safe use of the machine, clear advice should be given, e.g. on the packaging as well as on the machine, so that this information is prominently displayed at the point of sale.		P
	e) Durability and availability of the documents: documents giving instructions for use should be produced in durable form (i.e. they should be able to survive frequent handling by the user).		P

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict
	It may be useful to mark them “keep for future reference”		P
	Where information for use is kept in electronic form (e.g. CD, DVD, tape) information on safety-related issues that need immediate action shall always be backed up with a hard copy that is readily available.		P

7	Documentation of risk assessment and risk reduction		P
	The documentation shall demonstrate the procedure that has been followed and the results that have been achieved. This includes, when relevant, documentation of	See Annex 1 for the risk assessment report in detail.	P
	a) the machinery for which the risk assessment has been made (for example, specifications, limits, intended use);		P
	b) any relevant assumptions that have been made (loads, strengths, safety factors, etc.);		P
	c) the hazards and hazardous situations identified and the hazardous events considered in the risk assessment;		P
	d) the information on which risk assessment was based (see 5.2):		P
	1) the data used and the sources (accident histories, experience gained from risk reduction applied to similar machinery, etc.);		P
	2) the uncertainty associated with the data used and its impact on the risk assessment;		P
	e) the risk reduction objectives to be achieved by protective measures;		P
	f) the protective measures implemented to eliminate identified hazards or to reduce risk;	Warning sign and wear PPE	P
	g) residual risks associated with the machinery;		P
	h) the result of the risk assessment (see Figure 1);		P
	i) any forms completed during the risk assessment.		P
	Standards or other specifications used to select protective measures referred to in f) above should be referenced.		P

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Risk assessment

This risk assessment report is based on the methods in the EN ISO 12100:2010 and EN ISO 14121-2 standards, and the 4 factors S-A-G-W have been used for evaluating the level of risks.

S : Severity of possible harm

- S1 : Slight (normally reversible)
- S2 : Serious (normally irreversible)
- S3 : Cause a few men die
- S4 : Calamity or cause many men die

A : Frequency any duration of exposure

- A1 : Seldom to very often
- A2 : Frequent to continuous

G : Possibilities of avoidance

- G1 : Possible
- G2 : Impossible

W : Probability of occurrence of harm

- W1 : Low
- W2 : Medium
- W3 : High

			W3	W2	W1	
			1	-	--	
			2	1	--	
		G1	3	2	1	
		G2	4	3	2	
		G1	5	4	3	
		G2	6	5	4	
S2	A1		7	6	5	
S3	A1		8	7	6	
S4	A2					

Normal machine area

Solutions for the level of hazards

- 1 : Protected by warning sign
- 2 : Protected by guard and warning sign
- 3 : Consider the other design, choose the best one, add both guard and warning sign
- 4 : Consider another two design, choose the best one, add both guard and warning sign
- 5 : Consider another three design, choose the best one, add both guard and warning sign

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No.	Hazards source	S	A	G	W	Level
1	Mechanical hazards					
1.0-1	Mechanical hazards due to machine parts or work pieces					
1.0-2	Mechanical hazards due to accumulation of energy inside the machinery					
1.1	Crushing					--
1.2	Shearing					
1.3	Cutting or severing					
1.4	Entanglement					--
1.5	Drawing-in or trapping	1	1	1	1	--
1.6	Impact					--
1.7	Stabbing or puncture					
1.8	Friction or abrasion					
1.9	High pressure fluid injection or ejection					

2	Electrical hazards					
2.1	Contact with live parts	2	1	1	1	-
2.2	Contact with parts which have become live under faulty conditions	2	1	1	1	-
2.3	Approach to live part under high voltage					
2.4	Electrostatic phenomena					
2.5	Thermal radiation or other phenomena such as projection of molten particles and chemical effects form short-circuits, overloads etc.					

3	Thermal hazards					
3.1	Burns, scalds and other injuries by a possible contact of persons with objects or materials with an extreme high or low temperature, by flames or explosions and also by the radiation of heat sources					
3.2	Damage to health by hot or cold working environment					

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No.	Hazards source	S	A	G	W	Level
4	Hazards generated by noise					
4.1	Hearing loss (deafness), other physiological disorders	1	1	1	1	--
4.2	Interference with speech communication, acoustic signals, etc.	1	1	1	1	--

5	Hazards generated by noise					
5.1	Use of hand-help machines resulting in a variety of neurological and vascular disorder					
5.2	Whole body vibration, particular when combined with poor postures					

6	Hazards generated by radiation					
6.1	Low frequency, radio frequency radiation, microwaves					
6.2	Infrared, visible and ultraviolet light					
6.3	X and gamma rays					
6.4	Alpha, beta rays, electron or ion beams, neutrons					
6.5	Lasers					--

7	Hazards generated by materials and substances processed or used by the machinery					
7.1	Hazards from contact with or inhalation of harmful fluids, gases, mists, fumes and dusts	1	1	1	1	-
7.2	Fire and explosion hazard					
7.3	Biological and micro-biological (viral or bacterial) hazards					

8	Hazards generated by neglecting ergonomic principles in machine design					
8.1	Unhealthy postures or excessive effort					
8.2	Inadequate consideration of hand-arm or foot-leg anatomy					
8.3	Neglected use of personal protection equipment					
8.4	Inadequate local lighting					

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No.	Hazards source	S	A	G	W	Level
8.5	Mental overload or underload, stress					
8.6	Human error, human behavior	1	1	1	1	-
8.7	Inadequate design, location or identification of manual controls					
8.8	Inadequate design, location or identification of manual controls					

9	Combination of hazards					
	Combination of hazards					

10	Unexpected start-up, unexpected overrun/over-speed					
10.1	Failure/disorder of the control system	1	1	1	1	-
10.2	Restoration of energy on supply after an interruption					
10.3	External influences on electrical equipment					
10.4	Other external influences (gravity, wind, etc.)					
10.5	Errors in the software					
10.6	Error made by the operator (due to mismatch of machinery with human characteristics and abilities, see 8.6)					

11	Impossibility of stopping the machine in the best possible conditions					
	Impossibility of stopping the machine in the best possible conditions					

12	Variations in the rotational speed of tools					
	Variations in the rotational speed of tools					

13	Failure of the power supply					
	Failure of the power supply					

14	Failure of the control circuit					
14	Failure of the control circuit	1	1	1	1	-

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No.	Hazards source	S	A	G	W	Level
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15	Errors of fitting					
	Errors of fitting	1	1	1	1	--

16	Break-up during operation					
	Break-up during operation					

17	Falling or ejected objects or fluids					
	Falling or ejected objects or fluids					

18	Loss of stability / overturning of machinery					
	Loss of stability / overturning of machinery					

19	Slip, trip and fall of persons (related to machinery)					
	Slip, trip and fall of persons (related to machinery)					

20	Additional hazards, hazardous situations and hazardous events due to mobility					
	Relating to the traveling function					
20.1	Movement when starting the engine					
20.2	Movement without a driver at the driving position					
20.3	Movement without all parts in a safe position					
20.4	Excessive speed of pedestrian controlled machinery					
20.5	Excessive oscillations when moving					
20.6	Insufficient ability of machinery to be slowed down, stopped and immobilised					

21	Linked to the work position (including driving station) on the machine					
21.1	Fall of persons during access to (or at/ from) the work position					
21.2	Exhaust gases/lack of oxygen at the work position					
21.3	Fire (flammability of the cab, lack of extinguishing					

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No.	Hazards source	S	A	G	W	Level
	means)					
21.4	Mechanical hazards at the work position : contact with the wheels ; rollover ; fall of objects, penetration by objects ; break-up of parts rotation at high speed ; contact of persons with machine parts or tools (pedestrian controlled machines)					
21.5	Insufficient visibility form the work positions					
21.6	Inadequate lighting					
21.7	Inadequate seating					
21.8	Noise at the work position					
21.9	Vibration at the work position					
21.10	Insufficient means for evacuation/emergency exit					

22	Due to the control system					
22.1	Inadequate location of manual controls					
22.2	Inadequate design of manual controls and their mode of operation					

23	Form handling the machine (lack of stability)					
	Form handling the machine (lack of stability)					

24	Due to the power source and to the transmission of power					
24.1	Hazards form the engine and the batteries					
24.2	Hazards form the transmission of power between machines					
24.3	Hazards form coupling and towing					

25	Form/to third persons					
25.1	Unauthorized start-up/use	1	1	1	2	-
25.2	Drift of a part away from its stopping position					
25.3	Lack or inadequacy of visual or acoustic warning means					

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No.	Hazards source	S	A	G	W	Level
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26	Insufficient instructions for the driver/ operator					
26	Insufficient instructions for the driver/ operator	1	1	1	1	-

27	Additional hazards, hazardous situations and hazardous events due to lifting					
	Mechanical hazards and hazardous events					
27.1	Form load falls, collisions, machine tipping caused by :					
27.1.1	Lack of stability					
27.1.2	Uncontrolled loading-overloading-overturning moments exceeded					
27.1.3	Uncontrolled amplitude of movements					
27.1.4	Unexpected/unintended movement of loads					
27.1.5	Inadequate holding devices/accessories					
27.1.6	Collision of more then one machine					
27.2	Form access of persons to load support					
27.3	Form derailment					
27.4	Form insufficient mechanical strength of parts					
27.5	Form inadequate selection of chains, ropes, lifting and accessories and their inadequate integration into the machine					
27.6	Form inadequate selection of chains, ropes, lifting and accessories and their inadequate integration into the machine					
27.7	Form lowering of the load under the control of friction brake					
27.8	Form abnormal conditions of assembly/ testing/ use/ maintenance					
27.9	Form the effect of load on persons (impact by load or counterweight)					

28	Electrical hazards					
28.1	Form lightning					

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No.	Hazards source	S	A	G	W	Level
29	Hazards generated by neglecting ergonomic principles					
29.1	Insufficient visibility from the driving position					

	Additional hazards, hazardous and situations and hazardous events due to underground work					
30	Mechanical hazards and hazardous events due to:					
30.1	Lack of stability of powered roof supports					
30.2	Failing accelerator or brake control of machinery running on rails					
30.3	Failing or lack of dead man's control of machinery running on rails					
31	Restricted movement of persons					
32	Fire and explosion					
33	Emission of dust, gases etc.					

	Additional hazards, hazardous situations and hazardous events due to the lifting or moving of persons					
34	Mechanical hazards and hazardous events due to:					
34.1	Inadequate mechanical strength-inadequate working coefficients					
34.2	Failing of loading control					
34.3	Failing of controls in person carrier (function, priority)					
34.4	Over speed of person carrier					
35	Falling of person from person carrier					
36	Falling or overturning of person carrier					
37	Human error, human behavior					

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No.	Hazards source	S	A	G	W	Level
1.5	Drawing-in or trapping	1	1	1	1	-
Where	Contact with the conveyor of the machine					
When	during operation, inspection and maintenance of machine					
Improvement result						
Method		S	A	G	W	Level
1. Affixing suitable warning signs.		1	1	1	1	
2. Only operation by training/authorized persons.						
3. Operation of the machine shall conform to the instructions of the instruction manual.						
4. Check and inspection according to the specified durations of the instruction manual.						
5. Provide guards.						

No.	Hazards source	S	A	G	W	Level
2.1	Contact with live parts	1	1	1	1	-
Where	Whole power and control systems					
When	The machine is power on					
Improvement result						
Method		S	A	G	W	Level
1. Only operation by training/authorized persons.		1	1	1	1	
2. Operation of the machine shall conform to the instructions of the instruction manual.						
3. Check and inspection according to the specified durations of the instruction manual.						
4. Using safety components in accordance with those relevant international standards.						
5. Use of warning label.						

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No.	Hazards source	S	A	G	W	Level
2.2	Contact with parts which have become live under faulty conditions	1	1	1	1	-
Where	Whole power and control systems					
When	The machine is power on					
Improvement result						
Method		S	A	G	W	Level
1. Only operation by training/authorized persons.		1	1	1	1	
2. Operation of the machine shall conform to the instructions of the instruction manual.						
3. Check and inspection according to the specified durations of the instruction manual.						
4. Using safety components in accordance with those relevant international standards.						
5. Use of warning label.						

No.	Hazards source	S	A	G	W	Level
4.1	Hearing loss (deafness), other physiological disorders	1	1	1	1	-
Where	Near machine					
When	during operation, inspection and maintenance of machine					
Improvement result						
Method		S	A	G	W	Level
1. Only operation by training/authorized persons.		1	1	1	1	
2. Operation of the machine shall conform to the instructions of the instruction manual.						
3. Check and inspection according to the specified durations of the instruction manual.						
4. Using safety components in accordance with those relevant international standards.						
5. Use of warning label.						

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No.	Hazards source	S	A	G	W	Level
8.6	Human error, human behavior	1	1	1	1	-
Where	At load/ unload, tool mounting positions					
When	Reasonably foreseeable misuse, inadvertent operation of controls, incorrect work material and cutter handling and setting during loading/ unloading, process control, tool handling.					
Improvement result						
Method		S	A	G	W	Level
1. Only authorized person can use the machine.		1	1	1	1	
2. Training before using this machine.						
3. Make reference to the instruction manual before using this machine.						

No.	Hazards source	S	A	G	W	Level
10.1	Failure/disorder of the control system	1	1	1	1	-
Where	Control circuit/control components					
When	During operation of the machine					
Improvement result						
Method		S	A	G	W	Level
1. Only authorized person can use the machine.		1	1	1	1	
2. Make reference to the instruction manual before using this machine.						
3. Check before operation.						
4. Periodic maintenance.						

No.	Hazards source	S	A	G	W	Level
14	Failure of the control circuit	1	1	1	1	-
Where	Control circuit/control components					
When	During operation of the machine					
Improvement result						
Method		S	A	G	W	Level
1. Checking before operation.		1	1	1	1	
2. Make reference to the instruction manual before operate this machine.						
3. Daily/periodic inspection and maintenance.						

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No.	Hazards source	S	A	G	W	Level
15	Errors of fitting	1	1	1	2	-
Where	At machine					
When	machine elements fail or swing unexpectedly during process control, tool mounting, maintenance					
Improvement result						
Method		S	A	G	W	Level
1. Only authorized person can use the machine.		1	1	1	1	
2. Make reference to the instruction manual before using this machine.						
3. Check before operation.						
4. Periodic maintenance.						

Product Photos

Fig. 1



Fig. 2

Product Photos

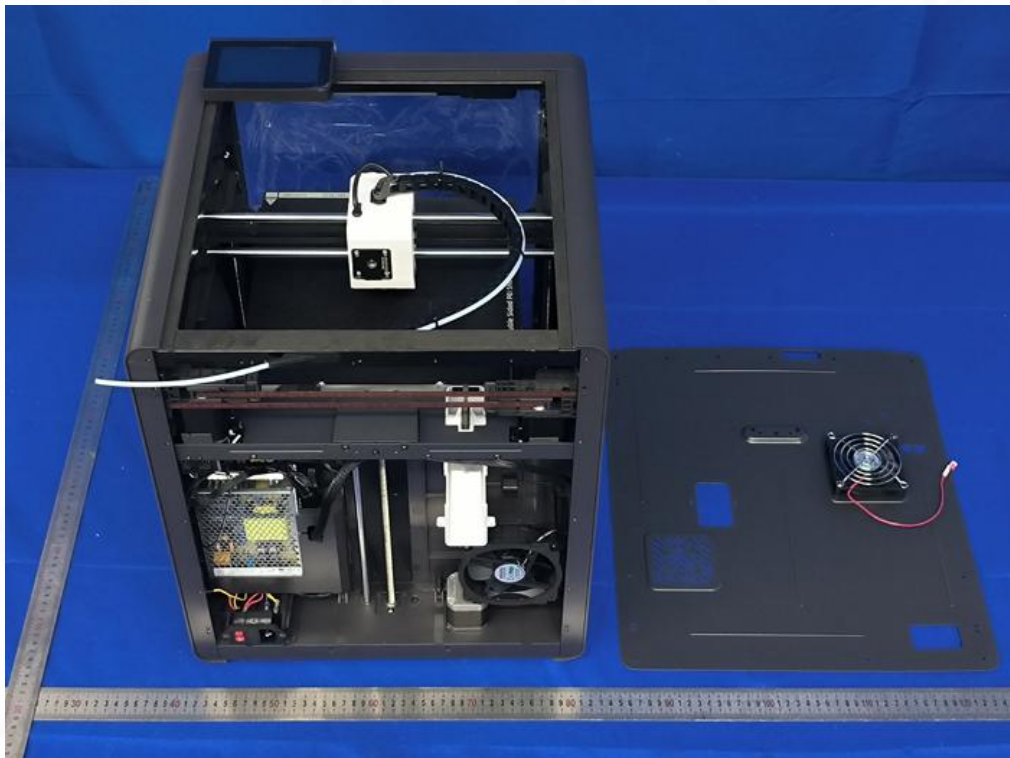


Fig. 3

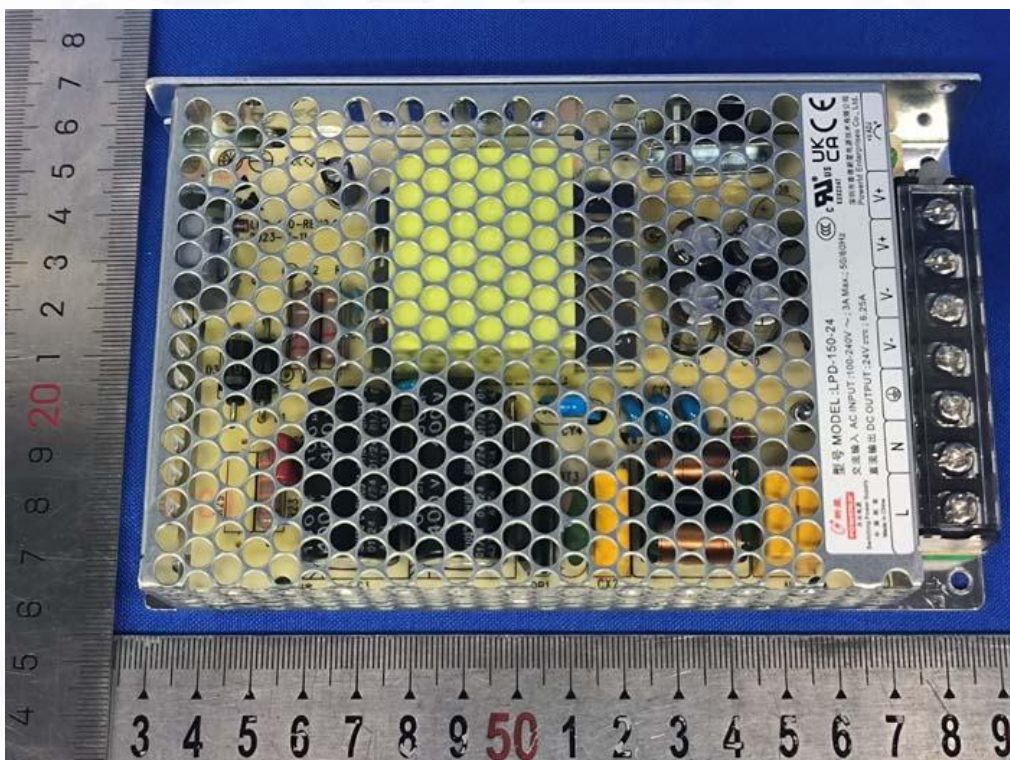


Fig. 4

Product Photos

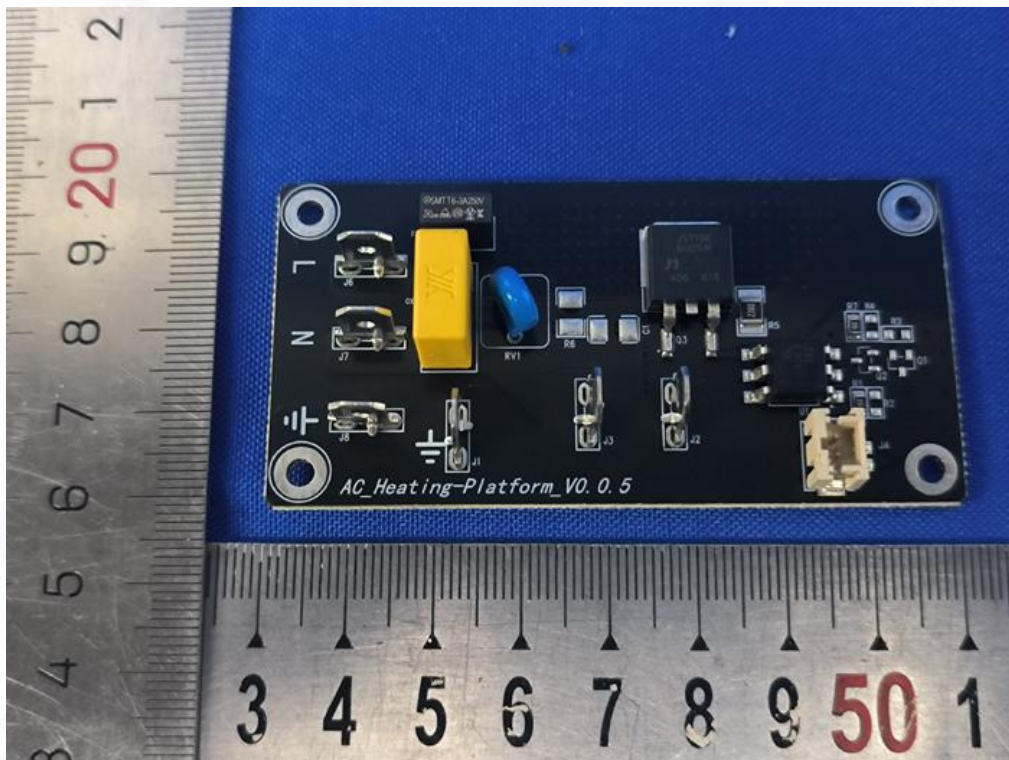


Fig. 5

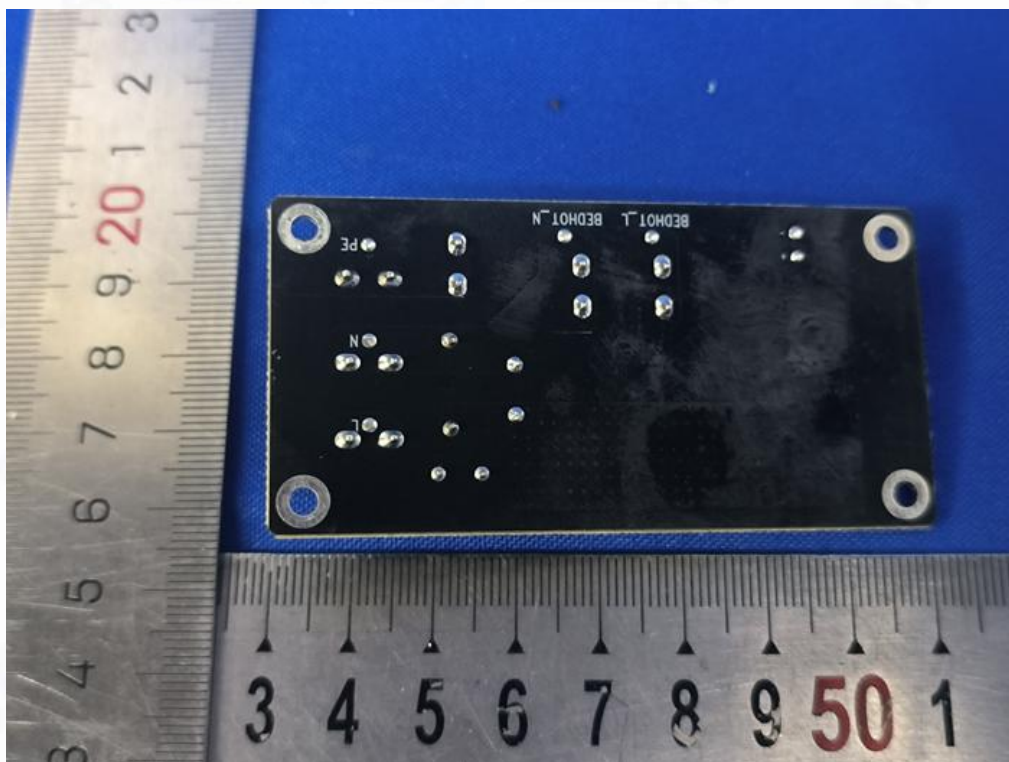


Fig. 6

Product Photos

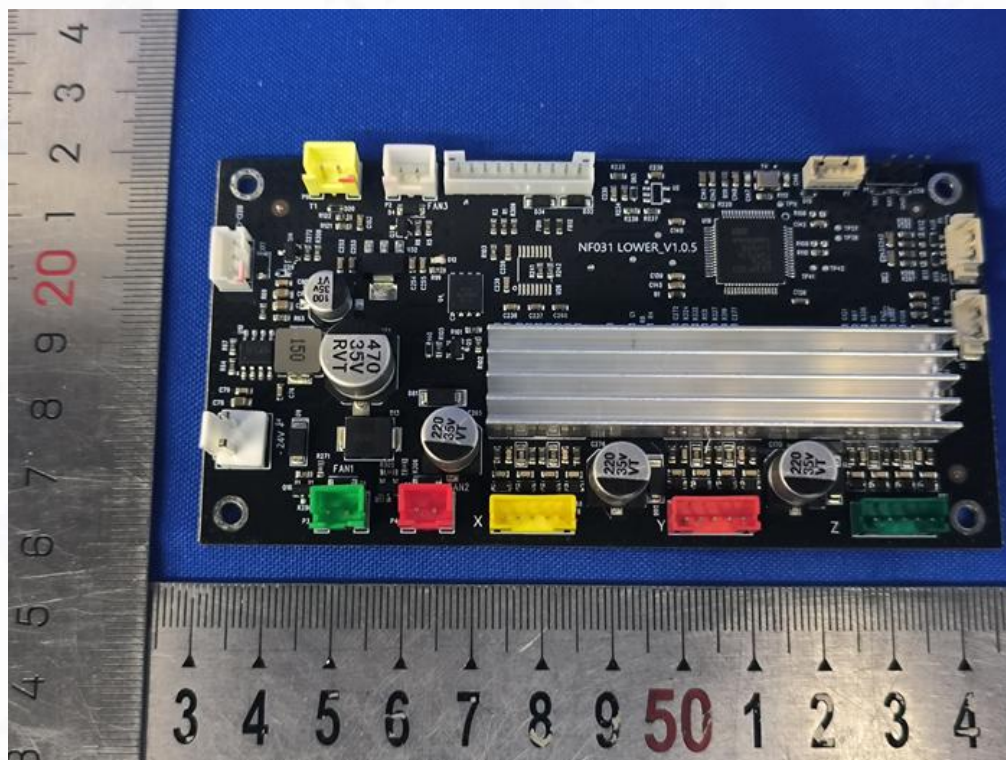


Fig. 7

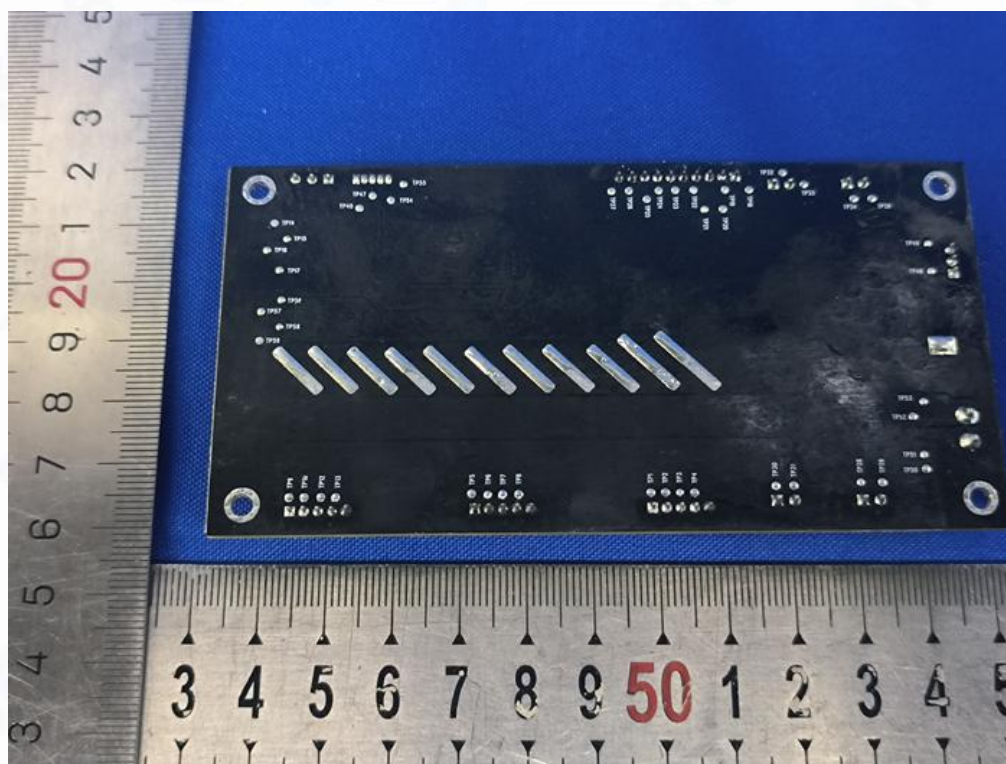


Fig. 8

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