



# SAFETY TEST REPORT

## MEASUREMENT AND TEST REPORT

For

ZHEJIANG WUMA DRIVE CO., LTD

No. 10, Xiangcun Industrial Zone, Dongyuan Town, Qingtian County, Lishui City, Zhejiang Province China

Models: WMRV (See page 3 for details)

2024-06-25

<b>This Report Concerns:</b> <input checked="" type="checkbox"/> Original Report	<b>Equipment Type:</b> GEARBOX
<b>Test Standard:</b> EN ISO 12100:2010	
<b>Report Number:</b> CCTS240620001SX	
<b>Test Date:</b> 2024-06-12 to 2024-06-21	
<b>Test category:</b> Consignment test	
<b>Prepared By:</b> Shenzhen Zhongan Quality Inspection and Certification Co., Ltd. Room 301&313, No. 20, Xinhe Road, Xinqiao Street, Bao'an District, Shenzhen, Guangdong, China Tel: 4008-078-685 E-mail: service@ccts-lab.com Web: www.ccts-lab.com	

**Note:** This test report is limited to the above client company and the product model only. It may not be duplicated without prior written consent of CCTS.

<b>TEST REPORT</b> <b>EN ISO 12100</b> <b>Safety of machinery - General principles for design - Risk assessment and risk reduction</b>	
Report reference No.	: CCTS240620001SX
Date of issue.....	: 2024-06-25
<b>Testing laboratory</b>	
Name.....	: Shenzhen Zhongan Quality Inspection and Certification Co., Ltd.
Address.....	: Room 301&313, No. 20, Xinhe Road, Xinqiao Street, Bao'an District, Shenzhen, Guangdong, China
<b>Client</b>	
Name.....	: ZHEJIANG WUMA DRIVE CO., LTD
Address.....	: No. 10, Xiangcun Industrial Zone, Dongyuan Town, Qingtian County, Lishui City, Zhejiang Province China
<b>Test specification</b>	
Standard.....	: EN ISO 12100:2010
Test procedure.....	: CE-MD
Procedure deviation.....	: N.A.
Non-standard test method.	: N.A.
<b>Test Report Form No.</b> .....: IEC60204_1C	
TRF originator .....	: Eurofins Electric & Electronic Product Testing AG
Master TRF .....	: Dated: 2019-11-15
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<b>Test item</b>	
Description.....	: GEARBOX
Model No.....	: WMRV, WRV, WK, WKA, WKAF, WKAZ, WKAB, WKAT, WKF, WS, WSAFWSF, WSAT, WSAZ, WSA, WR, WRF, WF, WFA, WFAF, WFAZ, WFF, WVF, WKM, WPL, WPLF, WEP, WFP, WPLR, WPLFR, WEPD, WPLH, PC, MB, WH, WB, MKA, MR, MFA, WRD, WPC, WPU, WT
Trademark.....	: N/A
Manufacturer.....	: ZHEJIANG WUMA DRIVE CO., LTD
Address.....	: No. 10, Xiangcun Industrial Zone, Dongyuan Town, Qingtian County, Lishui City, Zhejiang Province China
Rating(s).....	: N/A

**Test item particulars :**

Classification of installation and use.....: Portable appliance

Supply Connection.....: Matching adapter

**Possible test case verdicts:**

- test case does not apply to the test object..... N(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..... 2024-06-12

Date (s) of performance of tests..... 2024-06-12 to 2024-06-21

Sample appearance and function are in normal condition, yes or no..... Yes

**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.**General product information:**

- The max. operated temperature is considered as 40°C for no declaration from manufacture.

- Instructions and equipment marking related to safety is applied in the language that is acceptable in the country in which the equipment is to be sold.

-Are identical for construction, working principle. the only difference is the Model name.

-All tests were performed on mode WMRV.

**Copy of Marking plate:**

The artwork below may be only a draft.

GEARBOX  
Model: WMRV  
Rating: N/A



Manufacturer: ZHEJIANG WUMA DRIVE CO., LTD  
Address: No. 10, Xiangcun Industrial Zone, Dongyuan Town,  
Qingtian County, Lishui City, Zhejiang Province China  
MADE IN CHINA

Importer: XXX  
Address: XXX

**Remark for above marking:**

1. The height of graphical symbols shall not be less than 5 mm;
2. The height of letters and numerals shall not be less than 2 mm;
3. The height dimension of CE mark should not less than 5mm, the height dimension of WEEE symbol should not less than 7mm.
4. The main rating label was attached in enclosure.

Note: xxx means importer company name; yyy means importer company address information.  
Alternatively, Importer and importer address information provided in the instructions.

**Summary of testing:**

The submitted sample were tested and found to compliance with requirements of the standards  
EN ISO 12100:2010.

**Testing procedure and testing location**

Laboratory name..... : Shenzhen Zhongan Quality Inspection and Certification Co., Ltd.

Testing location/address: : Room 301&313, No. 20, Xinhe Road, Xinqiao Street, Bao'an District,  
Shenzhen, Guangdong, China

Testing procedure : TL ☒ RMT ☐ SMT ☐ WMT ☐ TMP ☐

Tested By  
(Test Engineer) : Lanny Lu

*Lanny Lu*

Reviewed By  
(Supervisor) : Jack Wang

*Jack Wang*

Approved By  
(Chief Engineer) : Peter Chen

*Peter Chen*



## EN ISO 12100

Clause	Requirement + Test	Result - Remark	Verdict
6	Risk reduction		P
6.1	General		P
	<p>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:</p> <ul style="list-style-type: none"> <li>_ severity of harm from the hazard under consideration;</li> <li>_ probability of occurrence of that harm.</li> </ul> <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>		P
6.2	Inherently safe design measures		P
6.2.1	General		P
	<p>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.</p>		P
	<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.</p> <p>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).</p>		P
6.2.2	Consideration of geometrical factors and physical aspects		P
6.2.2.1	Geometrical factors Such factors include the following.		P
	<p>a) The form of machinery is designed to maximize direct visibility of the working areas and hazard zones from the control position</p> <ul style="list-style-type: none"> <li>— reducing blind spots, for example</li> <li>— 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, for example:</li> </ul>		P

## EN ISO 12100

Clause	Requirement + Test	Result - Remark	Verdict
	<p>_ the travelling and working area of mobile machines;</p> <p>_ the zone of movement of lifted loads or of the carrier of machinery for lifting persons;</p> <p>_ 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 there are no exposed persons in the danger zones.</p>		
	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).		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.		P
	d) The form of the machine is designed so as to achieve a suitable working position and provide accessible manual controls (actuators).		P
6.2.2.2	Physical aspects		P
	Such aspects include the following:		P
	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;	This have been limited.	P
	<p>- c) limiting the emissions by acting on the characteristics of the source using measures for reducing</p> <p>1) noise emission at source (see ISO/TR 11688-1),</p> <p>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 handguided machinery, see CR 1030-1)],</p>	The emissions by acting on the characteristics of the source have been limited.	P



## EN ISO 12100

Clause	Requirement + Test	Result - Remark	Verdict
	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)].		
4.3	Taking into account the general technical knowledge regarding machine design 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 :		P
	a) mechanical stresses such as		P
	- stress limitation by implementation of correct calculation, construction and fastening methods as regards, e.g. bolted assemblies, welded assemblies	Has been taken into account.	P
	- stress limitation by overload prevention, (e.g. "fusible" plugs, pressure-limiting valve, breakage points, torque-limiting devices);	Has been taken into account.	P
	- avoiding fatigue in elements under variable stresses (notably cyclic stresses);	Has been taken into account.	P
	- static and dynamic balancing of rotating elements;	Has been taken into account	P
	b) materials and their properties such as		P
	- resistance to corrosion, ageing, abrasion and wear;		P
	- hardness, ductility, brittleness;		P
	- homogeneity;		P
	- toxicity;		P
	- flammability.		P
	c) emission values for :		P
	- noise;	No noise will result in hazard in this machine.	P
	- vibration;	No vibration will result in hazard in this machine.	P

## EN ISO 12100

Clause	Requirement + Test	Result - Remark	Verdict
	- hazardous substances;	No hazardous substances will result in hazard in this machine.	P
	- radiation.	No radiation 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.	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.	P
6.2.4	Choice of an appropriate technology		P
	One or more hazards can be eliminated or risks reduced by the choice of the technology to be used in certain applications, e.g. :		N
	a) on machines intended for use in explosive atmospheres: - fully pneumatic or hydraulic control system and machine actuators; - "intrinsically safe" electrical equipment (see IEC60079-11)	Not applicable.	N
	b) for particular products to be processed such as a solvent: equipment assuring that the temperature will remain far below the flash point.	Not applicable.	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.	Not applicable.	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).	The principle of the positive mechanical action of a component on another component has been applied..	P
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.	Satisfied it.	P
	Factors to be taken into account include		P

## EN ISO 12100

Clause	Requirement + Test	Result - Remark	Verdict
	<ul style="list-style-type: none"> <li>- geometry of the base;</li> <li>- weight distribution, including loading;</li> <li>- 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;</li> <li>- vibration</li> </ul>	Taken into account during design.	P
	- oscillations of the centre of gravity;	Not applicable	N
	- characteristics of the supporting surface in case of traveling or installation on different sites (e.g. ground conditions, slope);	Taken into account during design.	P
	- external forces (e.g. wind pressure, manual forces)	Taken into account during design.	P
	Stability shall be considered in all phases of the life of the machine, including handling, traveling, installation, use, de-commissioning and dismantling.	Taken into account during design.	P
	Other protective measures for stability relevant to safeguarding are given in 6.3.2.6	Please see the related clause.	P
6.2.7	Provision for maintainability		P
	When designing a machine, the following maintainability factors shall be taken into account:		P
	- accessibility, taking into account the environment and the human body measurements, including the dimensions of the working clothes and tools used;	These factors have been taken into account during design.	P
	been taken into account during design.	The factor has been taken into account during design.	P
	- limitation of the number of special tools and equipment;	The factor has been taken into account during design.	P
6.2.8	Observing ergonomic principles		P
	Ergonomic principles shall be taken into account in designing machinery to reduce mental or physical stress and strain of the operator.	Appropriate ergonomic principles have been taken into account in designing machinery	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

## EN ISO 12100

Clause	Requirement + Test	Result - Remark	Verdict
	Designer's attention is especially drawn to following ergonomic aspects of machine design		P
	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 temperature	This machine with low noise, low 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.	Not applicable.	N
	f) Select, locate and identify manual controls (actuators) so that		P
	- they are clearly visible and identifiable and appropriately marked where necessary (see 6.4.4)	All design and arrangement are 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
	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.	Not applicable.	N
	Controls shall be so arranged that their layout, travel and resistance to operation are compatible	All the arrangement of the control logic have been	P

## EN ISO 12100

Clause	Requirement + Test	Result - Remark	Verdict
	with the action to be performed, taking account of ergonomic principles.	checked in compliance with this requirement.	
	Constraints due to the necessary or foreseeable use of personal protective equipment(such as footwear, gloves)shall be taken into account.	taken into account	P
	g) Select, design and locate indicators, dials and visual display units so that		P
	- 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	Pass.	P
6.2.9	Preventing electrical hazard	-	P
	For the design of the electrical equipment of machines IEC 60204-1 gives general provisions, especially in clause 6 for protection against electric shock.	Please also make reference to EN 60335 test report.	P
	For requirements related to specific machines, see corresponding IEC standards (e.g. series of IEC 61029, IEC 60745, IEC 60335).	Not applicable.	N
6.2.10	Preventing and hydraulic hazards		P
	Pneumatic and hydraulic equipment of machinery shall be designed so that :		P
	-the maximum rated pressure cannot be exceeded in the circuits (e.g. by means of pressure limiting devices)	Appropriate limiting devices have been provided.	P
	- no hazard results from pressure surges or rises, pressure losses or drops or losses of vacuum;	No such hazards exist.	P
	- 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;	The devices are designed appropriately.	P
	- air elements of the equipment, and especially pipes and hoses, be protected against harmful external effects;	The pipes have been protected by appropriated devices.	P
	- 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	This requirement is complied with	P

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Clause	Requirement + Test	Result - Remark	Verdict
	depressurizing and pressure indication (see also ISO 14118:2000, clause 5)		
	- 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 ISO4414	This requirement is complied with by appropriate design.	P
6.2.11	Applying inherently safe design measures to control system	-	P
6.2.11.1	General		P
	The design measures of the control system shall be chosen so that their safety-related performance provides a sufficient amount of risk reduction (see ISO 13849-1 or IEC 62061)	Inherently safe design measures to control system have applied.	P
	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
	- an unsuitable design or modification (accidental or deliberate) of the control system logic;	No this kind of hazard in this machine	P
	- a temporary or permanent defect or a failure of one or several components of the control system;		P
	- a variation or a failure in the power supply of the control system;	No this kind of hazard in this machine	P
	- inappropriate selection, design and location of the control devices;	No this kind of hazard in this machine	P
	Typical examples of hazardous machine behaviour are	No this kind of hazard	P
	- unintended/unexpected start-up(see ISO 14118)	No this kind of hazard	P
	Pass.No this kind of hazard	No this kind of hazard	P
	- failure to stop moving parts;	No this kind of hazard	P
	- dropping or ejection of a mobile part of the machine or of a workpiece clamped by the machine;	No this kind of hazard	P
	- machine action resulting from inhibition (defeating or failure) of protective devices	No this kind of hazard	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	Please see the related clause.	P

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict
	circumstances (see ISO 13849-1 and IEC 60204-1 and IEC 62061).		
	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;		P
	- systematic analysis of start and stop conditions;	Systematic analysis have been applied.	P
	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 ISO 14118:2000, 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.	Not applicable.	N
	The different zones shall be clearly defined and it shall be obvious which parts of the machine belong to which zone.	Not applicable.	N
	Likewise it shall be obvious which control devices (e.g. emergency stop devices, supply disconnecting devices )and/or protective devices belong to which zone.	Not applicable.	N
	The interfaces between zones shall be designed such that no function in one zone creates hazards in another zone which has been stopped for an intervention.	Not applicable.	N
	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). For example:	Not applicable.	N
	- the traveling speed of mobile pedestrian controlled machinery other than remote-controlled shall be compatible with walking speed.	Not applicable	N

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict
	- 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.	Not applicable	N
	- the range of movements of parts of machinery for lifting loads shall be kept within specified limits.	Not applicable	N
	When machinery is designed to use synchronously different elements which can also be used independently the control system shall be designed to prevent risks due to lack of synchronization.	Not applicable	N
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).		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	P
6.2.11.4	Restart after power interruption	-	P
	If it may generate a hazard, the spontaneous restart of a machine when it is re-energized after	The spontaneous restart of a machine when it is re-	P



## EN ISO 12100

Clause	Requirement + Test	Result - Remark	Verdict
	power interruption shall be prevented (e.g. by use of a self-maintained relay, contactor or valve).	energized after power interruption has been prevented by contractor.	
6.2.11.5	Interruption of power supply situations resulting from interruption or excessive fluctuation of the power supply. At least the following requirements shall be met:	Machinery shall be designed to prevent hazardous	P
	- 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		P
	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		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;	Emergency stop is provided.	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	Not applicable	N
6.2.11.7	Safety functions implemented by programmable electronic control systems		P
6.2.11.7.1	General		P
	A control system including programmable electronic equipment (e.g. programmable controllers) can be used to implement safety functions t machinery.		P
	equipment (e.g. programmable controllers) can be used to implement safety functions t machinery.	Safety functions are considered during design.	P

EN ISO 12100			
Clause	Requirement + Test	Result - Remark	Verdict
	The design of the programmable electronic control system shall be such that the probability of random hardware failures and the likelihood of systematic failures that can adversely affect the performance of the safety-related control function(s) are sufficiently low.	Safety functions are considered during design.	P
	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)		P
	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.	It be installed and validated to ensure that the specified performance	P
	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.	All parts interact correctly to perform the safety function and that unintended functions do not occur.	P
6.2.11.7.2	Hardware aspects		P
	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)	It has PLC.	P
	Application software	-	P
	Application software should not be re-programmable by the user.	Not applicable.	N
	This may be achieved by use of embedded	Not applicable.	N

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	software in a non re-programmable memory (e.g. micro-controller, application specific integrated circuit (ASIC))		
	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	Not applicable.	N
6.2.11.8	Principles relating to manual control		P
	a) Manual control devices shall be designed and located according to the relevant ergonomic principles given in 6.2.8	Manual control devices have been designed and located according to the relevant ergonomic principles given in	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.	Not applicable.	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.	Not applicable.	N
	e) if it is possible to start the same hazardous element by means of several controls, the control 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	Not applicable.	N

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	(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)	This requirement is complied with.	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.	This requirement is complied with.	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.	This requirement is complied with.	P
	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)	Not applicable.	N
	Control mode for setting, teaching, process changeover fault-finding, cleaning or maintenance	Not applicable.	N
	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:	Not applicable.	N
	- disables all other control modes;	Not applicable.	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;	Not applicable.	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)	Not applicable.	N
	prevents any operation of hazardous functions by voluntary or involuntary action on the machine's sensors.	Not applicable.	N
	This control mode shall be associated with one or more of the following measures:	Not applicable.	N
	- restriction of access to the danger zone as far as possible.	Not applicable.	N

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	- emergency stop control within immediate reach of the operator;	Not applicable.	N
	- portable control unit (teach pendant) and/or local controls allowing sight of the controlled elements.( see IEC 60204-1:1997, 9.2.4)	Not applicable.	N
6.2.11.10	Selection of control and operating modes		N
	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.	Not applicable.	N
	Each position of the selector shall be clearly identifiable and shall exclusively allow one control or operating mode.	Not applicable.	N
	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).	Not applicable.	N
6.2.11.11	Applying measures achieve electromagnetic compatibility (EMC)-		N
	For guidance on electromagnetic compatibility, see IEC 60204-1, and IEC 61000-6 series.	Not applicable	N
6.2.11.12	Provision of diagnostic systems to aid fault-finding		N
	Diagnostic systems to aid fault finding should be included in the control system so that there is no need to disable any protective measures.	Not applicable.	N
6.2.12	Minimizing the probability of failure of safety functions		P
6.2.12.1	General		P
	Safety of machinery is not only dependent on the reliability of the control systems but also on the reliability of all parts of the machine.The continued operation of the safety functions is essential for the safe use of the machine. This can be achieved by :	Pass	P
6.2.12.2	Use of reliable components		P
	“Reliable components” means components which are capable of withstanding all disturbances andstresses associated with the usage of the equipment in the conditions of intended use (including the environmental conditions), for the period of time or the number of operations fixed for the use, with a low probability of failures generating a hazardous malfunctioning of the	Reliable components have been used.	P

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	machine. Components shall be selected taking into account all factors mentioned above(see also 6.2.13)		
6.2.12.3	Use of “oriented failure mode” components		N
	“Oriented failure mode” components or systems are those in which the predominant failure mode is known in advance and which can be used so that such a failure leads to a non-hazardous alteration of the machine function.	Not applicable.	N
	The use of such components should always be considered, particularly in cases where redundancy is (see 6.2.12.4) not employed.	Not applicable.	N
6.2.12.4	Duplication (or redundancy) of components or subsystems		N
	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 other components) continue(s) to perform its (their) function, thereby ensuring that the safety function remains available.	Not applicable.	N
	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,	Not applicable.	N
	provided that the inspection interval is shorter than the expected lifetime of the components.	Not applicable.	N
	Diversity of design and/or technology can be used to avoid common cause failures (e.g. from electromagnetic disturbance) or common mode failures.	Not applicable.	N
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.	This requirement is complied with.	P
	This applies to power systems (operative part) as well as to control systems, to safety functions as well as to other functions of machinery.	This requirement is complied with.	P
	Safety-critical components (as e.g. certain sensors) with a known reliability shall be used.	Safety-critical components are used in this machine.	P
	The elements of guards and of protective services shall be particularly reliable, as their failure can expose persons to hazards, and also as poor reliability would encourage attempts to defeat them.	This requirement is complied	P

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6.2.14	Limiting exposure to hazards through mechanization or Automation of loading(feeding) /unloading (removal) operations		P
	Mechanization and automation of machine loading/unloading operations and more generally of handling operations (of workpieces, materials, substances) limit the risk generated by these operations by reducing the exposure of persons to hazards at the operating points.	This requirement is complied with.	P
	Automation can be achieved e.g. by robots, handling devices, transfer mechanisms, air blast equipment.	This requirement has been complied with by design.	P
	Mechanization can be achieved, e.g. by feeding slides, push rods, hand-operated indexing tables.	This requirement has been complied with by design.	P
	While automatic feeding and removal devices have much to offer in preventing accidents to machine operators, they can create danger when any faults are being rectified.	Appropriate provisions have been provided.	P
	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.	These devices will not introduce further hazards	P
	Suitable safeguards (see 6.3) shall be provided if this cannot be ensured.	Please see the related clause.	P
	Automatic feeding and removal devices with their own control systems and the control systems 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.	This requirement has been complied with by design.	P
6.2.15	Limiting exposure to hazards through location of the setting and maintenance points outside of danger zones.		P
	The need for access to danger zones shall be minimized by locating maintenance, lubrication and setting points outside these zones.	This requirement has been complied with by design.	P
6.3	Safeguarding and complementary protective measures		P
6.3.1	General		P
	Guards and protective devices shall be used to protect persons whenever inherently safe design does not reasonably make it possible either to remove hazards or to sufficiently reduce risks. Complementary protective measures involving additional equipment (e.g. emergency stop equipment )may have to be implemented.	Appropriate guards and protective devices have been used to protect persons whenever inherently safe design does not reasonably make it possible either to remove hazards or to	P

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		sufficiently reduce risks.	
	The different kinds of guards and protective devices are defined in 3.27 and 3.28.	Please see the related clause.	P
	Certain safeguards may be used to avoid exposure to more than one hazard (e.g. a fixed guard preventing access to a zone where a mechanical hazard is present being used to reduce noise level and collect toxic emissions)	Such safeguards exist.	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 hazard generated by moving parts, according to the nature of those parts (see figure 4) and to the need for access to the danger zone(s).	Please see the related clause.	P
	The exact choice of a safeguard for a particular machine shall be made on the basis of the risk assessment for that machine.	Please see the related clause.	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 (operation without any malfunction) of the machinery.		P
	As the need for frequency of access increase this inevitably leads to the fixed guard not being replaced	This requirement is complied with.	P
	This requires the use of an alternative protective measure (movable interlocking guard, sensitive protective equipment.)	Movable interlocking guard is used.	P
	A combination of safeguards may sometimes be required. For example , where, in conjunction with a fixed guard, a mechanical loading (feeding) device is used to feed a workpiece into a machine, thereby removing the need for access to the primary hazard zone, a trip device may be required to protect against the secondary drawing-in or shearing hazard between the mechanical loading (feeding) device, when reachable, and the fixed guard.	Not applicable.	N
	Consideration shall be given to the enclosure of control positions or intervention zones to provide combined protection against several hazards	This requirement has been taken in to consideration.	P



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Clause	Requirement + Test	Result - Remark	Verdict
	which may include:		
	- hazards from falling or ejected objects (e.g. falling object protection structure)	No such hazards exist in this machine.	P
	- emission hazards (e.g. protection against noise, vibration, radiation , harmful substances)	No such hazards exist in this machine.	P
	- hazards due to the environment (e.g. protection against heat, cold, foul weather)	No such hazards exist in this machine.	P
	- hazards due to tipping over or rolling over of machinery (e.g. roll-over or tip-over protection structure)	No such hazards exist in this machine.	P
	The design of such enclosed work stations (e.g. cabs and cabins) shall take into account ergonomic principles concerning visibility, lighting, atmospheric conditions, access, posture.	No such hazards exist in this machine	P
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, safeguard should be selected from the following:		P
	a) fixed guard (see also ISO 14120)	Fixed guards are provided.	P
	b) interlocking guard with or without guard locking (see also 6.3.3.2.3, ISO 14119, ISO 14120);	are provided.	P
	c) self-closing guard (see ISO 14120:2002, 3.3.2)	Not applicable.	N
	d) sensitive protective equipment, e.g. electro-sensitive protective equipment (see IEC 61496) or pressure sensitive mat (see ISO 13856)	Not applicable.	N
6.3.2.3	Where access to the hazard zone is required during normal operation		N
	Where access to the hazard zone is required during normal operation of the machinery , safeguards should be selected from the following:		N
	a) interlocking guard with or without guard locking (see also ISO 14119, ISO 14120 and 6.3.3.2.3 of this standard);	Not applicable.	N
	b) sensitive protective equipment, e.g electro-sensitive protective equipment (see IEC 61496)	Not applicable.	N
	e) two-hand control device (see ISO 13851)	Not applicable.	N
6.3.2.4	Where access to the hazard zone is required for machine setting, teaching, process changeover, fault finding, cleaning or maintenance.		N
	As far as possible, machines shall be designed so that the safeguards provided for the protection of the production operator may ensure also the	Not applicable.	N

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	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 the machine (see 5.2)	Not applicable.	N
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.	Not applicable.	N
	The following provisions are intended to provide the designer with criteria for selecting , for each application , the most suitable device(s).	Not applicable.	N
	Types of sensitive protective equipment include, e.g.:		N
	- light curtains;	Not applicable.	N
	- scanning devices as, e.g. laser scanners;	Not applicable.	N
	- pressure sensitive mats;	Not applicable.	N
	- trip bars, trip wires.	Not applicable.	N
	Sensitive protective equipment can be used:		N
	- for tripping purposes;	Not applicable.	N
	- for presence sensing;	Not applicable.	N
	- for both tripping and presence sensing	Not applicable.	N
	- to re-initiate machine operation, a practice which is subject to stringent conditions.	Not applicable.	N
	The following characteristics of the machinery, among others, can preclude the sole use of sensitive protective equipment:	Not applicable.	N
	- tendency for the machinery to eject materials or component parts;	Not applicable.	N
	necessity to guard against emissions (noise, radiation, dust, etc.)	Not applicable.	N
	- erratic or excessive machine stopping time;	Not applicable.	N
	- inability of a machine to stop part-way through a cycle.	Not applicable.	N
6.3.2.5.2	Implementation		N
	consideration should be given to:		N
	a) - size, characteristics and positioning of the	Not applicable.	N

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Clause	Requirement + Test	Result - Remark	Verdict
	detection zone (see ISO 13855, which deals with the positioning of some types of sensitive protective equipment)		
	b) - reaction of the device to fault conditions (see IEC 61496 for electro-sensitive protective equipment)	Not applicable.	N
	c)- possibility of circumvention	Not applicable.	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.	Not applicable.	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;	Not applicable.	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;	Not applicable.	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;	Not applicable.	N
	- the machine cannot operate during interruption of the detection function of the sensitive protective equipment, except during muting phases,;	Not applicable.	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.	Not applicable.	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, 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	Not applicable.	N

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	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;	Not applicable.	N
	b) the requirements for an AOPD used as a tripping and presence-sensing device (see IEC 61496) are satisfied — in particular, location, minimum distance (see ISO 13855), detection capability, reliability and monitoring of control and braking systems;	Not applicable.	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;	Not applicable.	N
	d) entering the sensing field of the AOPD(s) or opening interlocking guards is the only way to enter the hazard zone;	Not applicable.	N
	e) if there is more than one AOPD safeguarding the machine, only one of the AOPD (s) is capable of cycle re-initiation;	Not applicable.	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.	Not applicable.	N
6.3.2.6	Protective measures for stability		N
	If stability cannot be achieved by inherently safe design measures such as weight distribution (see 4.6), it will be necessary to maintain it by protective measures such as the use of :		N
	- anchorage bolts; Pass Anchorage bolts have	Not applicable.	N
	- locking devices		N
	- movement limiters or mechanical stops;	Not applicable.	N
	- acceleration or deceleration limiters;	Not applicable.	N
	- load limiters;	Not applicable.	N
	- alarms warning of the approach to stability or tipping limits;	Not applicable.	N
6.3.2.7	6.3.2.7 Other protective devices		N
	When a machine requires continuous control by the operator(e.g. mobile machines, cranes) and an error of the operator can generate a hazardous situation, this machine shall be equipped with the	Not applicable.	N

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	necessary devices to enable the operation to remain within specified limits , in particular:		
	- when the operator has insufficient visibility of the hazard zone;	Not applicable.	N
	- when the operator lacks knowledge of the actual value of a safety - related parameter (e.g. .a distance, a speed, the mass of a load, the angle of a slope)	Not applicable.	N
	- when hazards may result from operations other than those controlled by the operator;	Not applicable.	N
	The necessary devices include:		N
	- devices for limiting parameters of movement (distance, angle, velocity , acceleration)	Not applicable.	N
	- overloading and moment limiting devices:	Not applicable.	N
	- devices to prevent collisions or interference with other machines;	Not applicable.	N
	-device for preventing hazards to pedestrian operators of mobile machinery or other pedestrians;	Not applicable.	N
	- torque limiting devices, breakage points to prevent excessive stress of components and assemblies;	Not applicable.	N
	- devices for limiting pressure, temperature;	Not applicable.	N
	- devices for monitoring emissions;	Not applicable.	N
	- devices prevent operation in the absence of the operator at the control position;	Not applicable.	N
	- device to prevent lifting operations unless stabilizers are in place;	Not applicable.	N
	- devices to ensure that components are in a safe position before traveling;	Not applicable.	N
	Automatic protective measures triggered by such devices which take operation of the machinery out of the control of the operator (e.g. automatic stop of hazardous movement) should be preceded or accompanied by a warning signal to enable the Noperator to take appropriate action (see 6.4.3)	Not applicable.	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 shall be compatible with the working environment of the machine and	Guards and protective devices have been appropriately designed.	P

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	designed so that they cannot be easily defeated. They shall provide the minimum possible interference with activities during operation and other phases of machine life, in order to reduce any incentive to defeat them.		
	Guards and protective devices shall :	-	P
	- be of robust construction.	This requirement has been taken into account during design.	P
	- not give rise to any additional hazard;	This requirement has been taken into account during design.	P
	- not be easy to by-pass or render non-operational;	This requirement has been taken into account during design.	P
	- be located at an adequate distance from the danger zone (see ISO 13857 and ISO 13855).	This requirement has been taken into account during design.	P
	- cause minimum obstruction to the view of the production process;	This requirement has been taken into account during design.	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 where the work has to be done, if possible without the guard or protective device having to be moved;	This requirement has been taken into account during design.	P
	For openings in the guards see ISO 13857	This requirement has been taken into account during design.	P
6.3.3.2	Requirements for fixed 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.	These functions are Achieved by fixed guards.	P
	Additionally, they may need to have particular properties relating to electricity, temperature, fire, explosion, vibration, visibility(see ISO 14120) and operator position ergonomics(e.g. usability, operator's movements, posture, repetitive movements).	These functions are achieved by fixed guards.	P
6.3.3.2.2	Requirements for fixed guards		P
	Fixed guards shall be securely held in place:		P

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	- either permanently (e.g. by welding ) - or by means of fasteners (screws, nuts) making removal/opening impossible without using tools; they should not remain closed without their fasteners (see ISO 14120)	All the fixed guards are securely held in place by appropriate fasteners	P
6.3.3.2.3	Requirements for movable guards		P
	a) movable guards which provide protection against hazards generated by moving transmission parts shall :		P
	- as far as possible remain fixed to the machinery or other structure (generally by means of hinges or guides ) when open;	Gemels are used for the movable guards.	P
	- be interlocking guards (with guard locking when necessary ) (see ISO 14119)		N
	b) movable guards against hazards generated by non-transmission moving parts shall be designed and associated with the machine control system so that:	-	P
	- 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.	Interlocking guards are provided to comply with these requirements.	P
	- they can be adjusted only by an intentional action, such as the use of a tool or a key;	This requirement is complied with.	P
	- 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 (see 4.11.6)	This requirement is complied with.	P
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;	Not applicable.	N
	They shall :		N
	- be designed so that the adjustment remains fixed during a given operation;	Not applicable.	N
	- be readily adjustable without the use of tools;	Not applicable.	N
6.3.3.2.5	Requirements for interlocking guards with a start function (control guards )	Not applicable.	N
	An interlocking guard with a start function may be used provided that	Not applicable.	N
	- all requirements for interlocking guards are satisfied (see ISO 14119)	Not applicable.	N

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	- the cycle time of the machine is short	Not applicable.	N
	- the maximum opening time of the guard is present to a low value (e.g. equal to the cycle time). 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.	Not applicable.	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 (see ISO 14120)	Not applicable.	N
	- all other guards whether fixed (removable type) or movable are interlocking guards;	Not applicable.	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 (see 4.11.6)- that its failure cannot lead to an intended/unexpected start-up;	Not applicable.	N
	- the guard is securely held open (e.g. by a spring or counterweight) such that it cannot initiate a start while falling by its own weight;	Not applicable.	N
6.3.3.2.6	Hazards from guards		P
	Care shall be taken to prevent hazards which might be generated by :		P
	- the guard construction (e.g. sharp edges or corners, material);	This requirement has been taken into account during design.	P
	- the movements of the guards (shearing or crushing zones generated by power-operated guards and by heavy guards which are liable to fall )	This requirement has been taken into account during design.	P
6.3.3.3	Technical characteristics of protective devices		P
	Protective devices shall be selected or designed and connected to the control system so as to ensure correct implementation of their safety function (s) is ensured.	This requirement has been taken into account during design.	P
	Protective devices shall be selected on the basis of their having met the appropriate product standard (for example, IEC 61496 for active optoelectronic protective devices) or shall be designed according to one or several of the principles formulated in ISO 13849-1 or IEC62061.	This requirement has been taken into account during design.	P
	Protective devices shall be installed and connected to the control system so that they cannot be easily defeated.	This requirement has been Taken into account during design	P



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Clause	Requirement + Test	Result - Remark	Verdict
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.	Not applicable.	N
6.3.4	Safeguarding for reducing emissions		P
6.3.4.1	General		P
	If the measures for the reduction of emissions at source mentioned in 6.2.2.2 are not adequate, the machine shall be provided with additional protective measures (see 6.3.4.2 to 6.3.4.5).	No such hazard exists.	P
6.3.4.2	Noise	-	P
	Additional protective measures include, for example: - enclosures (see ISO 15667) - screens fitted to the machine; - silencers (see ISO 14163)	No such hazard exists.	P
6.3.4.3	Vibration	-	P
	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.	No such hazard exists.	P
	For measures for vibration isolation of stationary industrial machinery see EN 1299	No such hazard exists.	P
6.3.4.4	Hazardous substances		N
	Additional protective measures include, for example:		N
	- encapsulation of the machine (enclosure with negative pressure);	Not applicable.	N
	- local exhaust ventilation with filtration.	Not applicable.	N
	- wetting with liquids;	Not applicable.	N
	- special ventilation in the area of the machine (air curtains , cabins for operators)	Not applicable.	N
6.3.4.5	Radiation		N
	Additional protective measures include, for example:		N
	- use of filtering and absorption;	Not applicable.	N
	- use of attenuating screens or guards	Not applicable.	N
6.3.5	Complementary protective measures		P
6.3.5.1	General		P
	Protective measures which are neither inherently	It meet the requirement.	P

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Clause	Requirement + Test	Result - Remark	Verdict
	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. Such measures include, but are not limited to , the ones dealt with in 6.3.5.2 to 6.3.5.6		
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:		P
	- the actuators shall be clearly identifiable, clearly visible and readily accessible	The actuators can 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;	The hazardous process can be topped as quickly as possible without creating additional hazards	P
	- the emergency stop control shall trigger or permit the triggering of certain safeguard movements where necessary.	No this situation exists.	P
	Once active operation of the emergency stop device has ceased following an emergency stop command, the effect of this command shall be sustained until it is reset.	Reset is necessary before re-start.	P
	This reset shall be possible only at that location where the emergency stop command has been initiated. The reset of the device shall not restart the machinery, but only permit restarting.	This requirement is complied with by appropriate design of the emergency stop.	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. Please see the related	Please see the related clauses	P
6.3.5.3	Measures for the escape and rescue of trapped persons -		N
	Measures for the escape and rescue of trapped persons may consist e.g. of :		N
	- escape routes and shelters in installations generating operator-trapping hazards'	Not applicable.	N
	- arrangements for moving some elements by hand, after an emergency stop	Not applicable.	N
	- arrangements for reversing the movement of	Not applicable.	N

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Clause	Requirement + Test	Result - Remark	Verdict
	some elements		
	- anchorage points for descender devices;	Not applicable.	N
	- means of communication to enable trapped operators to call for help	Not applicable.	N
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:		P
	a) isolating (disconnecting, separating ) the machine (or defined parts of the machine) from all power supplies;	A main switch with lock is provided.	P
	b) locking (or otherwise securing ) all the isolating units in the isolating position;	Please see the report for IEC 60335	P
	c) dissipating or , if this is not possible or practicable, restraining (containing) any stored energy which may give rise to a hazard;	Please see the report for IEC 60335	P
	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.	Please see the report for IEC 60335	P
	See ISO 14118:2000, clause 5 and IEC 60204-1:2005, 5.5 and 5.6		P
6.3.5.5	Provisions for easy and safe handling of machines and their heavy component parts	-	P
	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.	Appropriate attachments Are provided.	P
	These attachments may be, among others,		P
	- standardized lifting appliances with slings, hooks, eyebolts, or tapped holes for appliance fixing;	Not applicable.	N
	- appliances for automatic grabbing with a lifting hook when attachment is not possible from the ground.	Such devices are used	P.
	- guiding grooves for machines to be transported by a fork truck;	Not applicable.	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;		P

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Clause	Requirement + Test	Result - Remark	Verdict
	See also 6.4.4c) ( item 3).		
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.	These requirements have been taken into account during design.	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.	Not applicable	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 (see ISO 14122-3) shall be provided.	Not applicable.	N
	In large automated installations, particular attention shall be given to safe means of access such as walkways, conveyor bridges or crossover points.	Not applicable.	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)	Not applicable.	N
	As necessary , anchorage points for personal protective equipment against falls from a height shall also be provided (e.g. in carriers of machinery for lifting persons or with elevating control stations)	Not applicable.	N
	Openings shall whenever possible open towards a safe position. They shall be designed to prevent hazards due to unintended opening.	Not applicable.	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.	Not applicable.	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.	Not applicable.	N
	Movement of the lifting platform shall be prevented while the guards are open.	Not applicable.	N
	For detailed provisions see ISO 14122.	Not applicable.	N
6.4	Information for use		P
6.4.1	General requirements		P
	Drafting information for use is an integral part of the design of a machine (see figure 2).	Please see the related clause.	P

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Clause	Requirement + Test	Result - Remark	Verdict
6.4.1.1	Information of 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. It is directed to professional and/or non-professional 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, all its operating modes.	-	P
	The information shall contain all directions required to ensure safe and correct use of the machine. With this in view, it shall inform and warn the user about residual risk.	All the information is stated in the appropriate place.	P
	The information shall indicate, as appropriate,		P
	- the need for training,	All the information is stated in the appropriate place.	P
	- the need for personal protective equipment,	All the information is stated in the appropriate place.	P
	- the possible need for additional guards or protective devices (see Figure 2, Footnote d).	All the information is stated in the appropriate place.	P
	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.	All the information is stated in the appropriate place.	P
6.4.1.3	Information for use shall cover, separately or in combination, transport, assembly and installation, commissioning, use of the machine (setting, teaching/programming or process changeover, operation, cleaning, fault-finding and maintenance) and, if necessary, dismantling, disabling and scrapping.	All the information is stated in the appropriate place.	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:	All the information is stated in the appropriate place.	P
	- in /on the machine itself (see 6.3 and 6.4.4)	Adequate information is Stated in the machine itself.	P
	- in accompanying documents ( in particular instruction handbook , see 6.4.5)	Adequate information is stated in the accompanying documents	P
	- on the packaging	Adequate information is Stated on the packaging	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- 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 5.2.70	Please the related clause.	P
	It is essential that these signals:		P
	- be emitted before the occurrence of the hazardous event;	taken into account during design and selection of the warning devices.	P
	- be unambiguous;	This requirement is taken into account during design and selection of the warning devices.	P
	- be clearly perceived and differentiated from all other signals used; - be clearly recognized by the operator and other persons.	This requirement is taken into account during design and selection of the warning devices.	P
	The warning devices shall be designed and located such that checking is easy.	This requirement is taken into account during design and selection of the warning devices.	P
	The information for use shall prescribe regular checking of warning devices.	This requirement is taken into account during design and selection of the 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.	This requirement is taken into account during design and selection of 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 - name and address of the manufacturer; - designation of series or type; - serial number, if any.	Adequate information is provided.	P

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Clause	Requirement + Test	Result - Remark	Verdict
	b) in order to indicate its compliance with mandatory requirements;		P
	- marking; - written indications (e.g. for machines intended for use in potentially explosive atmosphere)	Adequate information is provided.	P
	c) for its safe use, e.g. :		P
	- maximum speed of rotating parts; - maximum diameter of tools; - mass (expressed in kilograms) of the machine itself and/or of removable parts' - maximum working load; - necessity of wearing personal protective equipment; - guard adjustment data; - frequency of inspection.	Adequate information is provided.	P
	Information printed directly on the machine should be permanent and remain legible throughout the expected life of the machine.	This requirement is complied with.	P
	Signs or written warnings only saying "danger" shall not be used.	This requirement is complied with.	P
	Readily understandable signs (pictograms) should be used in preference to written warnings.	This requirement is complied with.	P
	Signs and pictograms should only be used if they are understood in the culture in which the machinery is to be used.	This requirement is complied with.	P
	Markings shall comply with recognized standards (see ISO 2972, ISO 7000, particularly for pictograms, symbols, colours) See IEC 60204 series as regards marking of electrical equipment.	This requirement is complied with.	P
6.4.5	Accompanying documents (in particular, instruction handbook)		P
6.4.5.1	Contents		P
	The instruction handbook 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 instruction handbook	P
	- storage conditions for the machine; -	All the related information is stated in the instruction handbook	P
	- dimensions, mass value(s), position of the centre(s) of gravity;	All the related information is stated in the instruction handbook	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- indications for handling (e.g. drawings indicating application points for lifting equipment)	All the related information is stated in the instruction handbook	P
	b) information relating to installation and commissioning of the machine, e.g.	-	P
	- fixing/anchoring and vibration dampening requirements	All the related information is stated in the instruction handbook	P
	- assembly and mounting conditions;	All the related information is stated in the instruction handbook	P
	- space needed for use and maintenance;	All the related information is stated in the instruction handbook	P
	- permissible environmental conditions (e.g. temperature, moisture, vibration, electromagnetic radiation);	All the related information is stated in the instruction handbook	P
	- instructions for connecting the machine to power supply (particularly about protection against electrical overloading);	All the related information is stated in the instruction handbook	P
	- advice about waste removal /disposal;	All the related information is stated in the instruction handbook	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.	All the related information is stated in the instruction handbook	P
	c) information relating to the machine itself, e.g. :		P
	- detailed description of the machine, its fittings, its guards and/or protective devices;	All the related information is stated in the instruction handbook	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.	All the related information is stated in the instruction handbook	P
	- diagrams (especially schematic representation of safety functions);	All the related information is stated in the instruction handbook	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.	All the related information is stated in the instruction handbook	P
	- technical documentation about electrical equipment (see IEC 60204 series)	All the related information is stated in the instruction handbook	P



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Clause	Requirement + Test	Result - Remark	Verdict
	- documents attesting that the machine complies with mandatory requirements;	All the related information is stated in the instruction handbook	P
	d) information relating to the use of the machine, e.g. about:		P
	<ul style="list-style-type: none"> <li>- intended use;</li> <li>- description of manual controls (actuators);</li> <li>- setting and adjustment;</li> <li>- modes and means for stopping (especially emergency stop )</li> <li>- risks which could not be eliminated by the protective measures taken by the designer;</li> <li>- 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.</li> <li>- reasonably foreseeable misuse and prohibited usages; - fault identification and location , repair, and re</li> <li>- starting after an intervention;</li> <li>- personal protective equipment which need to be used and training required.</li> </ul>	All the related information is stated in the instruction handbook	P
	e) information for maintenance e.g.		P
	<ul style="list-style-type: none"> <li>- nature and frequency of inspections for safety functions;</li> <li>- 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)</li> <li>- 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)</li> <li>- drawings and diagrams enabling maintenance personnel to carry out their task rationally (especially fault-finding tasks)</li> </ul> <p>f) information relating to de-commissioning , dismantling and disposal;</p> <p>g) information for emergency situations , e.g. :</p> <ul style="list-style-type: none"> <li>- type of fire-fighting equipment to be used.</li> <li>- warning about possible emission or leakage of harmful substance(s), and if possible, indication of means to fight their effects.</li> </ul>	All the related information is stated in the instruction handbook	P
	h) maintenance instructions provided for skilled persons (second dash in e)) and maintenance	All the related information is stated in the instruction	P

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Clause	Requirement + Test	Result - Remark	Verdict
	instructions provided for unskilled persons (third dash in e)), that should appear clearly separated from each other.	handbook	
6.4.5.2	Production of the instruction handbook		P
	a) type and size of print shall ensure the best possible legibility. Safety warnings and/or cautions should be emphasized b the use of colours, symbols and/or large print.	All the related information is stated in the instruction handbook	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.	All the related information is stated in the instruction handbook	P
	c) whenever helpful to the understanding, text 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.	All the related information is stated in the instruction handbook	P
	d) consideration should be given to presenting information in tabular form where this will aid understanding.Tables should be adjacent to the relevant text.	All the related information is stated in the instruction handbook	P
	e) the use of colours should be considered, particularly in relation to components requiring quick identification.	All the related information is stated in the instruction handbook	P
	f) when information for use is lengthy, a table of contents and/or an index should be given.	All the related information is stated in the instruction handbook	P
	g) safety-relevant instructions which involve immediate action should be provided in a form readily available to the operator.	All the related information is stated in the instruction handbook	P
6.4.5.3	Drafting and editing information for use		P
	a) relationship to model : the information shall clearly relate to the specific model of machine and, if necessary, other appropriate identification (for example, by serial number).	All the related information is stated in the instruction handbook	P
	b) communicate principles : when information for use is being prepared, the communication process "see-think-use" should be followed in order to achieve the maximum effect and should follow sequential	All the related information is stated in the instruction handbook	P

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Clause	Requirement + Test	Result - Remark	Verdict
	operations. The questions “how ?” and “why ?” should be anticipated and the answers provided.	All the related information is stated in the instruction handbook	P
	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.	All the related information is stated in the instruction handbook	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.	All the related information is stated in the instruction handbook	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). It may be useful to mark them “keep for future reference”. 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 hand copy that is readily available.	All the related information is stated in the instruction handbook	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		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

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Clause	Requirement + Test	Result - Remark	Verdict
	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;		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

**Appendix****Photo documentation****Photo 1**

View:

☒ front☐ rear☒ right side☐ left side☒ top☐ bottom☐ internal

\*\*\*\*\*End of this report\*\*\*\*\*