Technical Construction File

File No：MD-TCF-240529-58442

Applicant:

MODE CHINA

Address of applicant:

Room 01.8/f#7 Tower. 4th Area, No. 186, South 4th Ring west Road.Fengtai District, Beijing, China

Directive: Machinery Directive (MD) 2006/42/EC

Legal Person：_____

Product: Free Hoist

Model: Free Hoist

Table of contents

Part I: General

1.1 List of applicable regulations and standards

In order to ensure the conformity for UKCA marking for these machines, some main European and/or International standards have been used to make assessment of conformity, they are:

EN ISO 12100:2010 Safety of machinery - General principles for design - Risk assessment and risk reduction

EN 60204-32:2008 Safety of machinery. Electrical equipment of machines - Requirements for hoisting machines

EN 14492-2:2019 Free Hoists - Power driven winches and hoists-Part 2: Power driven hoists

The test reports for these applicable standards in detail have been included in the relevant sub-clauses of this technical construction file.

1.2 Variations of the series products

Free Hoist

1.3 Quality control system

In order to ensure the conformity of the series production, the MODE CHINAhas taken the related procedures mentioned below：

(1) Apply for the consultant from the qualified body in Germany

The MODE CHINA has applied for the consultant from Shanghai Global Testing Services Co.,Ltd who is a competent institute for the CE marking consultant and certification in China. The complete technical construction file(TCF)have been established before applying for the UKCA marking certificate under the consultant of GTS.

(2) Carry out the inspection for parts and components according to the TCF

Before the assemblies of the series production, the QC engineers of MODE CHINA has to check and inspect the technical specifications and intended functions of parts and components to ensure the correct use of them according to the contents of TCF and principle described in the related technical information.

(3) Carry out the inspection & testing for the products before packing

Before packing the products, the QC engineers of MODE CHINA have to do the necessary inspection and testing to ensure the conformity of related requirements, in particularly, the testing and inspection of electrical characteristics and outer feature.

(4) Carry out the inspection for the packing

After finishing the necessary inspection and testing for the products, an inspection for the packing has to be done to ensure the necessary elements being included in this packing before shipment.

(5) Provision for the change of design

Any change of the products described in this TCF must be checked in detail and written down again in the TCF by the designer of MODE CHINA, if the change may effects the related electrical or mechanical characteristics.

(6) Provision for the Quality Assurance

For the provisions of internal control measures to ensure the conformity of series production of the machines, MODE CHINA has built an internal quality control system in accordance with the international standard of ISO-9001.

TECHNICAL FILE

Essential health and safety requirements

The third Party	Shanghai Global Testing Services Co., Ltd Floor 3rd, Building D-1, No. 128, Shenfu Road, Minhang District, Shanghai, China	Tel: / Fax: /
Name and address of the applicant	MODE CHINA Room 01.8/f#7 Tower. 4th Area, No. 186, South 4th Ring west Road.Fengtai District, Beijing, China	
Name and address of the manufacturer	Zhuozhou Mude Industrial Technology Co., Ltd No.C55, Zhongguaneun Hegu Innovatien Industrial Park, Chaoyang EastRoad,ZhuozhouDevelopment Zone, BaodingCity, Hebei Province	
Name and address of the factory (production sites)	Zhuozhou Mude Industrial Technology Co., Ltd No.C55, Zhongguaneun Hegu Innovatien Industrial Park, Chaoyang EastRoad,ZhuozhouDevelopment Zone, BaodingCity, Hebei Province	
Product	Free Hoist	
Mode/type reference	Free Hoist	
Reviewed according to	Essential health and safety requirements	
Review Result	PASS	
TCF No.	MD-TCF-240529-58442	
Work carried out by	Tony Guo Director	Signature
Word verified by	Kevin Shi Manager	Signature
Date of issue	2024/05/31	

Part II：Assessment of conformity

2.1 Essential health and safety requirements

ESSENTIAL REQUIREMENTS ACCORDING TO ANNEX I

Machinery Directive (MD) 2006/42/EC

Article	Sub-article	Requirement	Fullfilment			Remark
			Y	N	N/A	
1	1.1.2	*Principles of safety integration* (a) Machinery must be so constructed that it is fitted for its function, and can be adjusted and maintained without putting persons at risk when these operations are carried out under the conditions foreseen by the manufacturer. The aim of measures taken must be to eliminate any risk of accident throughout the foreseeable lifetime of the machinery, including the phases of assembly and dismantling, even where risks of accident arise from foreseeable abnormal situations. (b) In selecting the most appropriate methods, the manufacturer must apply the following principles, in the order given: - eliminate or reduce risks as far as possible (inherently safe machinery design and construction), - take the necessary protection measures in relation to risks that cannot be eliminated,	☑			**Pass.** All the machines are fitted for the function. Enough protection is provided - **Pass** Manufacturer has provided enough safety devices to eliminate or reduce risks.. **Pass.** Safety guards and other devices are used.

		- inform users of the residual risks due to any shortcomings of the protection measures adopted, indicate whether any particular training is required and specify any need to provide personal protection equipment. (c) When designing and constructing machinery, and when drafting the instructions, the manufacturer must envisage not only the normal use of the machinery but also uses which could reasonably be expected. The machinery must be designed to prevent abnormal use if such use would engender a risk. In other cases the instructions must draw the user's attention to ways - which experience has shown might occur - in which the machinery should not be used. (d) Under the intended conditions of use, the discomfort, fatigue and psychological stress faced by the operator must be reduced to the minimum possible taking ergonomic principles into account. (e) When designing and constructing machinery, the manufacturer must take account of the constraints to which the operator is subject as a result of the necessary or foreseeable use of personal protection equipment (such as footwear, gloves, etc.). (f) Machinery must be supplied with all the essential special equipment and accessories to enable it to be adjusted, maintained and used without risk.				**Pass.** Enough warnings are provided in the appropriate spot **Pass.** All the conditions are considered by the manufacturer, and the related information also has been provided within the instruction **Pass.** These requirements have been complied with, and the related information also has been provided within the instruction manual. **Pass.** These requirements have been taken into account during the design of this machine
	1.1.3	*Materials and products* The materials used to construct machinery or products used and created during its use must not endanger exposed persons' safety or health. In particular, where fluids are used, machinery must be designed and constructed for use without risks due to filling, use, recovery or draining.	☑			**Pass**. They cannot endanger exposed person’s safety or health
	1.1.4	*Lighting* The manufacturer must supply integral lighting suitable for the operations concerned where its lack is likely to cause a risk despite ambient lighting of normal intensity. The manufacturer must ensure that there is no area of shadow likely to cause			☑	**Not applicable.** No integral lighting has been used. **Not applicable.**

		nuisance, that there is no irritating dazzle and that there are no dangerous stroboscopic effects due to the lighting provided by the manufacturer. . Internal parts requiring frequent inspection and adjustment and maintenance areas must be provided with appropriate lighting				No integral lighting has been used. **Not applicable.** No integral lighting has been used.
	1.1.5	*Design of machinery to facilitate its handling* Machinery or each component part thereof must: - be capable of being handled safely, - be packaged or designed so that it can be stored safely and without damage (e.g. adequate stability, special supports, etc.). Where the weight, size or shape of machinery or its various component parts prevents them from being moved by hand, the machinery or each component part must; - either be fitted with attachments for lifting gear, or - be designed so that it can be fitted with such attachments (e.g. threaded holes), or - be shaped in such a way that standard lifting gear can easily be attached. Where machinery or one of its component parts is to be moved by hand, it must: - either be easily movable, or - be equipped for picking up (e.g. hand-grips, etc.) and moving in complete safety. Special arrangements must be made for the handling of tools and/or machinery parts, even if lightweight, which could be dangerous (shape, material, etc.).			☑	- **Pass.** Enough measures have been taken to ensure the safe of the handling. **Pass.** The machine can be stored in wood box safely and without damage. **Not applicable** **Not applicable** **Not applicable** **Not applicable** **Not applicable** **Not applicable** **Not applicable**

	1.2	**Controls**	☑			
	1.2.1	*Safety and reliability of control systems* Control systems must be designed and constructed so that they are safe and reliable, in a way that will prevent a dangerous situation arising. Above all they must be designed and constructed in such a way that: - they can withstand the rigours of normal use and external factors, - errors in logic do not lead to dangerous situations.				**Pass.** The control system for this machine is safe and reliable by appropriate designing - **Pass.** The control system can withstand related effects during normal operation. **Pass.** Any error in logic doesn't lead to dangerous situations.
	1.2.2	*Control devices* Control devices must be: - clearly visible and identifiable and appropriately marked where necessary, - positioned for safe operation without hesitation or loss of time, and without ambiguity, - designed so that the movement of the control is consistent with its effect, - located outside the danger zones, except for certain controls where necessary, such as emergency stop, console for training of robots,	☑			**Pass.** Appropriate lables and markings are provided This requirement has been complied with Pass. Appropriate positions have been taken into account during design. **Pass.** Movement of the control is consistent with its effect Pass.

		- positioned so that their operation cannot cause additional risk, - designed or protected so that the desired effect, where a risk is involved, cannot occur without an intentional operation, - made so as to withstand foreseeable strain; particular attention must be paid to emergency stop devices liable to be subjected to considerable strain. Where a control is designed and constructed to perform several different actions, namely where there is no one-to-one correspondence (e.g. keyboards, etc.), the action to be performed must be clearly displayed and subject to confirmation where necessary. Controls must be so arranged that their layout, travel and resistance to operation are compatible with the action to be performed, taking account of ergonomic principles. Constraints due to the necessary or foreseeable use of personal protection equipment (such as footwear, gloves, etc.) must be taken into account. Machinery must be fitted with indicators (dials, signals, etc.) as required for safe operation. The operator must be able to read them from the control position From the main control position the operator must be able to ensure that there are no exposed persons in the danger zones. If this is impossible, the control system must be designed and constructed so that an acoustic and/ or visual warning signal is given whenever the machinery is about to start. The exposed person must have the time and the means to take rapid action to prevent the machinery starting up.				All control devices have been located outside the danger zones. **Pass.** All operation of control devices ’tcause additional risk. **Pass.** ppropriate safety devices have been used to comply with this requirement. **Not applicable.** The equipment has no emergency switch **Not applicable.** **Pass.** These requirements have been taken into account during design. **Not applicable.** **Pass.** The indicators have been provided. **Pass.** Main switch and other related devices have been provided for the exposed person.
	1.2.3	*Starting*	☑			

		It must be possible to start machinery only by voluntary actuation of a control provided for the purpose. The same requirement applies: - when restarting the machinery after a stop-page, whatever the cause, - when effecting a significant change in the operating conditions (e.g. speed, pressure, etc.), unless such restarting or change in operating conditions is without risk to exposed persons. This essential requirement does not apply to the restarting of the machinery or to the change in operating conditions resulting from the normal sequence of an automatic cycle. Where machinery has several starting controls and the operators can therefore put each other in danger, additional devices (e.g. enabling devices or selectors allowing only one part of the starting mechanism to be actuated at any one time) must be fitted to rule out such risks. It must be possible for automated plant functioning in automatic mode to be restarted easily after a stoppage once the safety conditions have been fulfilled.				**Pass.** Devices preventing unintended strating have been provided. **Pass.** Reset is necessary before restaring. **Pass.** These requirements have been complied with. — **Not applicable.** **Not applicable.**
	1.2.4	*Stopping device* *Normal stopping* Each machine must be fitted with a control whereby the machine can be brought safely to a complete stop. Each workstation must be fitted with a control to stop some or all of the moving parts of the machinery, depending on the type of hazard, so that the machinery is rendered safe. The machinery's stop control must have priority over the start controls..	☑			**Pass.** A normal stop control has been provided. **Pass.** It has priority over the start control.

		Once the machinery or its dangerous parts have stopped, the energy supply to the actuators concerned must be cut off				Pass. The stops belong to the category 0, or category 1 stops.
		Emergency stop Each machine must be fitted with one or more emergency stop devices to enable actual or impending danger to be averted. The following exceptions apply: - machines in which an emergency stop device would not lessen the risk, either because it would not reduce the stopping time or because it would not enable the special measures required to deal with the risk to be taken, - hand-held portable machines and hand-guided machines. This device must: - have clearly identifiable, clearly visible and quickly accessible controls, - stop the dangerous process as quickly as possible, without creating additional hazards, - where necessary, trigger or permit the triggering of certain safeguard movements. Once active operation of the emergency stop control has ceased following a stop command, that command must be sustained by engagement of the emergency stop device until that engagement is specifically overridden; it must not be possible to engage the device without triggering a stop command; it must be possible to disengage the device only by an appropriate operation, and disengaging the device must not restart the machinery but only permit restarting.			☑	**Pass.** Not applicable — **Not applicable.** **Not applicable.** — **Not applicable** **Not applicable** **Not applicable.** **Not applicable**
		Complex installations In the case of machinery or parts of machinery designed to work together, the manufacturer must so design and construct the machinery that the stop controls, including the emergency stop, can stop not only the machinery itself but also all equipment upstream and/or downstream if its continued operation	☑			— **Not applicable.**

		can be dangerous.				
	1.2.5	*Mode selection* The control mode selected must override all other control systems with the exception of the emergency stop. If machinery has been designed and built to allow for its use in several control or operating modes presenting different safety levels (e.g. to allow for adjustment, maintenance, inspection, etc.), it must be fitted with a mode selector which can be locked in each position. Each position of the selector must correspond to a single operating or control mode. The selector may be replaced by another selection method which restricts the use of certain functions of the machinery to certain categories of operator (e.g. access codes for certain numerically controlled functions, etc.). If, for certain operations, the machinery must be able to operate with its protection devices neutralised, the mode selector must simultaneously: - disable the automatic control mode, - permit movements only by controls requiring sustained action, - permit the operation of dangerous moving parts only in enhanced safety conditions (e.g. reduced speed, reduced power, step-by-step, or other adequate provision) while preventing hazards from linked sequences, - prevent any movement liable to pose a danger by acting voluntarily or involuntarily on the machine's internal sensors. In addition, the operator must be able to control operation of the parts he is working on at the adjustment point.			☑	**Not applicable.** **Not applicable.** No this kind of mode selectionhas been found. **Not applicable.** No this kind of mode selection has been found **Not applicable.** No this kind of mode selection has been found. **Not applicable.** No this kind of mode selection has been found. **Not applicable.** **Not applicable.** **Not applicable.** **Not applicable.** **Not applicable.** No this kind of mode selectionhas been found.
	1.2.6	*Failure of the power supply* The interruption, re-establishment after an interruption or fluctuation in whatever manner of the power supply to the machinery must not lead to a dangerous situation.	☑			— **Pass.** No any dangerous situation has

		In particular: - the machinery must not start unexpectedly, - the machinery must not be prevented from stopping if the command has already been given, - no moving part of the machinery or piece held by the machinery must fall or be ejected, - automatic or manual stopping of the moving parts whatever they may be must be unimpeded, - the protection devices must remain fully effective.				been found. — **Pass.** The stop command has the priority over all other devices **Pass.** No such part is found.
	1.2.7	*Failure of the control circuit* A fault in the control circuit logic, or failure of or damage to the control circuit must not lead to dangerous situations.n particular: - the machinery must not start unexpectedly, - the machinery must not be prevented from stopping if the command has already been given, - no moving part of the machinery or piece held by the machinery must fall or be ejected, - automatic or manual stopping of the moving parts whatever they may be must be unimpeded, - the protection devices must remain fully effective.	☑			**Pass.** Failure to heed these dangerous situations may result in personal injury and/or property damage
	1.2.8	*Software* Interactive software between the operator and the command or control system			☑	

		of a machine must be user-friendly.				
	1.3 1.3.1	Protection against mechanical hazards Stability Machinery, components and fittings thereof must be so designed and constructed that they are stable enough, under the foreseen operating conditions (if necessary taking climatic conditions into account) for use without risk of overturning, falling or unexpected movement. If the shape of the machinery itself or its intended installation does not offer sufficient stability, appropriate means of anchorage must be incorporated and indicated in the instructions.	☑			- - **Pass.** These requirements have been taken into account design **Pass.** Locate a suitable anchor such as a strong tree trunk or boulder. Double check your anchors and make sure all connections are secure
	1.3.2	*Risk of break-up during operation* The various parts of machinery and their linkages must be able to withstand the stresses to which they are subject when used as foreseen by the manufacturer. phenomena of fatigue, ageing, corrosion and abrasion. The durability of the materials used must be adequate for the nature of the work place foreseen by the manufacturer, in particular as regards the The manufacturer must indicate in the instructions the type and frequency of inspection and maintenance required for safety reasons. He must, where appropriate, indicate the parts subject to wear and the criteria for replacement. Where a risk of rupture or disintegration remains despite the measures taken (e.g. as with grinding wheels) the moving parts must be mounted and positioned in such a way that in case of rupture their fragments will be	☑			**Pass.** All parts of the machine can withstand related stress when they are used. **Pass.** All materials used for this machine areappropriate for their intended useand have adequate life. **Pass.** The related information has been provided within the instruction manual. **Not applicable.** No such risk is possible.

		contained. Both rigid and flexible pipes carrying fluids, particularly those under high pressure, must be able to withstand the foreseen internal and external stresses and must be firmly attached and/or protected against all manner of external stresses and strains; precautions must be taken to ensure that no risk is posed by a rupture (sudden movement, high-pressure jets, etc.). Where the material to be processed is fed to the tool automatically, the following conditions must be fulfilled to avoid risks to the persons exposed (e.g. tool breakage): - when the workpiece comes into contact with the tool the latter must have attained its normal working conditions, - when the tool starts and/or stops (intentionally or accidentally) the feed movement and the tool movement must be coordinated.				**Not applicable.** **Pass.** **Pass.**
	1.3.3	*Risks due to falling or ejected objects* Precautions must be taken to prevent risks from falling or ejected objects (e.g. workpieces, tools, cuttings, fragments, waste, etc.).	☑			**Pass.** The end of the length of the traction rope shall be marked obviously, and at least 5 laps shall be kept on the drum when the rope is pulled out.
	1.3.4	*Risks due to surfaces, edges or angles* In so far as their purpose allows, accessible parts of the machinery must have no sharp edges, no sharp angles, and no rough surfaces likely to cause injury.	☑			— **Pass.** No this kind injury has been found.
	1.3.5	*Risks related to combined machinery* Where the machinery is intended to carry out several different operations with the manual removal of the piece between each operation (combined machinery), it must be designed and constructed in such a way as to enable each element to be used separately without the other elements constituting a danger or risk for the exposed person.			☑	— **Not applicable.** No this kind of combined machinery.

		For this purpose, it must be possible to start and stop separately any elements that are not protected.				**Not applicable.** No this kind of combined machinery.
	1.3.6	*Risks relating to variations in the rotational speed of tools* When the machine is designed to perform operations under different conditions of use (e.g. different speeds or energy supply), it must be designed and constructed in such a way that selection and adjustment of these conditions can be carried out safely and reliably.	☑			— **Not applicable.**
	1.3.7	*Prevention of risks related to moving parts* The moving parts of machinery must be designed, built and laid out to avoid hazards or, where hazards persist, fixed with guards or protective devices in such a way as to prevent all risk of contact which could lead to accidents. All necessary steps must be taken to prevent accidental blockage of moving parts involved in the work.	☑			— **Pass.** This kind of hazards have been prevented by appropriate guards. **Pass.** All necessary steps have been taken.
		In cases where, despite the precautions taken, a blockage is likely to occur, specific protection devices or tools, the instruction handbook and possibly a sign on the machinery should be provided by the manufacturer to enable the equipment to be safely unblocked.				**Not applicable.** No this kind of need.
	1.3.8	*Choice of protection against risks related to moving parts* Guards or protection devices used to protect against the risks related to moving parts must be selected on the basis of the type of risk. The following guidelines must be used to help make the choice. *A. Moving transmission parts* Guards designed to protect exposed persons against the risks associated with moving transmission parts (such as pulleys, belts, gears, rack and pinions, shafts, etc.) must be:	☑			— **Pass.** It is in accordance with the risk assessment.

		- either fixed, complying with requirements 1.4.1 and 1.4.2.1, or - movable, complying with requirements 1.4.1 and 1.4.2.2.A. Movable guards should be used where frequent access is foreseen.				See the related clauses. See the related clauses.
		B. Moving parts directly involved in the process Guards or protection devices designed to protect exposed persons against the risks associated with moving parts contributing to the work (such as cutting tools, moving parts of presses, cylinders, parts in the process of being machined, etc.) must be: - wherever possible fixed guards complying with requirements 1.4.1 and 1.4.2.1, - otherwise, movable guards complying with requirements 1.4.1 and 1.4.2.2.B or protection devices such as sensing devices (e.g. non-material barriers, sensor mats), remote-hold protection devices (e.g. two-hand controls), or protection devices intended automatically to prevent all or part of the operator's body from encroaching on the danger zone in accordance with requirements 1.4.1 and 1.4.3. However, when certain moving parts directly involved in the process cannot be made completely or partially inaccessible during operation owing to operations requiring nearby operator intervention, where technically possible such parts must be fitted with: - fixed guards, complying with requirements 1.4.1 and 1.4.2.1 preventing access to those sections of the parts that are not used in the work, - adjustable guards, complying with requirements 1.4.1 and 1.4.2.3 restricting access to those sections of the moving parts that are strictly for the work.	☑			
	1.4	*Required characteristics of guards and protection devices*	☑			
	1.4.1	*General requirements* Guards and protection devices must: - be of robust construction,				**Pass.** They all can be opened only

		- not give rise to any additional risk, - not be easy to by-pass or render non-operational, - be located at an adequate distance from the danger zone, - cause minimum obstruction to the view of the production process, - enable essential work to be carried out on installation and/or replacement of tools and also for maintenance by restricting access only to the area where the work has to be done, if possible without the guard or protection device having to be dismantled.				with tools. **Not applicable.** **Not applicable.**
	1.4.2 1.4.2.1	*Special requirements for guards* *Fixed guards* Fixed guards must be securely held in place. They must be fixed by systems that can be opened only with tools. Where possible, guards must be unable to remain in place without their fixings.			☑	Not applicable.
	1.4.2 1.4.2.2	*Movable guards* *A. Type A movable guards must* - as far as possible remain fixed to the machinery when open, - be associated with a locking device to prevent moving parts starting up as long as these parts can be accessed and to give a stop command whenever they are no longer closed.			☑	Not applicable.
	1.4.2 1.4.2.2	*B. Type B movable guards must be designed and incorporated into the* *control system so that:* - moving parts cannot start up while they are within the operator's reach, - the exposed person cannot reach moving parts once they have started up, - they can be adjusted only by means of an intentional action, such as the use of a tool, key, etc.,			☑	Not applicable.

		- the absence or failure of one of their components prevents starting or stops the moving parts, - protection against any risk of ejection is proved by means of an appropriate barrier.				
	1.4.2 1.4.2.3	*Adjustable guards restricting access* Adjustable guards restricting access to those areas of the moving parts strictly necessary for the work must: - be adjustable manually or automatically according to the type of work involved, - be readily adjustable without the use of tools, - reduce as far as possible the risk of ejection.			☑	Not applicable.
	1.4.3	*Special requirements for protection devices* Protection devices must be designed and incorporated into the control system so that:			☑	Not applicable.
		- moving parts cannot start up while they are within the operator's reach,				
		- the exposed person cannot reach moving parts once they have started up, - they can be adjusted only by means of an intentional action, such as the use of a tool, key, etc., - the absence or failure of one of their components prevents starting or stops the moving parts.				
	1.5 1.5.1	*Protection against other hazards* *Electricity supply* Where machinery has an electricity supply it must be designed, constructed and equipped so that all hazards of an electrical nature are or can be prevented. The specific rules in force relating to electrical equipment designed for use within certain voltage limits must apply to machinery which is subject to those limits.	☑			Pass
	1.5.2	*Static electricity* Machinery must be so designed and constructed as to prevent or limit the build-up of potentially dangerous electrostatic charges and/or be fitted with a	☑			Pass

		discharging system.				
	1.5.3	*Energy supply other than electricity* Where machinery is powered by an energy other than electricity (e.g. hydraulic, pneumatic or thermal energy, etc.), it must be so designed, constructed and equipped as to avoid all potential hazards associated with these types of energy.			☑	Not applicable. battery powered
	1.5.4	*Errors of fitting* Errors, likely to be made when fitting or refitting certain parts which could be a source of risk must be made impossible by the design of such parts or, failing this, by information given on the parts themselves and/or the housings. The same information must be given on moving parts and/or their housings where the direction of movement must be known to avoid a risk. Any further information that may be necessary must be given in the instructions. Where a faulty connection can be the source of risk, incorrect fluid connections, including electrical conductors, must be made impossible by the design or, failing this, by information given on the pipes, cables, etc. and/or connector blocks.	☑			Pass
	1.5.5	*Extreme temperatures* Steps must be taken to eliminate any risk of injury caused by contact with or proximity to machinery parts or materials at high or very low temperatures. The risk of hot or very cold material being ejected should be assessed. Where this risk exists, the necessary steps must be taken to prevent it or, if this is not technically possible, to render it non-dangerous.			☑	Not applicable. Winch can work normally in the ambient temperature range of -41℃-46℃
	1.5.6	*Fire* Machinery must be designed and constructed to avoid all risk of fire or overheating posed by the machinery itself or by gases, liquids, dust, vapours or other substances produced or used by the machinery.	☑			Pass Substandard batteries, improper use of batteries may cause a fire, so check and replace the battery

						regularly
	1.5.7	*Explosion* Machinery must be designed and constructed to avoid any risk of explosion posed by the machinery itself or by gases, liquids, dust, vapours or other substances produced or used by the machinery. To that end the manufacturer must take steps to: - avoid a dangerous concentration of products, - prevent combustion of the potentially explosive atmosphere, - minimise any explosion which may occur so that it does not endanger the surroundings. The same precautions must be taken if the manufacturer foresees the use of the machinery in a potentially explosive atmosphere. Electrical equipment forming part of the machinery must conform, as far as the risk from explosion is concerned, to the provision of the specific Directives in force.	☑			Pass
	1.5.8	*Noise* Machinery must be so designed and constructed that risks resulting from the emission of airborne noise are reduced to the lowest level taking account of technical progress and the availability of means of reducing noise, in particular at source.	☑			Pass
	1.5.9	*Vibration* Machinery must be so designed and constructed that risks resulting from vibrations produced by the machinery are reduced to the lowest level, taking account of technical progress and the availability of means of reducing vibration, in particular at source.			☑	Not applicable.
	1.5.10	*Radiation* Machinery must be so designed and constructed that any emission of radiation is limited to the extent necessary for its operation and that the effects on exposed persons are non-existent or reduced to non-dangerous proportions.			☑	Not applicable.

	1.5.11	*External radiation* Machinery must be so designed and constructed that external radiation does not interfere with its operation.			☑	Not applicable.
	1.5.12	*Laser equipment* Where laser equipment is used, the following provisions should be taken into account: - laser equipment on machinery must be designed and constructed so as to prevent any accidental radiation, - laser equipment on machinery must be protected so that effective radiation, radiation produced by reflection or diffusion and secondary radiation do not damage health, - optical equipment for the observation or adjustment of laser equipment on machinery must be such that no health risk is created by the laser rays.			☑	Not applicable.
	1.5.13	*Emissions of dust, gases, etc* Machinery must be so designed, constructed and/or equipped that risks due to gases, liquids, dust, vapours and other waste materials which it produces can be avoided. Where a hazard exists, the machinery must be so equipped that the said substances can be contained and/or evacuated. Where machinery is not enclosed during normal operation, the devices for containment and/or evacuation must be situated as close as possible to the source emission.			☑	Not applicable. The equipment will not produce gas and dust during use
	1.5.14	*Risk of being trapped in a machine* Machinery must be designed, constructed or fitted with a means of preventing an exposed person from being enclosed within it or, if that is impossible, with a means of summoning help.			☑	Not applicable. You don't get stuck in machinery
	1.5.15	*Risk of slipping, tripping or falling* Parts of the machinery where persons are liable to move about or stand must be designed and constructed to prevent persons slipping, tripping or falling on or off these parts.	☑			Pass The end of the length of the traction rope shall be marked obviously, and at least 5 laps shall be kept on

						the drum when the rope is pulled out.
	1.6 1.6.1	*Maintenance* *Machinery maintenance* Adjustment, lubrication and maintenance points must be located outside danger zones. It must be possible to carry out adjustment, maintenance, repair, cleaning and servicing operations while machinery is at a standstill. If one or more of the above conditions cannot be satisfied for technical reasons, these operations must be possible without risk (see 1.2.5). In the case of automated machinery and, where necessary, other machinery, the manufacturer must make provision for a connecting device for mounting diagnostic fault-finding equipment. Automated machine components which have to be changed frequently, in particular for a change in manufacture or where they are liable to wear or likely to deteriorate following an accident, must be capable of being removed and replaced easily and in safety. Access to the components must enable these tasks to be carried out with the necessary technical means (tools, measuring instruments, etc.) in accordance with an operating method specified by the manufacturer.	☑			Pass The gear box has been lubricated using a high temperature lithium grease and is sealed at the factory. No internal lubrication is required. Do not attempt to disassemble the gear box. Repairs should be done by the manufacturer or an authorized repair center Periodically check the tightness of mounting bolts and electrical connections. Remove all dirt or corrosion and always keep clean
	1.6.2	*Access to operating position and servicing points* The manufacturer must provide means of access (stairs, ladders, catwalks, etc.) to allow access in safety to all areas used for production, adjustment and maintenance operations.	☑			Pass Appropriate prevention measures and safety control device have been used
	1.6.3	*Isolation of energy sources* All machinery must be fitted with means to isolate it from all energy sources. Such isolators must be clearly identified. They must be capable of being locked if reconnection could endanger exposed persons. In the case of machinery supplied with electricity through a plug capable of being plugged into a circuit, separation of the plug is sufficient.	☑			The power switch has been used

		The isolator must be capable of being locked also where an operator is unable, from any of the points to which he has access, to check that the energy is still cut off. After the energy is cut off, it must be possible to dissipate normally any energy remaining or stored in the circuits of the machinery without risk to exposed persons. As an exception to the above requirements, certain circuits may remain connected to their energy sources in order, for example, to hold parts, protect information, light interiors, etc. In this case, special steps must be taken to ensure operator safety.				
	1.6.4	*Operator intervention* Machinery must be so designed, constructed and equipped that the need for operator intervention is limited. If operator intervention cannot be avoided, it must be possible to carry it out easily and in safety.	☑			Pass operator intervention is easily and safety
	1.6.5	*Cleaning of internal parts* The machinery must be designed and constructed in such a way that it is possible to clean internal parts which have contained dangerous substances or preparations without entering them; any necessary unblocking must also be possible from the outside. If it is absolutely impossible to avoid entering the machinery, the manufacturer must take steps during its construction to allow cleaning to take place with the minimum of danger.	☑			Pass Replacing the battery is very easy
	1.7 1.7.0	*Indicators* *Information devices* The information needed to control machinery must be unambiguous and easily understood. It must not be excessive to the extent of overloading the operator. Where the health and safety of exposed persons may be endangered by a fault in the operation of unsupervised machinery, the machinery must be equipped to give an appropriate acoustic or light signal as a warning.	☑			Pass The information needed are clearly and easily understand
	1.7.1	*Warning devices*	☑			Pass

		Where machinery is equipped with warning devices (such as signals, etc.), these must be unambiguous and easily perceived. The operator must have facilities to check the operation of such warning devices at all times. The requirements of the specific Directives concerning colours and safety signals must be complied with.				
	1.7.2	*Warning of residual risks* Where risks remain despite all the measures adopted or in the case of potential risks which are not evident (e.g. electrical cabinets, radioactive sources, bleeding of a hydraulic circuit, hazard in an unseen area, etc.), the manufacturer must provide warnings. Such warnings should preferably use readily understandable pictograms and/or be drawn up in one of the languages of the country in which the machinery is to be used, accompanied, on request, by the languages understood by the operators.	☑			Pass
	1.7.3	*Marking* All machinery must be marked legibly and indelibly with the following minimum particulars: - name and address of the manufacturer, - the UKCA marking (see Annex III), - designation of series or type, - serial number, if any, - the year of construction. Furthermore, where the manufacturer constructs machinery intended for use in a potentially explosive atmosphere, this must be indicated on the machinery. Machinery must also bear full information relevant to its type and essential to its safe use (e.g. maximum speed of certain rotating parts, maximum diameter of tools to be fitted, mass, etc.).	☑			Pass

		Where a machine part must be handled during use with lifting equipment, its mass must be indicated legibly, indelibly and unambiguously. The interchangeable equipment referred to in the third indent of Article 1(2)(a), must bear the same information.				
	1.7.4	*Instructions* (a) All machinery must be accompanied by instructions including at least the following: - a repeat of the information with which the machinery is marked, except the serial number (see 1.7.3) together with any appropriate additional information to facilitate maintenance (e.g. addresses of the importer, repairers, etc.), - foreseen use of the machinery within the meaning of 1.1.2(c), - workstation(s) likely to be occupied by operators, - instructions for safe: - putting into service, - use, - handling, giving the mass of the machinery and its various parts where they are regularly to be transported separately, - assembly, dismantling, - adjustment - maintenance (servicing and repair), - where necessary, training instructions, - where necessary, the essential characteristics of tools which may be fitted to the machinery. Where necessary, the instructions should draw attention to ways in which the machinery should not be used. (b) The instructions must be drawn up in one of the Community languages by the manufacturer or his authorised representative established in the Community. On being put into service, all machinery must be accompanied by a translation of the instructions in the language or languages of the country in which the machinery is to be used and by the instructions in the original language. This translation must be done either by the manufacturer or his authorised	☑			User manual in English provided

		representative established in the Community or by the person introducing the machinery into the language area in question. By way of derogation from this requirement, the maintenance instructions for use by specialised personnel employed by the manufacturer or his authorised representative established in the Community may be drawn up in only one of the Community languages understood by that personnel. (c) The instructions must contain the drawings and diagrams necessary for putting into service, maintenance, inspection, checking of correct operation and, where appropriate, repair of the machinery, and all useful instructions in particular with regard to safety. (d) Any literature describing the machinery must not contradict the instructions as regards safety aspects. The technical documentation describing the machinery must give information regarding the airborne noise emissions referred to in (f) and, in the case of hand-held and/or hand-guided machinery, information regarding vibration as referred to in 2.2. (e) Where necessary, the instructions must give the requirements relating to installation and assembly for reducing noise or vibration (e.g. use of dampers, type and mass of foundation block, etc.). (f) The instructions must give the following information concerning airborne noise emissions by the machinery, either the actual value or a value established on the basis of measurements made on identical machinery: - equivalent continuous A-weighted sound pressure level at workstations, where this exceeds 70 dB(A); where this level does not exceed 70 dB(A), this fact must be indicated, - peak C-weighted instantaneous sound pressure value at workstations, where this exceeds 63 Pa (130 dB in relation to 20 mPa), - sound power level emitted by the machinery where the equivalent continuous A-weighted sound pressure level at workstations exceeds 85 dB(A). In the case of very large machinery, instead of the sound power level, the equivalent continuous sound pressure levels at specified positions around the machinery may be indicated. Where the harmonised standards are not applied, sound levels must be measured using the most appropriate method for the machinery. The manufacturer must indicate the operating conditions of the machinery during measurement and what methods have been used for the measurement.					

		Where the workstation(s) are undefined or cannot be defined, sound pressure levels must be measured at a distance of 1 metre from the surface of the machinery and at a height of 1,60 metres from the floor or access platform. The position and value of the maximum sound pressure must be indicated. (g) If the manufacturer foresees that the machinery will be used in a potentially explosive atmosphere, the instructions must give all the necessary information. (h) In the case of machinery which may also be intended for use by non-professional operators, the wording and layout of the instructions for use, whilst respecting the other essential requirements mentioned above, must take into account the level of general education and acumen that can reasonably be expected from such operators.				
Technical construction file shall be retained and kept available for the competent national authorities for at least 10 years following the date of manufacture of the machinery or of the last unit produced.			☑			
Safety measures for fulfilling the product conformity requirements - Critical components shall be checked for every purchasing order if it is comply with the critical component list and relevant conformance and requirements are considered during incoming inspection. - Production flow chart and quality control plans - Regulatory compliance records for the released machinery. (Availability and compliance) ¤ Relevant warning signs ¤ CE Conformity mark ¤ User manual ¤ Relevant circuit diagrams ¤ Relevant accessories, tools and apparatus ¤ Functional tests ¤ Mechanical tests ¤ Electrical safety tests			☑			

TECHNICAL FILE

The third party	Shanghai Global Testing Services Co., Ltd Floor 3rd, Building D-1, No. 128, Shenfu Road, Minhang District, Shanghai, China	Tel: / Fax: /
Name and address of the applicant	MODE CHINA Room 01.8/f#7 Tower. 4th Area, No. 186, South 4th Ring west Road.Fengtai District, Beijing, China	
Name and address of the manufacturer	Zhuozhou Mude Industrial Technology Co., Ltd No.C55, Zhongguaneun Hegu Innovatien Industrial Park, Chaoyang EastRoad,ZhuozhouDevelopment Zone, BaodingCity, Hebei Province	
Name and address of the factory (production sites)	Zhuozhou Mude Industrial Technology Co., Ltd No.C55, Zhongguaneun Hegu Innovatien Industrial Park, Chaoyang EastRoad,ZhuozhouDevelopment Zone, BaodingCity, Hebei Province	
Product	Free Hoist	
Mode/type reference	Free Hoist	
Reviewed according to	EN ISO 12100:2010, EN 60204-32:2008, EN 14492-2:2019	
Review Result	PASS	
Review Report No.	MD-TCF-240529-58442	
Work carried out by	Tony Guo Director	Signature
Word verified by	Kevin Shi Manager	Signature
Date of issue	2024/05/31	

Part III: Technical file

3.1 EN ISO 12100 & EN 14492-2 Report

EN ISO 12100:2010			
Clause	Requirement – Test	Result - Remark	Verdict
4.	Strategy for risk assessment and risk reduction		
	To implement risk assessment and risk reduction the designer shall take the following actions, in the order given:	According to the strategy.	Pass
	a) determine the limits of the machinery, which include the intended use and any reasonably foreseeable misuse thereof;	According to the strategy.	Pass
	b) identify the hazards and associated hazardous situations;	According to the strategy.	Pass
	c) estimate the risk for each identified hazard and hazardous situation;	According to the strategy.	Pass
	d) evaluate the risk and take decisions about the need for risk reduction;	According to the strategy.	Pass
	e) eliminate the hazard or reduce the risk associated with the hazard by means of protective measures.Actions a) to d) are related to risk assessment and e) to risk reduction.	According to the strategy.	Pass
	Risk assessment is a series of logical steps to enable, in a systematic way, the analysis and evaluation of the risks associated with machinery. Risk assessment is followed, whenever necessary, by risk reduction. Iteration of this process can be necessary to eliminate hazards as far as practicable and to adequately reduce risks by the implementation of protective measures.		Pass
	Protective measures are the combination of the measures implemented by the designer and the user in accordance with Figure 2. Measures which can be incorporated at the design stage are preferable to those implemented by the user and usually prove more effective.		Pass

EN ISO 12100:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	The objective to be met is the greatest practicable risk reduction, taking into account the four below factors. The strategy defined in this clause is represented by the flowchart in Figure 1. The process itself is iterative and several successive applications can be necessary to reduce the risk, making the best use of available technology. In carrying out this process, it is necessary to take into account these four factors, in the following order of preference:		Pass
	- the safety of the machine during all the phases of its life		Pass
	cycle;		Pass
	—the ability of the machine to perform its function;		Pass
	—the usability of the machine;		Pass
	—the manufacturing, operational and dismantling costs of the machine.		Pass
5.	Risk assessment		—
5.1	General		—
	Risk assessment comprises (see Figure1)	According to the strategy.	Pass
	- risk analysis, comprising		
	1) determination of the limits of the machinery (see 5.3),		Pass
	2) hazard identification (5.4 and Annex B), and		Pass
	3) risk estimation (see 5.5), and		Pass
	- risk evaluation (see 5.6).		Pass
	Risk analysis provides information required for the risk evaluation, which in turn allows judgments to be made about whether or not risk reduction is required.		Pass
	These judgments shall be supported by a qualitative or, where appropriate, quantitative estimate of the risk associated with the hazards present on the machinery.		Pass
	The risk assessment shall be documented according to Clause 7.		Pass
5.2	Information for risk assessment		—

EN ISO 12100:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	The information for risk assessment should include the following.	According to the strategy.	—
	a) Related to machinery description:		—
	1) user specifications;		Pass
	2) anticipated machinery specifications, including		Pass
	i) a description of the various phases of the whole life cycle of the machinery,		Pass
	ii) design drawings or other means of establishing the nature of the machinery, and		Pass
	iii) required energy sources and how they are supplied;		Pass
	3) documentation on previous designs of similar machinery, if relevant;		N/A
	4) information for use of the machinery, as available.	See instruction	Pass
	b) Related to regulations, standards and other applicable documents:		—
	1) applicable regulations;		Pass
	2) relevant standards;		Pass
	3) relevant technical specifications;		Pass
	4) relevant safety data sheets.		Pass
	c) Related to experience of use:		—
	1) any accident, incident or malfunction history of the actual or similar machinery;		Pass
	2) the history of damage to health resulting, for example, from emissions (noise, vibration, dust, fumes,etc.), chemicals used or materials processed by the machinery;		Pass
	3) the experience of users of similar machines and, whenever practicable, an exchange of information with the potential users.		Pass
	d) Relevant ergonomic principles.		—
	The information shall be updated as the design develops or when modifications to the machine are required.	According to the strategy.	Pass

EN ISO 12100:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	Comparisons between similar hazardous situations associated with different types of machinery are often possible, provided that sufficient information about hazards and accident circumstances in those situations is available.		Pass
	For quantitative analysis, data from databases, handbooks, laboratories or manufacturers' specifications may be used, provided that there is confidence in the suitability of the data. Uncertainty associated with these data shall be indicated in the documentation (see Clause 7).		Pass
5.3	Determination of limits of machinery		—
5.3.1	General		—
	Risk assessment begins with the determination of the limits of the machinery, taking into account all the phases of the machinery life. This means that the characteristics and performances of the machine or a series of machines in an integrated process, and the related people, environment and products, should be identified in terms of the limits of machinery as given in 5.3.2 to 5.3.5	According to the strategy.	Pass
5.3.2	Use limits		—
	Use limits include the intended use and the reasonably foreseeable misuse. Aspects to be taken into account include the following:		Pass
	a) the different machine operating modes and different	See the instruction	Pass
	intervention procedures for the users, including interventions required by malfunctions of the machine;		
	b) the use of the machinery (for example, industrial, non-industrial and domestic) by persons identified by sex, age, dominant hand usage, or limiting physical abilities (visual or hearing impairment, size, strength,etc.);		Pass
	c) the anticipated levels of training, experience		Pass

EN ISO 12100:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	or ability of users including		
	1) operators,		Pass
	2) maintenance personnel or technicians,		Pass
	3) trainees and apprentices, and		Pass
	4) the general public;		Pass
	d) exposure of other persons to the hazards associated with the machinery where it can be reasonably foreseen:		Pass
	1) persons likely to have a good awareness of the specific hazards, such as operators of adjacent machinery;		Pass
	2) persons with little awareness of the specific hazards but likely to have a good awareness of site safety procedures, authorized routes, etc., such as administration staff;		Pass
	3) persons likely to have very little awareness of the machine hazards or the site safety procedures, such as visitors or members of the general public, including children.		Pass
	If specific information is not available in relation to b), above, the manufacturer should take into account general information on the intended user population (for example, appropriate anthropometric data).		N/A
	5.3.3 Space limits		—
	Aspects of space limits to be taken into account include		
	a) the range of movement,		Pass
	b) space requirements for persons interacting with the machine, such as during operation and maintenance,		Pass

EN ISO 12100:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	c) human interaction such as the operator-machine interface, and		Pass
	d) the machine-power supply interface.		Pass
5.3.4	Time limits		—
	Aspects of time limits to be taken into account include:		
	a) the life limit of the machinery and/or of some of its components (tooling, parts that can wear, electromechanical components, etc.), taking into account its intended use and reasonably foreseeable misuse, and		Pass
	b) recommended service intervals.		Pass
5.3.5	Other limits		—
	Examples of other limits include:		—
	a) properties of the material(s) to be processed,		N/A
	b) housekeeping — the level of cleanliness required, and		N/A
	c) environmental — the recommended minimum and maximum temperatures, whether the machine can be operated indoors or outdoors, in dry or wet weather, in direct sunlight, tolerance to dust and wet, etc	See the instruction	Pass
5.4	Hazard identification		—
	After determination of the limits of the machinery, the essential step in any risk assessment of the machinery is the systematic identification of reasonably foreseeable hazards (permanent hazards and those which can appear unexpectedly), hazardous situations and/or hazardous events during all phases of the machine life cycle, i.e.:		Pass
	- transport, assembly and installation;		Pass
	-commissioning;		Pass
	- use;		Pass
	- dismantling, disabling and scrapping.		Pass

EN ISO 12100:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	Only when hazards have been identified can steps be taken to eliminate them or to reduce risks. To accomplish this hazard identification, it is necessary to identify the operations to be performed by the machinery and the tasks to be performed by persons who interact with it, taking into account the different parts, mechanisms or functions of the machine, the materials to be processed, if any, and the environment in which the machine can be used.		Pass
	The designer shall identify hazards taking into account the following.		
	a) Human interaction during the whole life cycle of the machine		—
	Task identification should consider all tasks associated with every phase of the machine life cycle as given	According to the strategy.	Pass
	above. Task identification should also take into account, but not be limited to, the following task categories:		
	-setting;		Pass
	- testing;		Pass
	- teaching/programming;		Pass
	- process/tool changeover;		Pass
	- start-up;		Pass
	- all modes of operation;		Pass
	- feeding the machine;		Pass
	- removal of product from machine;		Pass
	- stopping the machine;		Pass
	-stopping the machine in case of emergency;		Pass
	- recovery of operation from jam or blockage;		Pass
	-restart after unscheduled stop;		Pass
	-fault-finding/trouble-shooting (operator intervention);		Pass
	-cleaning and housekeeping;		Pass
	- preventive maintenance;		Pass
	-corrective maintenance		Pass
	All reasonably foreseeable hazards, hazardous situations or hazardous events associated with		Pass

EN ISO 12100:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	the various tasks shall then be identified. Annex B gives examples of hazards, hazardous situations and hazardous events to assist in this process. Several methods are available for the systematic identification of hazards. See also ISO/TR 14121-2.		
	In addition, reasonably foreseeable hazards, hazardous situations or hazardous events not directly related to tasks shall be identified.		Pass
	b) Possible states of the machine		—
	These are as follows:		—
	1) the machine performs the intended function (the machine operates normally);		Pass
	2) the machine does not perform the intended function (i.e. it malfunctions) due to a variety of reasons,including		Pass
	- variation of a property or of a dimension of the processed material or of the workpiece,		Pass
	- failure of one or more of its component parts or services,		Pass
	- external disturbances (for example, shocks, vibration, electromagnetic interference),		Pass
	- design error or deficiency (for example, software		Pass
	errors),		Pass
	- disturbance of its power supply, and		Pass
	-surrounding conditions (for example, damaged floor surfaces).		Pass
	c) Unintended behaviour of the operator or reasonably foreseeable misuse of the machine		—

EN ISO 12100:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	Examples include - loss of control of the machine by the operator (especially for hand-held or mobile machines),		Pass
	- reflex behaviour of a person in case of malfunction, incident or failure during the use of the machine,		Pass
	- behaviour resulting from lack of concentration or carelessness,		Pass
	- behaviour resulting from taking the "line of least resistance" in carrying out a task,		Pass
	- behaviour resulting from pressures to keep the machine running in all circumstances, and		Pass
	- behaviour of certain persons (for example, children, disabled persons).		Pass
5.5	Risk estimation		—
5.5.1	General		—
	After hazard identification, risk estimation shall be carried out for each hazardous situation by determining the elements of risk given in 5.5.2. When determining these elements, it is necessary to take into account then aspects given in 5.5.3.	According to the strategy.	Pass
	If standardized (or other suitable) measurement methods exist for an emission, they should be used, in conjunction with existing machinery or prototypes, to determine emission values and comparative emission data. This makes it possible for the designer to	According to the strategy.	Pass
	-estimate the risk associated with the emissions,		Pass
	-evaluate the effectiveness of the protective measures implemented at the design stage,		Pass
	-provide potential buyers with quantitative information on emissions in the technical documentation, and		Pass
	- provide users with quantitative information on emissions in the information for use.		Pass
	Hazards other than emissions that are described by measurable parameters can be dealt with in a similar manner.		Pass
5.5.2	Elements of risk		—

EN ISO 12100:2010			
Clause	Requirement – Test	Result - Remark	Verdict
5.5.2.1	General		—
	The risk associated with a particular hazardous situation depends on the following elements: a) the severity of harm;	According to the strategy .	Pass
	b) the probability of occurrence of that harm, which is a function of 1) the exposure of person(s) to the hazard, 2) the occurrence of a hazardous event, and 3) the technical and human possibilities to avoid or limit the harm.		Pass
5.5.2.2	Severity of harm		—
	The severity can be estimated by taking into account the following: a) the severity of injuries or damage to health, for example, -slight, -serious, - death.		Pass
	b) the extent of harm, for example, to - one person, - several persons.		Pass
	When carrying out a risk assessment, the risk from the most likely severity of the harm that is likely to occur from each identified hazard shall be considered, but the highest foreseeable severity shall also be taken into account, even if the probability of such an occurrence is not high.		Pass
5.5.2.3	Probability of occurrence of harm		—
5.5.2.3. 1	Exposure of persons to the hazard		—
	The exposure of a person to the hazard influences the probability of the occurrence of harm. Factors to be taken into account when estimating the exposure are, among others,	According to the strategy.	Pass
	a) the need for access to the hazard zone (for normal operation, correction of malfunction, maintenance or repair, etc.),		Pass
	b) the nature of access (for example, manual feeding of materials),		Pass
	c) the time spent in the hazard zone,		Pass

EN ISO 12100:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	d) the number of persons requiring access, and		Pass
	e) the frequency of access.		Pass
5.5.2.3. 2	Occurrence of a hazardous event		—
	The occurrence of a hazardous event influences the probability of occurrence of harm. Factors to be taken into account when estimating the occurrence of a hazardous event are, among others, a) reliability and other statistical data, b) accident history, c) history of damage to health, and d) comparison of risks (see 5.6.3).	According to the strategy.	
5.5.2.3. 3	Possibility of avoiding or limiting harm		—
	The possibility of avoiding or limiting harm influences the probability of occurrence of harm. Factors to be taken into account when estimating the possibility of avoiding or limiting harm are, among others, the following:	According to the strategy.	Pass
	a) different persons who can be exposed to the hazard(s), for example, - skilled, - unskilled;		Pass
	b) how quickly the hazardous situation could lead to harm, for example, - suddenly, - quickly, - slowly;		Pass
	c) any awareness of risk, for example, - by general information, in particular, information for use, - by direct observation, - through warning signs and indicating devices, in particular, on the machinery;		Pass
	d) the human ability to avoid or limit harm (for example, reflex, agility, possibility of escape);		Pass
	e) practical experience and knowledge, for example, - of the machinery, - of similar machinery,		Pass

EN ISO 12100:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	- no experience.		
5.5.3	Aspects to be considered during risk estimation		—
5.5.3.1	Persons exposed		—
	Risk estimation shall take into account all persons (operators and others) for whom exposure to the hazard is reasonably foreseeable.	According to the strategy.	Pass
5.5.3.2	Type, frequency and duration of exposure		—
	The estimation of the exposure to the hazard under consideration (including long-term damage to health) requires analysis of, and shall account for, all modes of operation of the machinery and methods of working. In particular, the analysis shall account for the needs for access during loading/unloading, setting, teaching,process changeover or correction, cleaning, fault-finding and maintenance.	According to the strategy.	Pass
	The risk estimation shall also take into account tasks, for which it is necessary to suspend protective measures.		Pass
5.5.3.3	Relationship between exposure and effects		—
	The relationship between an exposure to a hazard and its effects shall be taken into account for each hazardous situation considered. The effects of accumulated exposure and combinations of hazards shall also be considered. When considering these effects, risk estimation shall, as far as practicable, be	According to the strategy.	Pass

EN ISO 12100:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	based on appropriate recognized data.		
5.5.3.4	Human factors		—
	Human factors can affect risk and shall be taken into account in the risk estimation, including, for example, a) the interaction of person(s) with the machinery, including correction of malfunction,		Pass
	b) interaction between persons,		Pass
	c) stress-related aspects,		Pass
	d) ergonomic aspects,		Pass
	e) the capacity of persons to be aware of risks in a given situation depending on their training, experience and ability,		Pass
	f) fatigue aspects, and		Pass
	g) aspects of limited abilities (due to disability, age, etc.).		Pass
	Training, experience and ability can affect risk; nevertheless, none of these factors shall be used as a substitute for hazard elimination, risk reduction by inherently safe design measure or safeguarding, wherever these protective measures can be practicably implemented.	According to the strategy	Pass
5.5.3.5	Suitability of protective measures		—
	Risk estimation shall take into account the suitability of protective measures and shall		Pass
	a) identify the circumstances which can result in harm,		Pass
	b) whenever appropriate, be carried out using quantitative methods to compare alternative protective measures (see ISO/TR 14121-2), and		N/A
	c) provide information that can assist with the selection of appropriate protective measures.		Pass

EN ISO 12100:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	When estimating risk, those components and systems identified as immediately increasing the risk in case of failure need special attention.		Pass
	When protective measures include work organization, correct behaviour, attention, application of personal protective equipment (PPE), skill or training, the relatively low reliability of such measures compared with proven technical protective measures shall be taken into account in the risk estimation.		Pass
5.5.3.6	Possibility of defeating or circumventing protective measures		—
	For the continued safe operation of a machine, it is important that the protective measures allow its easy use and do not hinder its intended use. Otherwise, there is a possibility that protective measures might be bypassed in order for maximum utility of the machine to be achieved.	According to the strategy.	Pass
	Risk estimation shall take account of the possibility of defeating or circumventing protective measures. It shall also take account of the incentive to defeat or circumvent protective measures when, for example,		Pass
	a) the protective measure slows down production or interferes with another activity or preference of the user,		Pass
	b) the protective measure is difficult to use,		Pass
	c) persons other than the operator are involved, or		Pass
	d) the protective measure is not recognized by the user or not accepted as being suitable for its function.		Pass
	Whether or not a protective measure can be defeated depends on both the type of protective measure, such as an adjustable guard or programmable trip device, and its design details.	According to the strategy.	Pass
	Protective measures that use programmable electronic	According to the strategy and	Pass

EN ISO 12100:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	systems introduce additional possibilities of defeat or circumvention if access to safety-related software is not appropriately restricted by design and monitoring methods. Risk estimation shall identify where safety-related functions are not separated from other machine functions and shall determine the extent to which access is possible. This is particularly important when remote access for diagnostic or process correction purposes is required.		Pass
5.5.3.7	Ability to maintain protective measures		—
	Risk estimation shall consider whether the protective measures can be maintained in the condition necessary to provide the required level of protection.		Pass
5.5.3.8	Information for use		—
	Risk estimation shall take into account the information for use, as available. See also 6.4.		Pass
5.6	Risk evaluation		—
5.6.1	General		—
	After risk estimation has been completed, risk evaluation shall be carried out to determine if risk reduction is required. If risk reduction is required, then appropriate protective measures shall be selected and applied (see Clause 6). As shown in Figure 1, the adequacy of the risk reduction shall be determined after applying each of the three steps of risk reduction described in Clause 6. As part of this iterative process, the designer shall also check whether additional hazards are introduced or other risks increased when new protective measures are applied. If additional hazards do occur, they shall be added to the list of identified hazards and appropriate protective measures will be required to address them.		Pass
	Achieving the objectives of risk reduction and a favourable outcome of risk comparison applied when practicable gives confidence that risk has been adequately reduced.		Pass

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Clause	Requirement – Test	Result - Remark	Verdict
5.6.2	Adequate risk reduction		—
	Application of the three-step method described in 6.1 is essential in achieving adequate risk reduction. Following the application of the three-step method, adequate risk reduction is achieved when		Pass
	- all operating conditions and all intervention procedures		Pass
	have been considered,		Pass
	- the hazards have been eliminated or risks reduced to the lowest practicable level,		Pass
	- any new hazards introduced by the protective measures have been properly addressed,		Pass
	- users are sufficiently informed and warned about the residual risks (see 6.1, step 3),		Pass
	- protective measures are compatible with one another,		Pass
	- sufficient consideration has been given to the consequences that can arise from the use in a nonprofessional/ non-industrial context of a machine designed for professional/industrial use, and		Pass
	- the protective measures do not adversely affect the operator's working conditions or the usability of the machine.		Pass
5.6.3	Comparison of risks		—
	As part of the process of risk evaluation, the risks associated with the machinery or parts of machinery can be compared with those of similar machinery or parts of machinery, provided the following criteria apply: - the similar machinery is in accordance with the relevant type-C standard(s);		N/A
	- the intended use, reasonably foreseeable misuse and the way both machines are designed and constructed are comparable;		N/A
	- the hazards and the elements of risk are comparable;		N/A
	- the technical specifications are comparable;		N/A
	- the conditions for use are comparable.		N/A

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Clause	Requirement – Test	Result - Remark	Verdict
	The use of this comparison method does not eliminate the need to follow the risk assessment process as described in this International Standard for the specific conditions of use. For example, when a band saw used for cutting meat is compared with a band saw used for cutting wood, the risks associated with the different material shall be assessed.		N/A
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. 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).	This requirement is complied with.	Pass
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.	Pass
	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	Appropriate machine design has been performed by the manufacturer.	Pass

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Clause	Requirement – Test	Result - Remark	Verdict
	achieve the risk reduction objectives in the case where inherently safe design measures are not sufficient (see 6.1 for the three-step method).		
6.2.2	Consideration of geometrical factors and physical aspects		
6.2.2.1	Geometrical factors		Pass
	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, 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 there are no exposed persons in the danger zones.	Appropriate machine design has been performed by the manufacturer.	Pass
	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	Appropriate machine design has been performed by the manufacturer.	Pass

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Clause	Requirement – Test	Result - Remark	Verdict
	13857).		
	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.	Appropriate machine design has been performed by the manufacturer.	Pass
	d) The form of the machine is designed so as to achieve a suitable working position and provide accessible manual controls (actuators).	Appropriate machine design has been performed by the manufacturer.	Pass
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.	Pass
	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.	Pass
	c) limiting the emissions by acting on the 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	The emissions by acting on the characteristics of the source have been limited.	Pass

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Clause	Requirement – Test	Result - Remark	Verdict
	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)]		
6.2.3	Taking into account general technical knowledge of machine design		
	This general technical knowledge can be derived from technical specifications for design (standards, design codes, calculation rules, etc.), which should be used to cover		
	a) mechanical stresses such as		
	- stress limitation by implementation of correct calculation, construction and fastening methods as regards, for example, bolted assemblies and welded assemblies,	The appropriate technical knowledge of mechanical has been taken into account.	Pass
	- stress limitation by overload prevention (bursting disk, pressure-limiting valves, breakage points, torque-limiting devices, etc.),	The appropriate technical knowledge of mechanical has been taken into account.	Pass
	- avoiding fatigue in elements under variable	The appropriate	Pass

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Clause	Requirement – Test	Result - Remark	Verdict
	stresses (notably cyclic stresses),	technical knowledge of mechanical has been taken into account.	
	- static and dynamic balancing of rotating elements,	The appropriate technical knowledge of mechanical has been taken into account.	Pass
	b) materials and their properties such as		
	- resistance to corrosion, ageing, abrasion and wear,	The materials have been treated by appropriate methods.	Pass
	- hardness, ductility, brittleness,	The materials have been treated by appropriate methods.	Pass
	- homogeneity,	The materials have been treated by appropriate methods.	Pass
	- toxicity,	The materials have been treated by appropriate methods.	Pass
	- flammability	The materials have been treated by appropriate methods.	Pass
	c) emission values for		
	- noise,	No noise will result in hazard in this machine.	Pass
	- vibration,	No vibration will result in hazard in this machine.	Pass
	- hazardous substances,	No hazardous substances will result in hazard in this machine.	Pass

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Clause	Requirement – Test	Result - Remark	Verdict
	- radiation	No radiation will result in hazard in this machine.	Pass
	When the reliability of particular components or assemblies is critical for safety (for example, ropes, chains, lifting accessories for lifting loads or persons), stress limits shall be multiplied by appropriate working coefficients.	Appropriate working coefficients have been taken into account during design and calculation.	Pass
6.2.4	Choice of appropriate technology		
	One or more hazards can be eliminated or risks reduced by the choice of the technology to be used in certain applications such as the following:		
	a) on machines intended for use in explosive atmospheres, using - appropriately selected pneumatic or hydraulic control system and machine actuators, - intrinsically safe electrical equipment (see IEC 60079-11);	Not applicable.	N/A
	b) for particular products to be processed (for example, by a solvent), by using equipment that ensures the temperature will remain far below the flash point;	Not applicable.	N/A
	c) the use of alternative equipment to avoid high noise levels, such as - electrical instead of pneumatic equipment, - in certain conditions, water-cutting instead of mechanical equipment.	The appropriate technology has been chosen.	Pass
6.2.5	Applying principle of positive mechanical action		
	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	The principle of the positive mechanical action of a component on another component has been applied.	Pass

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Clause	Requirement – Test	Result - Remark	Verdict
	circuit (see IEC 60947-5-1 and ISO 14119).		
6.2.6	Provisions for stability		
	Machines shall be designed so that they 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.	Pass
	Factors to be taken into account include		
	- the geometry of the base,	The factor has been taken into account during design.	Pass
	- the weight distribution, including loading,	The factor has been taken into account during design.	Pass
	- the dynamic forces due to movements of parts of the machine, of the machine itself or of elements held by the machine which can result in an overturning moment,	The factor has been taken into account during design.	Pass
	- vibration	The factor has been taken into account during design.	Pass
	- oscillations of the centre of gravity,	Not applicable.	N/A
	- characteristics of the supporting surface in case of travelling or installation on different sites (ground conditions, slope, etc.),	The factor has been taken into account during design.	Pass
	- external forces, such as wind pressure and manual forces.	The factor has been taken into account during design.	Pass
	Stability shall be considered in all phases of the life cycle of the machine, including handling, travelling, installation, use, dismantling, disabling and scrapping.	The factor has been taken into account during design.	Pass
	Other protective measures for stability relevant to safeguarding are given in 6.3.2.6.	Please see the related clause.	Pass

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Clause	Requirement – Test	Result - Remark	Verdict
6.2.7	Provisions for maintainability		
	When designing a machine, the following maintainability factors shall be taken into account to enable maintenance of the machine:		
	- 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.	Pass
	- ease of handling, taking into account human capabilities;	The factor has been taken into account during design.	Pass
	- limitation of the number of special tools and equipment.	The factor has been taken into account during design.	Pass
6.2.8	Observing ergonomic principles		
	Ergonomic principles shall be taken into account in designing machinery so as to reduce the mental or physical stress of, and strain on, the operator.	Appropriate ergonomic principles have been taken into account in designing machinery to reduce mental or physical stress and strain of the operator.	Pass
	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.	Pass
	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.	Pass
	All elements of the operator–machine interface, such as controls, signalling or data	All arrangement and design of manual	Pass

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Clause	Requirement – Test	Result - Remark	Verdict
	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, EN 13861 and IEC 61310-1.	controls have been checked in compliance with.	
	The designer's attention is particularly drawn to following ergonomic aspects of machine design.		-
	a) Avoid the necessity for stressful postures and movements during the use of the machine (for example, providing facilities to adjust the machine to suit the various operators).	Stressful postures and movements during use of the machine have been avoided.	Pass
	b) Design machines, especially hand-held and mobile machines, so as 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.	Pass
	c) Limit as far as possible noise, vibration and thermal effects such as extreme temperatures.	This machine has been designed with low noise, vibration.	Pass
	d) Avoid linking the operator's working rhythm to an automatic succession of cycles.		Pass
	e) Provide 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 or the lighting source has to be adjusted, its location shall be such that it does not cause any risk to persons making the adjustment.	All these factors have been taken into account during design.	Pass
	f) Select, locate and identify manual controls		-

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Clause	Requirement – Test	Result - Remark	Verdict
	(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.	Pass
	- they can be safely operated without hesitation or loss of time and without ambiguity (for example, 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.	Pass
	- their location (for push-buttons) and their movement (for levers and hand wheels) are consistent with their effect (see IEC 61310-3),	All the function has been checked in compliance with this requirement.	Pass
	- their operation cannot cause additional risk.		Pass
	Where a control is designed and constructed to perform several different actions — namely, where there is no one-to-one correspondence (for example, keyboards) — the action to be performed shall be clearly displayed and subject to confirmation where necessary.		N/A
	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. Constraints due to the necessary or foreseeable use of personal protective equipment (such as footwear, gloves) shall be taken into account.	All the arrangement of the control logic have been checked in compliance with this requirement.	Pass
	g) Select, design and locate indicators, dials and visual display units so that		
	- they fit within the parameters and characteristics of human perception,		Pass

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Clause	Requirement – Test	Result - Remark	Verdict
	- 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,		Pass
	- the operator is able to perceive them from the control position.		Pass
6.2.9	Electrical hazards		
	For the design of the electrical equipment of machines, BS EN 60204-32 gives general provisions about disconnection and switching of electrical circuits and for protection against electric shock.	Please also make reference to BS EN 60204-32 test report.	Pass
	For requirements related to specific machines, see corresponding IEC standards (for example, IEC 61029, IEC 60745 or IEC 60335).		N/A
6.2.10	Pneumatic and hydraulic hazards		-
	Pneumatic and hydraulic equipment of machinery shall be designed so that		
	- the maximum rated pressure cannot be exceeded in the circuits (using, for example, pressure-limiting devices),	This requirement is complied with.	Pass
	- no hazard results from pressure fluctuations or increases, or from loss of pressure or vacuum,	This requirement is complied with.	Pass
	- no hazardous fluid jet or sudden hazardous movement of the hose (whiplash) results from leakage or component failures,	This requirement is complied with.	Pass
	- air receivers, air reservoirs or similar vessels (such as in gas-loaded accumulators) comply with the applicable design standard codes or regulations for these elements,	This requirement is complied with.	Pass
	- all elements of the equipment, especially pipes and hoses, are protected against harmful external effects,	This requirement is complied with.	Pass
	- as far as possible, reservoirs and similar vessels (for example, gas-loaded	This requirement is complied with.	Pass

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Clause	Requirement – Test	Result - Remark	Verdict
	accumulators) are automatically depressurized when isolating the machine from its power supply (see 6.3.5.4) and, if not possible, means are provided for their isolation, local 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 are provided with clearly identified exhaust devices, and there is a warning label drawing attention to the necessity of depressurizing those elements before any setting or maintenance activity on the machine.	This requirement is complied with.	Pass
6.2.11	Applying inherently safe design measures to control systems		-
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 ISO 13849-1 or IEC 62061).	Inherently safe design measures to control system have applied.	Pass
	The correct design of machine control systems can avoid unforeseen and potentially hazardous machine behaviour.		Pass
	Typical causes of hazardous machine behaviour are		
	- an unsuitable design or modification (accidental or deliberate) of the control system logic,	No this kind of hazard in this machine	Pass
	- a temporary or permanent defect or failure of one or several components of the control system,	No this kind of hazard in this machine	Pass
	- a variation or a failure in the power supply of the control system,	No this kind of hazard in this	Pass

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Clause	Requirement – Test	Result - Remark	Verdict
		machine	
	- inappropriate selection, design and location of the control devices.	No this kind of hazard in this machine	Pass
	Typical examples of hazardous machine behaviour are		
	- unexpected start-up (see ISO 14118),	No this kind of hazard in this machine	Pass
	- uncontrolled speed change,	No this kind of hazard in this machine	Pass
	- failure to stop moving parts,	No this kind of hazard in this machine	Pass
	- dropping or ejection of part of the machine or of a workpiece clamped by the machine,	No this kind of hazard in this machine	Pass
	- machine action resulting from inhibition (defeating or failure) of protective devices.	No this kind of hazard in this machine	Pass
	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. These principles and methods shall be applied singly or in combination as appropriate to the circumstances (see ISO 13849-1, BS EN 60204-32 and IEC 62061).	The design of control systems comply with the related principles and methods	Pass
	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.	Pass

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Clause	Requirement – Test	Result - Remark	Verdict
	- provision for specific operating modes (for example, 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.	Pass
	- clear display of the faults;		Pass
	- measures to prevent accidental generation of unexpected start commands (for example, shrouded start device) likely to cause dangerous machine behaviour (see ISO 14118:2000, Figure 1);	Main switch with lock and related devices are provided.	Pass
	- maintained stop commands (for example, interlock) to prevent restarting that could result in dangerous machine behaviour (see ISO 14118:2000, Figure 1).	This requirement is complied with.	Pass
	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. The different zones shall be clearly defined and it shall be obvious which parts of the machine belong to which zone. Likewise, it shall be obvious which control devices (for example, emergency stop devices, supply disconnecting devices) and/or protective devices belong to which zone. 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.		N/A
	Control systems shall be designed to limit the movements of parts of the machinery, the machine itself, or work pieces and/or loads held by the machinery, to the safe design parameters (for example, range, speed, acceleration, deceleration, load capacity). Allowance shall be made for dynamic effects (swinging of loads, etc.).	This requirement is complied with.	Pass

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Clause	Requirement – Test	Result - Remark	Verdict
6.2.11.2	Starting of an internal power source/switching on an external power supply		
	The starting of an internal power source or switching-on of an external power supply shall not result in a hazardous situation.	Please also make reference to BS EN 60204-32 test report.	Pass
6.2.11.3	Starting/stopping of a mechanism		
	The primary action for starting or accelerating the movement of a mechanism should be performed by the application or an increase of voltage or fluid pressure, or — if binary logic elements are considered — by passage from state 0 to state 1 (where state 1 represents the highest energy state).	This requirement has been taken into account during design.	Pass
	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 (where state 1 represents the highest energy state)		Pass
	In certain applications, such as high-voltage switchgear, this principle cannot be followed, in which case other measures should be applied to achieve the same level of confidence for the stopping or slowing down.		N/A
	When, in order for the operator to maintain permanent control of deceleration, this principle is not observed (for example, 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.		Pass
6.2.11.4	Restart after power interruption		
	If a hazard could be generated, the spontaneous restart of a machine when it is re-energized after power interruption shall be		Pass

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Clause	Requirement – Test	Result - Remark	Verdict
	prevented (for example, by use of a self-maintained relay, contactor or valve).		
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.	Pass
	- the stopping function of the machinery shall remain;		Pass
	- all devices whose permanent operation is required for safety shall operate in an effective way to maintain safety (for example, locking, clamping devices, cooling or heating devices, power-assisted steering of self-propelled mobile machinery);		Pass
	- 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.		Pass
6.2.11.6	Use of automatic monitoring		
	Automatic monitoring is intended to ensure that a safety function or functions implemented by a protective measure do 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 such that hazards are generated.	Appropriate automatic monitoring has been used.	Pass
	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. In either case, the protective measure can be initiated immediately or delayed until a	Appropriate automatic monitoring has been used.	Pass

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Clause	Requirement – Test	Result - Remark	Verdict
	specific event occurs (for example, the beginning of the machine cycle).		
	The protective measure may be, for example,		-
	- the stopping of the hazardous process,		Pass
	- preventing the restart of this process after the first stop following the failure,		Pass
	- the triggering of an alarm.		Pass
6.2.11.7	Safety functions implemented by programmable electronic control systems		-
6.2.11.7.1	General		-
	A control system that includes programmable electronic equipment (for example, programmable controllers) can, where appropriate, be used to implement safety functions at machinery. 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. 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) is 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 the IEC 61508 series for further guidance).		N/A
	The programmable electronic control system should be installed and validated to ensure that the specified performance [for example, safety integrity level (SIL) in IEC 61508] for each safety function has been achieved. Validation comprises testing and analysis (for example, static, dynamic or failure analysis) to show that all parts interact		N/A

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Clause	Requirement – Test	Result - Remark	Verdict
	correctly to perform the safety function and that unintended functions do not occur.		
6.2.11.7.2	Hardware aspects		
	The hardware (including, for example, sensors, actuators and 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 - architectural constraints (the configuration of the system, its ability to tolerate faults, its behaviour on detection of a fault, etc.), - selection, and/or design, of equipment and devices with an appropriate probability of dangerous random hardware failure, and - the incorporation of measures and techniques within the hardware so as to avoid systematic failures and control systematic faults.		N/A
6.2.11.7.3	Software aspects		
	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). Application software should not be reprogrammable by the user. This may be achieved by use of embedded software in a non-reprogrammable memory [for example, micro-controller, application-specific integrated circuit (ASIC)]. When the application requires reprogramming by the user, the access to the software dealing with safety functions should be restricted (for example, by locks or passwords for the authorized persons).		N/A
6.2.11.	Principles relating to manual control		

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Clause	Requirement – Test	Result - Remark	Verdict
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	a) Manual control devices shall be designed and located according to the relevant ergonomic principles given in 6.2.8, item f).	This requirement has been taken into account during design.	Pass
	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.	Pass
	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.	Pass
	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.		Pass
	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 of, among others, a portable control unit (such as a teach pendant), with which the operator can enter danger zones.	Not applicable.	N/A
	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, ISO 9355-3 and ISO 447).		Pass
	g) For machine functions whose safe operation depends on permanent, direct		Pass

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Clause	Requirement – Test	Result - Remark	Verdict
	control by the operator, measures shall be implemented to ensure the presence of the operator at the control position (for example, by the design and location of control devices).		
	h) For cableless control, an automatic stop shall be performed when correct control signals are not received, including loss of communication (see BS EN 60204-32).	Not applicable.	N/A
6.2.11.9	Control mode for setting, teaching, process changeover, fault-finding, cleaning or maintenance		
	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 into operation, the safety of the operator shall be achieved using a specific control mode which simultaneously	Not applicable.	N/A
	a) disables all other control modes,	Not applicable.	N/A
	b) permits operation of the hazardous elements only by continuous actuation of an enabling device, a two-hand control device or a hold-to-run control device,	Not applicable.	N/A
	c) permits operation of the hazardous elements only in reduced risk conditions (for example, reduced speed, reduced power/force, step-by-step, for example, with a limited movement control device),	Not applicable.	N/A
	d) prevents any operation of hazardous functions by voluntary or involuntary action on the machine's sensors.	Not applicable.	N/A
6.2.11.10	Selection of control and operating modes		
	If machinery has been designed and built to allow for its use in several control or	This requirement is complied with.	Pass

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Clause	Requirement – Test	Result - Remark	Verdict
	operating modes requiring different protective measures and/or work procedures (for example, to allow for adjustment, setting, maintenance, inspection), it shall be fitted with a mode selector which can be locked in each position. Each position of the selector shall be clearly identifiable and shall exclusively allow one control or operating mode.		
	The selector may be replaced by another selection means which restricts the use of certain functions of the machinery to certain categories of operators (for example, access codes for certain numerically controlled functions).	This requirement is complied with.	Pass
6.2.11.11	Applying measures to achieve electromagnetic compatibility (EMC)		
	For guidance on electromagnetic compatibility, see BS EN 60204-32 and IEC 61000-6.	C	N/A
6.2.11.12	Provision of diagnostic systems to aid fault-finding		
	Diagnostic systems to aid fault-finding should be included in the control system so that there is no need to disable any protective measure.		Pass
6.2.12	Minimizing probability of failure of safety functions		
6.2.12.1	General		
	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 the measures given in 6.2.12.2 to 6.2.12.4.		Pass
6.2.12.2	Use of reliable components		

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	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 (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 machine. Components shall be selected taking into account all factors mentioned above (see also 6.2.13).	Reliable components have been used.	Pass
6.2.12.3	Use of "oriented failure mode" components		
	"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 the effect of such a failure on the machine function can be predicted.		N/A
6.2.12.4	Duplication (or redundancy) of components or subsystems		
	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 components continue to perform the respective function(s), thereby ensuring that the safety function remains available.	Not applicable.	N/A
	In order to allow the proper action to be initiated, component failure shall be 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.	Not applicable.	N/A
	Diversity of design and/or technology can be used to avoid common cause failures (for example, from electromagnetic disturbance) or common mode failures.	Not applicable.	N/A

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Clause	Requirement – Test	Result - Remark	Verdict
6.2.13	Limiting exposure to hazards through reliability of equipment		
	Increased reliability of all component parts of machinery reduces the frequency of incidents requiring intervention, thereby reducing exposure to hazards.	This requirement is complied with.	Pass
	This applies to power systems (operative part, see Annex A) as well as to control systems, and to safety functions as well as to other functions of machinery.	This requirement is complied with.	Pass
	Safety-related components (for example, certain sensors) of known reliability shall be used.	This requirement is complied with.	Pass
	The elements of guards and of protective devices shall be especially reliable, as their failure can expose persons to hazards, and also because poor reliability would encourage attempts to defeat them.	This requirement is complied with.	Pass
6.2.14	Limiting exposure to hazards through mechanization or automation of loading (feeding)/ unloading (removal) operations		
	Mechanization and automation of machine loading/unloading operations and, more generally, of handling operations — of workpieces, materials or substances — limits the risk generated by these operations by reducing the exposure of persons to hazards at the operating points.	This requirement is complied with.	Pass
	Automation can be achieved by, for example, robots, handling devices, transfer mechanisms and air-blast equipment. Mechanization can be achieved by, for example, feeding slides, push-rods and hand-operated indexing tables.	This requirement has been complied with by design.	Pass
	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 corrected. Care shall be taken to ensure that the	This requirement has been complied with by design.	Pass

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	use of these devices does not introduce further hazards, such as trapping or crushing, between the devices and parts of the machine or workpieces/materials being processed. Suitable safeguards (see 6.3) shall be provided if this cannot be ensured.		
	Automatic feeding and removal devices with their own control systems and the control system of the associated machine shall be interconnected after thorough study of how all safety functions are performed in all the control and operation modes of the entire equipment.	This requirement has been complied with by design.	Pass
6.2.15	Limiting exposure to hazards through location of setting and maintenance points outside danger zones		
	The need for access to danger zones shall be minimized by locating maintenance, lubrication and setting points outside these zones.		Pass
6.3	Safeguarding and complementary protective measures		
6.3.1	General		
	Guards and protective devices shall be used to protect persons whenever an inherently safe design measure does not reasonably make it possible either to remove hazards or to sufficiently reduce risks. Complementary protective measures involving additional equipment (for example, emergency stop equipment) may have to be implemented. NOTE The different kinds of guards and protective devices are defined in 3.27 and 3.28.		Pass
6.3.2	Selection and implementation of guards and protective devices		
6.3.2.1	General		
	This subclause gives guidelines for the selection and the implementation of guards		Pass

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Clause	Requirement – Test	Result - Remark	Verdict
	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 4) and to the need for access to the danger zone(s).		
	The exact choice of a safeguard for a particular machine shall be made on the basis of the risk assessment for that machine.		Pass
	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 the access of an operator into a danger zone is not required during the normal operation (operation without malfunction) of the machinery.		Pass
	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 (movable interlocking guard, sensitive protective equipment).	Movable interlocking guard is used.	Pass
	A combination of safeguards can 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 can be required to protect against the secondary drawing-in or shearing hazard between the mechanical loading (feeding) device, when reachable, and the fixed guard.		N/A
	Consideration shall be given to the enclosure of control positions or intervention zones to provide combined protection against several hazards including	This requirement has been taken in to consideration.	Pass
	a) hazards from falling or ejected objects, using, for example, protection in the form of a	No such hazards exist in this machine.	Pass

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Clause	Requirement – Test	Result - Remark	Verdict
	falling object protection structure (FOPS),		
	b) emission hazards (protection against noise, vibration, radiation, substances hazardous to health, etc.),	No such hazards exist in this machine.	Pass
	c) hazards due to the environment (protection against heat, cold, foul weather, etc.),	No such hazards exist in this machine.	Pass
	d) hazards due to tipping over or rolling over of machinery, using, for example, protection in the form of roll-over or tip-over protection structures (ROPS and TOPS).	No such hazards exist in this machine.	Pass
	The design of enclosed work stations, such as cabs and cabins, shall take into account ergonomic principles concerning visibility, lighting, atmospheric conditions, access, posture.	Ergonomic principles have been taken into account during design.	Pass
6.3.2.2	Where access to the hazard zone is not required during normal operation		
	Where access to the hazard zone is not required during normal operation of the machinery, safeguards should be selected from the following:		
	a) fixed guards (see also ISO 14120);	Fixed guards are provided.	Pass
	b) interlocking guards with or without guard locking (see also 6.3.3.2.3, ISO 14119 and ISO 14120);	Not applicable.	N/A
	c) self-closing guards (see ISO 14120:2002, 3.3.2);	Not applicable.	N/A
	d) sensitive protective equipment, such as electrosensitive protective equipment (see IEC 61496) or pressure-sensitive protective devices (see ISO 13856).	Not applicable.	N/A
6.3.2.3	Where access to the hazard zone is required during normal operation		
	Where access to the hazard zone is required during normal operation of the machinery, safeguards should be selected from the		

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Clause	Requirement – Test	Result - Remark	Verdict
	following:		
	a) interlocking guards with or without guard locking (see also ISO 14119, ISO 14120 and 6.3.3.2.3 of this document); b) sensitive protective equipment, such as electrosensitive protective equipment (see IEC 61496); c) adjustable guards; d) self-closing guards (see ISO 14120:2002, 3.3.2); e) two-hand control devices (see ISO 13851); f) interlocking guards with a start function (control guard) (see 6.3.3.2.5).	Not applicable.	N/A
6.3.2.4	Where access to the hazard zone is required for machine setting, teaching, process changeover, fault-finding, cleaning or maintenance		
	As far as possible, machines shall be designed so that the safeguards provided for the protection of the production operator also ensure the protection of personnel carrying out setting, teaching, process changeover, fault-finding, cleaning or maintenance, without hindering them in the performance of 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/A
6.3.2.5	Selection and implementation of sensitive protective equipment1)		
6.3.2.5.1	Selection		
	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. The following provisions are intended to provide the designer with criteria for selecting, for each application, the most	Not applicable.	N/A

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	suitable device(s).		
	Types of sensitive protective equipment include - light curtains, - scanning devices, for example, laser scanners, - pressure-sensitive mats, and - trip bars, trip wires.	Not applicable.	N/A
	Sensitive protective equipment can be used - for tripping purposes, - for presence sensing, - for both tripping and presence sensing, or - to re-initiate machine operation — a practice subject to stringent conditions.	Not applicable.	N/A
	The following characteristics of the machinery, among others, can preclude the sole use of sensitive protective equipment: - tendency for the machinery to eject materials or component parts; - necessity to guard against emissions (noise, radiation, dust, etc.); - erratic or excessive machine stopping time; - inability of a machine to stop part-way through a cycle.	Not applicable.	N/A
6.3.2.5.2	Implementation		
	Consideration should be given to a) the size, characteristics and positioning of the detection zone (see ISO 13855, which deals with the positioning of some types of sensitive protective equipment), b) the reaction of the device to fault conditions (see IEC 61496 for electrosensitive protective equipment), c) the possibility of circumvention, and d) detection capability and its variation over	Not applicable.	N/A

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Clause	Requirement – Test	Result - Remark	Verdict
	the course of time (as a result, for example, of its susceptibility to different environmental conditions such as the presence of reflecting surfaces, other artificial light sources and sunlight or impurities in the air).		
	Sensitive protective equipment shall be integrated in the operative part and associated with the control system of the machine so that - a command is given as soon as a person or part of a person is detected, - the withdrawal of the person or part of a person detected does not, by itself, restart the hazardous machine function(s), and therefore the command given by the sensitive protective equipment is maintained by the control system until a new command is given, - 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, - the machine cannot operate during interruption of the detection function of the sensitive protective equipment, except during muting phases, and - the position and the shape of the detection field prevents, possibly together with fixed guards, a person or part of a person from entering or being present in the hazard zone without being detected.	Not applicable.	N/A
6.3.2.5.3	Additional requirements for sensitive protective equipment when used for cycle initiation		
	In this exceptional application, the 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	Not applicable.	N/A

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	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:	Not applicable.	N/A
	a) only active optoelectronic protective devices (AOPDs) complying with IEC 61496 series shall be used;	Not applicable.	N/A
	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/A
	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/A
	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/A
	e) if there is more than one AOPD safeguarding the machine, only one of the AOPDs is capable of cycle re-initiation;	Not applicable.	N/A
	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/A
6.3.2.6	Protective measures for stability		
	If stability cannot be achieved by inherently safe design measures such as weight		

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	distribution (see 6.2.6), it shall be maintained by the use of protective measures such as		
	- anchorage bolts,		Pass
	- locking devices,		Pass
	- movement limiters or mechanical stops,		Pass
	- acceleration or deceleration limiters,		N/A
	- load limiters,		Pass
	- alarms warning of the approach to stability or tipping limits.		N/A
6.3.2.7	Other protective devices		
	When a machine requires continuous control by the operator (for example, mobile machines, Free Hoists) 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	Not applicable.	N/A
	- when the operator has insufficient visibility of the hazard zone,	Not applicable.	N/A
	- when the operator lacks knowledge of the actual value of a safety-related parameter (distance, speed, mass, angle, etc.),	Not applicable.	N/A
	- when hazards can result from operations other than those controlled by the operator.	Not applicable.	N/A
	The necessary devices include		
	a) devices for limiting parameters of movement (distance, angle, velocity, acceleration), b) overloading and moment limiting devices, c) devices to prevent collisions or interference with other machines, d) devices for preventing hazards to pedestrian operators of mobile machinery or other pedestrians, e) torque limiting devices, and breakage points to prevent excessive stress of components and assemblies,	Not applicable.	N/A

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Clause	Requirement – Test	Result - Remark	Verdict
	f) devices for limiting pressure or temperature, g) devices for monitoring emissions, h) devices to prevent operation in the absence of the operator at the control position, i) devices to prevent lifting operations unless stabilizers are in place, j) devices to limit inclination of the machine on a slope, and k) devices to ensure that components are in a safe position before travelling.		
	Automatic protective measures triggered by such devices that take operation of the machinery out of the control of the operator (for example, automatic stop of hazardous movement) should be preceded or accompanied by a warning signal to enable the operator to take appropriate action (see 6.4.3).	Not applicable.	N/A
6.3.3	Requirements for design of guards and protective devices		
6.3.3.1	General requirements		
	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 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 have been appropriately designed.	Pass
	Guards and protective devices shall		
	a) be of robust construction,	This requirement has been taken into account during design.	Pass

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Clause	Requirement – Test	Result - Remark	Verdict
	b) not give rise to any additional hazard,	This requirement has been taken into account during design.	Pass
	c) not be easy to bypass or render non-operational,	This requirement has been taken into account during design.	Pass
	d) be located at an adequate distance from the danger zone (see ISO 13855 and ISO 13857),	This requirement has been taken into account during design.	Pass
	e) cause minimum obstruction to the view of the production process,	This requirement has been taken into account during design.	Pass
	f) enable essential work to be carried out for the installation and/or replacement of tools and for maintenance by allowing access only to the area where the work has to be carried out — if possible, without the guard having to be removed or protective device having to be disabled.	This requirement has been taken into account during design.	Pass
6.3.3.2	Requirements for guards		
6.3.3.2.1	Functions of guards		
	The functions that guards can achieve are		
	- prevention of access to the space enclosed by the guard, and/or - containment/capture of materials, workpieces, chips, liquids which can be ejected or dropped by the machine, and reduction of emissions (noise, radiation, hazardous substances such as dust, fumes, gases) that can be generated by the machine.	These functions are achieved by fixed guards	Pass
	Additionally, they could need to have particular properties relating to electricity, temperature, fire, explosion, vibration,	These functions are achieved by fixed guards	Pass

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Clause	Requirement – Test	Result - Remark	Verdict
	visibility (see ISO 14120) and operator position ergonomics (for example, usability, operator's movements, postures, repetitive movements).		
6.3.3.2.2	Requirements for fixed guards		
	Fixed guards shall be securely held in place either - permanently (for example 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.	Pass
6.3.3.2.3	Requirements for movable guards		
	Movable guards which provide protection against hazards generated by moving transmission parts shall a) as far as possible when open remain fixed to the machinery or other structure (generally by means of hinges or guides), and b) be interlocking (with guard locking when necessary) (see ISO 14119). See Figure 4. Movable guards against hazards generated by non-transmission moving parts shall be designed and associated with the machine control system so that - 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, with this able to be achieved by interlocking guards, with guard locking when necessary, - they can be adjusted only by an intentional action, such as the use of a tool or a key, and - the absence or failure of one of their components either prevents starting of the moving parts or stops them, with this able to	Not applicable.	N/A

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Clause	Requirement – Test	Result - Remark	Verdict
	be achieved by automatic monitoring (see 6.2.11.6).		
6.3.3.2.4	Requirements for adjustable guards		
	Adjustable guards may only be used where the hazard zone cannot for operational reasons be completely enclosed. Manually adjustable guards shall be - designed so that the adjustment remains fixed during a given operation, and - readily adjustable without the use of tools.	Not applicable.	N/A
6.3.3.2.5	Requirements for interlocking guards with a start function (control guards)		
	An interlocking guard with a start function may only be used provided that a) all requirements for interlocking guards are satisfied (see ISO 14119), b) the cycle time of the machine is short, c) the maximum opening time of the guard is preset to a low value (for example, equal to the cycle time) and, 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, d) 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), e) all other guards, whether fixed (removable type) or movable, are interlocking guards, f) the interlocking device associated with the interlocking guard with a start function is designed such that — for example, by duplication of position detectors and use of automatic monitoring (see 6.2.11.6) — its failure cannot lead to an unintended/unexpected start-up, and	Not applicable.	N/A

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	g) the guard is securely held open (for example, by a spring or counterweight) such that it cannot initiate a start while falling by its own weight.		
6.3.3.2.6	Hazards from guards		
	Care shall be taken to prevent hazards which could be generated by - the guard construction (sharp edges or corners, material, noise emission, etc.), - the movements of the guards (shearing or crushing zones generated by power-operated guards and by heavy guards which are liable to fall).	No such hazards exist in this machine.	Pass
6.3.3.3	Technical characteristics of protective devices		
	Protective devices shall be selected or designed and connected to the control system such that correct implementation of their safety function(s) is ensured.	This requirement has been taken into account during design.	Pass
	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 IEC 62061.	This requirement has been taken into account during design.	Pass
	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.	Pass
6.3.3.4	Provisions for alternative types of safeguards		
	Provisions should be made to facilitate the fitting of alternative types of safeguards on machinery where it is known that it will be necessary to change the safeguards because of the range of work to be carried out.	Not applicable.	N/A
6.3.4	Safeguarding to reduce emissions		

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Clause	Requirement – Test	Result - Remark	Verdict
6.3.4.1	General		
	If the measures for the reduction of emissions at source specified 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).		Pass
6.3.4.2	Noise		
	Additional protective measures against noise include - enclosures (see ISO 15667), - screens fitted to the machine, and - silencers (see ISO 14163).	No such hazards exist in this machine.	Pass
6.3.4.3	Vibration		
	Additional protective measures against vibration include - vibration isolators, such as damping devices placed between the source and the exposed person, - resilient mounting, and - suspended seats. For measures for vibration isolation of stationary industrial machinery see EN 1299.	No such hazards exist in this machine.	Pass
6.3.4.4	Hazardous substances		
	Additional protective measures against hazardous substances include - encapsulation of the machine (enclosure with negative pressure), - local exhaust ventilation with filtration, - wetting with liquids, and — special ventilation in the area of the machine (air curtains, cabins for operators).	No such hazards exist in this machine.	Pass
6.3.4.5	Radiation		
	Additional protective measures against radiation include - use of filtering and absorption, and - use of attenuating screens or guards.	No such hazards exist in this machine.	Pass
6.3.5	Complementary protective measures		

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Clause	Requirement – Test	Result - Remark	Verdict
6.3.5.1	General		
	Protective measures which are neither inherently safe design measures, nor safeguarding (implementation of guards and/or protective devices), nor information for use, could 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, those dealt with in 6.3.5.2 to 6.3.5.6.		Pass
6.3.5.2	Components and elements to achieve emergency stop function		
	If, following a risk assessment, a machine needs to be fitted with components and elements to achieve an emergency stop function for enabling actual or impending emergency situations to be averted, the following requirements apply:		
	- the actuators shall be clearly identifiable, clearly visible and readily accessible;	The actuators can be clearly identifiable, clearly visible and readily accessible	Pass
	- the hazardous process shall be stopped as quickly as possible without creating additional hazards, but 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 stopped as quickly as possible without creating additional hazards	Pass
	- the emergency stop control shall trigger or permit the triggering of certain safeguard movements where necessary.	No this situation exists.	Pass
	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.	Pass
	This reset shall be possible only at the location where the emergency stop command	This requirement is complyied with by	

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	has been initiated. The reset of the device shall not restart the machinery, but shall only permit restarting.	appropriate design of the emergency stop.	
	More details for the design and selection of electrical components and elements to achieve the emergency stop function are provided in IEC 60204.	Please see the related clauses.	Pass
6.3.5.3	Measures for the escape and rescue of trapped persons		
	Measures for the escape and rescue of trapped persons may consist, among others, of - escape routes and shelters in installations generating operator-trapping hazards, - arrangements for moving some elements by hand, after an emergency stop, - arrangements for reversing the movement of some elements, - anchorage points for descender devices, - means of communication to enable trapped operators to call for help.	Not applicable.	N/A
6.3.5.4	Measures for isolation and energy dissipation		
	Machines shall be equipped with the technical means to achieve isolation from power supply(ies) and dissipation of stored energy by means of the following actions:		
	a) isolating (disconnecting, separating) the machine (or defined parts of the machine) from all power supplies;	A main switch with lock is provided	Pass
	b) locking (or otherwise securing) all the isolating units in the isolating position;	Please see the report for EN60204	Pass
	c) dissipating or, if this is not possible or practicable, restraining (containing) any stored energy which can give rise to a hazard;	Please see the report for EN60204	Pass
	d) verifying, by means of safe working procedures, that the actions taken according to a), b) and c) above have produced the desired effect.	Please see the report for EN60204	Pass
6.3.5.5	Provisions for easy and safe handling of		

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Clause	Requirement – Test	Result - Remark	Verdict
	machines and their heavy component parts		
	Machines and their component parts which cannot be moved or transported by hand shall be provided or be capable of being provided with suitable attachment devices for transport by means of lifting gear.	Appropriate attachments are provided.	Pass
	These attachments may be, among others,		
	- standardized lifting appliances with slings, hooks, eyebolts, or tapped holes for appliance fixing,	Such devices are used	Pass
	- appliances for automatic grabbing with a lifting hook when attachment is not possible from the ground,		N/A
	- fork locating devices for machines to be transported by a lift truck,	Such devices are used	Pass
	- lifting and stowing gear and appliances integrated into the machine.		N/A
	Parts of machinery which can be removed manually in operation shall be provided with means for their safe removal and replacement.		Pass
6.3.5.6	Measures for safe access to machinery		
	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.		Pass
	Where this is not possible, machines shall have built-in platforms, stairs or other facilities to provide safe access for those tasks; however, care should be taken to ensure that such platforms or stairs do not give access to danger zones of machinery. 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, shall be provided with suitable guard-rails (see	Not applicable.	N/A

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Clause	Requirement – Test	Result - Remark	Verdict
	ISO 14122-3). In large automated installations, particular attention shall be given to safe means of access, such as walkways, conveyor bridges or crossover points. Means of access to parts of machinery located at height shall be provided with collective means of protection against falls (for example, guard-rails for stairways, stepladders and platforms and/or safety cages for ladders). As necessary, anchorage points for personal protective equipment against falls from height shall also be provided (for example, in carriers of machinery 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. The necessary aids for access shall be provided (steps, handholds, etc.). Control devices shall be designed and located to prevent their being used as aids for access. When machinery for lifting goods and/or persons includes landings at fixed levels, these shall be equipped with interlocking guards for preventing falls when the platform is not present at a level. Movement of the lifting platform shall be prevented while the guards are open.		
6.4	Information for use		
6.4.1	General requirements		
6.4.1.1	Drafting information for use is an integral part of the design of a machine (see Figure 2). 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. Information for use is intended for professional and/or	All the information is stated in the appropriate place.	Pass

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	non-professional users.		
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.		
	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 instruction manual.	Pass
	The information shall indicate, as appropriate,		
	- the need for training, - the need for personal protective equipment, and - the possible need for additional guards or protective devices (see Figure 2, Footnote d).	All the information is stated in the instruction manual.	Pass
	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.	Pass
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 instruction manual.	Pass
6.4.2	Location and nature of information for use		
	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		Pass
	a) in/on the machine itself (see 6.4.3 and 6.4.4),	Adequate information is stated in the instruction	Pass

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Clause	Requirement – Test	Result - Remark	Verdict
		manual.	
	b) in accompanying documents (in particular instruction handbook, see 6.4.5),	Adequate information is stated in the instruction manual.	Pass
	c) on the packaging,	Adequate information is stated in the instruction manual.	Pass
	d) by other means such as signals and warnings outside the machine.	Adequate information is stated in the instruction manual.	Pass
	Standardized phrases shall be considered where important messages such as warnings are given (see also IEC 62079).		Pass
6.4.3	Signals and warning devices		
	Visual signals, such as flashing lights and audible signals such as sirens may be used to warn of an impending hazardous event such as machine start-up or overspeed. Such signals may also be used to warn the operator before the triggering of automatic protective measures (see 6.3.2.7).	Signals and warning devices are provided.	Pass
	It is essential that these signals		
	a) be emitted before the occurrence of the hazardous event, b) be unambiguous, c) be clearly perceived and differentiated from all other signals used, and d) be clearly recognized by the operator and other persons.	This requirement is taken into account during design and selection of the warning devices.	Pass
	The warning devices shall be designed and located such that checking is easy. The information for use shall prescribe regular checking of warning devices.		Pass
	The attention of designers is drawn to the possibility of “sensorial saturation”, which		Pass

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Clause	Requirement – Test	Result - Remark	Verdict
	can result from too many visual and/or acoustic signals and which can also lead to defeating the warning devices.		
6.4.4	Markings, signs (pictograms) and written warnings		
	Machinery shall bear all markings which are necessary		
	a) for its unambiguous identification, including at least		
	1) the name and address of the manufacturer, 2) the designation of series or type, and 3) the serial number, if any,	Adequate information is provided.	Pass
	b) in order to indicate its compliance with mandatory requirements, comprising		
	1) marking, and 2) written indications, such as the authorized representative of the manufacturer, designation of the machinery, year of construction, and intended use in potentially explosive atmospheres),	Adequate information is provided.	Pass
	c) for its safe use, for example,		
	1) maximum speed of rotating parts, 2) maximum diameter of tools, 3) mass (in kilograms) of the machine itself and/or of removable parts, 4) maximum working load, 5) necessity of wearing personal protective equipment, 6) guard adjustment data, and 7) frequency of inspection.	Adequate information is provided.	Pass
	Information printed directly on the machine should be permanent and remain legible throughout the expected life of the machine.	This requirement is complied with.	Pass
	Signs or written warnings indicating only “Danger” shall not be used.	This requirement is complied with.	Pass
	Markings, signs and written warnings shall be readily understandable and unambiguous,	This requirement is complied with.	Pass

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Clause	Requirement – Test	Result - Remark	Verdict
	especially as regards the part of the function(s) of the machine to which they are related. Readily understandable signs (pictograms) should be used in preference to written warnings.		
	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.	Pass
	Markings shall comply with recognized standards (for example, ISO 2972 or ISO 7000, for pictograms, symbols and colours in particular).	All the markings are standard.	Pass
6.4.5	Accompanying documents (in particular — instruction handbook)		
6.4.5.1	Contents		
	The instruction handbook or other written instructions (for example, on the packaging) shall contain, among others, the following:	All the related information is stated in the instruction handbook	Pass
	a) information relating to transport, handling and storage of the machine, such as		
	1) storage conditions for the machine, 2) dimensions, mass value(s), position of the centre(s) of gravity, and 3) indications for handling (for example, drawings indicating application points for lifting equipment);	All the related information is stated in the instruction handbook	Pass
	b) information relating to installation and commissioning of the machine, such as		
	1) fixing/anchoring and dampening of noise and vibration requirements, 2) assembly and mounting conditions, 3) space needed for use and maintenance, 4) permissible environmental conditions (for example, temperature, moisture, vibration, electromagnetic radiation), 5) instructions for connecting the machine to	All the related information is stated in the instruction handbook	Pass

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Clause	Requirement – Test	Result - Remark	Verdict
	power supply (particularly on protection against electrical overloading), 6) advice on waste removal/disposal, and 7) if necessary, recommendations related to protective measures which have to be implemented by the user — for example, additional safeguards (see Figure 2, Footnote d), safety distances, safety signs and signals;		
	c) information relating to the machine itself, such as		
	1) detailed description of the machine, its fittings, guards and/or protective devices, 2) the 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, 3) diagrams (especially schematic representation of safety functions), 4) data on noise and vibration generated by the machine, and on radiation, gases, vapours and dust emitted by it, with reference to the measuring methods (including measurement uncertainties) used, 5) technical documentation of electrical equipment (see IEC 60204), and 6) documents attesting that the machine complies with mandatory requirements;	All the related information is stated in the instruction handbook	Pass
	d) information relating to the use of the machine, such as that related to or describing		
	1) intended use, 2) manual controls (actuators), 3) setting and adjustment, 4) modes and means for stopping (especially emergency stop), 5) risks which could not be eliminated by the protective measures implemented by the designer,	All the related information is stated in the instruction handbook	Pass

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Clause	Requirement – Test	Result - Remark	Verdict
	6) particular risks which can be generated by certain applications, by the use of certain fittings, and about specific safeguards necessary for such applications, 7) reasonably foreseeable misuse and prohibited applications, 8) fault identification and location, for repair and for restarting after an intervention, and 9) personal protective equipment needed to be used and the training that is required;		
	e) information for maintenance, such as		
	1) the nature and frequency of inspections for safety functions, 2) specification of the spare parts to be used when these can affect the health and safety of operators, 3) instructions relating to maintenance operations which require a definite technical knowledge or particular skills and hence need to be carried out exclusively by skilled persons (for example, maintenance staff, specialists), 4) instructions relating to maintenance actions (replacement of parts, etc.) which do not require specific skills and hence may be carried out by users (for example, operators), and 5) drawings and diagrams enabling maintenance personnel to carry out their task rationally (especially fault-finding tasks);	All the related information is stated in the instruction handbook	Pass
	f) information relating to dismantling, disabling and scrapping;	All the related information is stated in the instruction handbook	Pass
	g) information for emergency situations, such as		
	1) the operating method to be followed in the event of accident or breakdown,	All the related information is stated	Pass

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Clause	Requirement – Test	Result - Remark	Verdict
	2) the type of fire-fighting equipment to be used, and 3) a warning of possible emission or leakage of hazardous substance(s) and, if possible, an indication of means for fighting their effects;	in the instruction handbook	
	h) maintenance instructions provided for skilled persons [item e) 3) above] and maintenance instructions provided for unskilled persons [item e) 4) above], that need to appear clearly separated from each other.	All the related information is stated in the instruction handbook	Pass
6.4.5.2	Production of instruction handbook		
	The following applies to the production and presentation of the instruction handbook.		
	a) The type fount 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.	All the related information is stated in the instruction handbook	Pass
	b) The 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.		Pass
	If more than one language is to be used, each should be readily distinguished from another, and efforts should be made to keep the translated text and relevant illustration together..		Pass
	NOTE In some countries the use of specific language(s) is covered by legal requirements		
	c) Whenever helpful to the understanding, text should be supported by illustrations. These illustrations should be supplemented with written details enabling, for example, manual controls (actuators) to be located and identified. They should not be separated from the accompanying text and should follow sequential operations.		Pass
	d) Consideration should be given to presenting information in tabular form where		Pass

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Clause	Requirement – Test	Result - Remark	Verdict
	this will aid understanding. Tables should be adjacent to the relevant text.		
	e) The use of colours should be considered, particularly in relation to components requiring quick identification.		Pass
	f) When information for use is lengthy, a table of contents and/or an index should be provided.		Pass
	g) Safety-relevant instructions which involve immediate action should be provided in a form readily available to the operator.		Pass
6.4.5.3	Drafting and editing information for use		
	The following applies to the drafting and editing of information for use.		Pass
	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	Pass
	b) Communication 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 operations. The questions, “How?” and “Why?” should be anticipated and the answers provided.		Pass
	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.		Pass
	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 user. If personal protective equipment is required for the safe use of the machine, clear advice should be given, for example, on the packaging as well as on the machine, so that this information is prominently displayed at		Pass

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Clause	Requirement – Test	Result - Remark	Verdict
	the point of sale.		
	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 can be useful to mark them “keep for future reference”. Where information for use is kept in electronic form (CD, DVD, tape, hard disk, etc.), information on safety-related issues that need immediate action shall always be backed up with a hard copy that is readily available.		Pass
7	Documentation of risk assessment and risk reduction		Pass
	The documentation shall demonstrate the procedure that has been followed and the results that have been achieved. This includes, when relevant, documentation of		Pass
	a) the machinery for which the risk assessment has been made (for example, specifications, limits, intended use);	Please see the risk assessment report in detail.	Pass
	b) any relevant assumptions that have been made (loads, strengths, safety factors, etc.);		Pass
	c) the hazards and hazardous situations identified and the hazardous events considered in the risk assessment;		Pass
	d) the information on which risk assessment was based (see 5.2):		Pass
	1) the data used and the sources (accident histories, experience gained from risk reduction applied to similar machinery, etc.);		Pass
	2) the uncertainty associated with the data used and its impact on the risk assessment;		Pass
	e) the risk reduction objectives to be achieved by protective measures;		Pass
	f) the protective measures implemented to eliminate identified hazards or to reduce risk;		Pass

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Clause	Requirement – Test	Result - Remark	Verdict
	g) residual risks associated with the machinery;		Pass
	h) the result of the risk assessment (see Figure 1);		Pass
	i) any forms completed during the risk assessment.		Pass
	Standards or other specifications used to select protective measures referred to in f) above should be referenced.		Pass

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Clause	Requirement – Test	Result - Remark	Verdict
5	Safety requirements and/or protective measures		P
5.1	General		P
	Hoists shall comply with the safety requirements and/or protective measures of this clause. In addition, the hoist shall be designed in accordance with the principles of EN ISO 12100 for hazards relevant but not significant, which are not dealt with by this European Standard.		P
	Hoists shall be designed for loads and load combinations in accordance with EN 13001-2, relevant to the intended use of a hoist.		P
	Mechanical and electrical equipment of hoists shall conform to EN 13135 and EN 60204-32, except as otherwise given in this standard.		P
	a)hoists shall be in accordance with Annex D for high risk applications, e.g. when transporting hot molten masses		P
	b)hoists shall be in accordance with Annex E when holding stationary loads above persons;		P
	c)supporting-structures for NGL building hoists shall be in accordance with Annex I.		P
	d)hoists should be in accordance with Annex G when operating in aggressive environments and outdoors;		P
	e)hoists should be in accordance with Annex H when operating at low temperatures.		P
	Accessible parts shall not have sharp edges, sharp angles or protruding parts that can cause injury. This can be achieved by e.g. deburring, flanging, trimming or sand blasting.		P
	Connections and individual components of hoists shall incorporate features so that they cannot selfloosen.		P
	Moving transmission parts (shafts, fans, wheels, gears, belts, couplings) shall be designed, positioned or guarded in order to protect against the risks associated with possible contact of		P

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Clause	Requirement – Test	Result - Remark	Verdict
	exposed persons during the intended use		
	Risk of burn during hoisting operation caused by contact between the operator's skin and hot surfaces of the hoist shall be reduced by following the principles of EN ISO 13732-1.		P
	The test procedure for verification of the design of hoists shall be in accordance with Annex J. Hoists and trolleys shall be designed taking into account the static and dynamic forces which may occur at intended use. Forces which occur due to the activation of the rated capacity limiter and the Emergency-Stop- Function shall be taken into account.		P
5.2	Devices		P
5.2.1	Control devices		P
	Devices for starting and stopping manually-controlled hoists shall be fitted with hold-to-run control elements so that the drive energy supply is interrupted when the actuating elements are released		P
5.2.2	Rated capacity limiters and indicators		N/A
5.2.2.1	General		N/A
5.2.1.4	Tests on thick sample		N/A
	Hoists with a rated capacity of 1 000 kg or more shall be fitted with a rated capacity limiter		N/A
	When it is necessary in order to avoid flashover or because of limitations of available equipment, specimens may be prepared by machining to smaller thicknesses as needed.		N/A
	A rated capacity limiter may also be incorporated within the supporting structure into which a hoist is fitted.Rated capacity limiters shall be in accordance with EN 12077-2.		N/A
5.2.2.2	Setting		N/A
5.2.2.2.1	General		N/A
	The rated capacity limiter shall limit the forces to a level equal to or less than the designed operating forces (as defined in EN		N/A

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Clause	Requirement – Test	Result - Remark	Verdict
	12077-2:1998+Al:2008, 5.4.1.2).		
5.2.2.2.2	Direct acting rated capacity limiters		N/A
	The setting shall be such that a load equal to 110 % of the rated capacity of the hoist can be lifted in order to perform the dynamic overload test, see Clause 6, this without changing the setting ofthe rated capacity limiter		N/A
5.2.2.2.3	Indirect acting rated capacity limiters		N/A
	The limiter system shall be such that lifting of a grounded load greater than 1,1 times the rated capacity triggers the lifting capacity limiter.		N/A
5.2.2.3	Maximum force		N/A
5.2.2.3.1	General		N/A
	The maximum force Fmax l occurs when the rated capacity limiter operates		N/A
5.2.2.3.2	Direct acting rated capacity limiters — maximum force		N/A
5.2.2.3.3	Indirect acting rated capacity limiters - maximum force		N/A
5.2.2.4	Additional requirements for friction torque limiters		N/A
5.2.3	Emergency stop function		P
	Hoists shall be provided with an emergency stop function. The emergency stop function shall be available and operational at all times, regardless of the operating mode.		P
5.2.4	Hoisting and lowering limiters		P
5.2.4.1	General		P
	Hoists shall be fitted with hoisting and lowering limiters in accordance with EN 12077‑2:1998+Al:2008, 5.6.1.		P
	Hoisting and lowering limiters include, for example, electrical limit switches, adjustable friction torque limiters, relief valves.		P
	Electromechanical limiters shall have a positive		P

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Clause	Requirement – Test	Result - Remark	Verdict
	opening system.		
5.2.4.2	limiter (= backup limiter) for hoisting		P
5.2.5	Safety-related functions		P
	All safety-related functions of controls shall fulfil at least the following requirements of EN ISO 13849-1:		P
	—control circuits built with electromechanical, hydraulic and pneumatic components: at least Performance level c and at least category 1;		P
	--control circuits built with electronic or programmable components, respectively: at least Performance Level c and category 2.		P
	Safety related functions of the control systems are e.g.		P
	—rated capacity limiters, see 5.2.2;		P
	—emergency stop device, see 5.2.3;		P
	—hoisting and lowering limiters, see 5.2.4;		P
	—protective measures (pneumatic), see 5.10.5;		P
	—protective measures (hydraulic), see 5.11.6;		P
5.3	Couplings		N/A
	Couplings in the flow ofhoisting forces, with the exception of friction torque limiters, shall be constructed so that in case of a failure of plastic or rubber parts, there is a positive engagement by metal parts.		N/A
5.4	Brakes for hoisting and lowering movements		N/A
	Service brakes for vertical movements shall be designed in accordance with EN 13135, with the following additional requirements as given in this clause. Backup brakes for vertical movements shall be designed in accordance with EN 13135.		N/A

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Clause	Requirement – Test	Result - Remark	Verdict
5.5	Gearbox		P
	earboxes shall be designed in accordance with the EN 13135. Gears shall be supported and connected to the driving and driven mechanisms in such a way that no impermissible and uncontrolled stresses or deformations are produced in the gears or bearings.		P
5.6	Load hooks		P
	The proof of competence of forged hooks shall be in accordance with EN 13001-3-5. Hooks shall be designed in accordance with EN 13135.		P
5.7	Rope drives		P
5.7.1	General		P
	Rope drives with steel wire ropes shall be classified and dimensioned in accordance with EN 13001-3-2. The design number of ropes used during the total design life of the hoists shall be provided.		P
5.7.2	Rope drum		P
	Measures on drums shall be provided, e.g. flanged drum end plates, frame/housing and rope guides, which prevent the ropes to run off the ends of the rope drums.		P
	Rope run-on points in the normal working position of the operating personnel and in the traffic area shall be guarded to prevent accidental ingress of parts of the human body.		P
	For NGL building hoists, having more than one layer of rope on the drum and where the rope has a nominal diameter w 8 mm, a grooved drum is not necessary.		P
5.7.3	Ropes		P
	Ropes used as hoist medium in rope drives shall be selected for the particular application and be made of suitable materials so that they withstand the permissible stresses and are rated for a period of service that exceeds the inspection interval		P

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Clause	Requirement – Test	Result - Remark	Verdict
	specified by the manufacturer.		
5.7.4	Rope sheaves		P
	Ropes sheaves shall be in accordance with EN 13135. Rope sheaves shall be provided with a suitable means of preventing the rope from jumping out of the groove		P
	In working and traffic areas to which personnel have unlimited access, the components of the rope systems and rope run-on points shall be installed or guarded in such a way that Free Hoist operations can be conducted with a minimized risk of trapping or drawing-in of hands or arms into jamming-prone areas.		P
	The distance between the edge of the sheave and the protective components shall be less than 0,5 x nominal rope diameter.		P
	If the rope sheave breaks, it shall not be possible for the rope to slip off the sheave shaft.		P
5.7.5	Rope guides/rope runs		P
	Rope drives shall be arranged in such a way that damage to the ropes by contact between them and with fixed and moving structures is prevented.		P
	Ropes shall be prevented in case of slack rope conditions from lifting off the rope winding and generate dangerous conditions during the intended use.		P
5.7.6	Rope fastening onto the rope drum		P
	Rope fastening onto the rope drum shall be made in such a way that at least 2,5 times the remaining static force at the fastening device is accommodated when the rated capacity is applied to the hoist taking into account the friction effect of the winding on the drum. The coefficient of friction between wire rope and contact surface shall be assumed to be p = 0,1.		P
	There shall be at least two rope windings remaining on the drum before the fixing point of the rope in the lowest position of the load		P

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Clause	Requirement – Test	Result - Remark	Verdict
	supporting device (e.g. hook).		
	The fastening elements of the fixing point of the rope shall be selected taking into account the rope and drum contours. The rope shall not be led over edges.		P
5.7.7	Rope anchorage		P
	Rope anchorage shall be such that bending of the rope and other additional stresses on the wire rope are avoided.		P
	Rope anchorages for wire ropes of non-rotation resistant type, shall prevent the wire rope from twisting about its longitudinal axis.		P
5.7.8	Compensating lever		P
	In rope systems with a compensating lever, means shall be provided to return the lever to the middle position after the extreme, inclined position of the lever has been reached		P
5.7.9	Rope end terminations		P
	The rope-end terminations shall withstand, without permanent deformation, the rope force equal to 2,5times the static rope force resulting from the rated capacity of the hoist.		P
5.7.10	Traction Winches		P
	The traction capacity shall be such that during intended use, tests and verification according to Clause 6 the rope does not slip or creep.		P
	The traction capacity shall be proven either by calculation or by test, for 1,5 times the rated capacity for the intended number of pulling cycles. Wear and tear shall be taken into account, e.g. in case of winches where the traction depends on the state of wear of the groove.		P
	The calculation of the traction capacity shall be in accordance with EN 81-50:2014, 5.11.		P
	Means shall be provided to prevent the ropes from running off the sides of the traction sheave.		P
	Where traction sheaves made of steel are grooved, the grooves shall correspond to the type		P

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Clause	Requirement – Test	Result - Remark	Verdict
	and diameter of the rope intended to be used together with the winch. The groove surfaces, made of steel should have a roughness of not more than Ra = 6,3.		
	V-grooves without undercut groove base profile shall be stiff enough to prevent fundamental deformation, e.g. opening of the shape.		P
5.8	Chain drives		N/A
5.8.1	General		N/A
	Proof of competence for chain drives shall be made in accordance with EN 818-l:1996+Al:2008 and EN 818-7:2002+Al:2008, except as otherwise given in this standard. The calculation factors different from those in EN 818-7:2002+Al:2008 are given in Annex N and shall be applied.		N/A
5.8.2	Chains		N/A
	Chains shall be of short steel link type and in accordance with EN 818-1 and EN 818-7.		N/A
5.8.3	Chain guides		N/A
	Chain drives shall be provided with a device which ensures that the chain runs properly over chain drive sprockets and chain guide wheels and which prevents the chain from jumping out, twisting and jamming.		N/A
5.8.4	Chain anchorage		N/A
	Chain anchorage devices shall withstand four times the static chain tensile force at rated capacity of the hoist without rupture.		N/A
5.8.5	Securing the chain from running off		N/A
5.9	Belt drives		N/A
5.9.1	General		N/A
	The drive shall be such that the belt is subject to uniform loading over its entire width under load conditions.		N/A
5.9.2	Belts		N/A
	Belts used as load-bearing media in hoists shall		N/A

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Clause	Requirement – Test	Result - Remark	Verdict
	be selected for the particular operating conditions, be made of materials such that they withstand the permissible stresses, and shall be rated for a period of service exceeding that specified by the manufacturer of the belt		
	Discard criteria shall be based on externally recognizable belt conditions. A sufficient period of service shall remain between discard condition and rupture.		N/A
5.9.3	Belt guide/belt pulleys/belt drum		N/A
	The ratio ofbelt sheave and drum diameter to the rated belt thickness shall not be less than 18 {D/s 2 18). If a slack belt situation is possible, provisions shall be made to ensure tight winding of the belt It shall be ensured that the belt is not able to run off the side of the pulley or drum. Rims shall be such that they do not damage the belt which runs against them.		N/A
	If an inclined pull is possible, measures shall be taken to avoid excessive loading in the edge zones, e.g. moveable suspension of the lifting appliance.		N/A
5.9.4	Fastening to the drum		N/A
	Belt fastening onto the belt drum shall be made in such a way that at least 2,5 times the remaining static force at the fastening device is accommodated when the rated capacity is applied to the hoist taking into account the friction effect of the winding on the drum. The specific friction values of the particular materials shall be considered for calculation ofthe friction torque. It shall be assumed that lubricants are present on the materials.		N/A
5.9.5	Belt anchorage		N/A
	Belt anchorage devices shall withstand four times the static belt tensile force at rated capacity ofthe hoist without destruction ofthe anchorage and its fastening elements.		N/A
	Threaded connections on belt anchorage devices		N/A

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Clause	Requirement – Test	Result - Remark	Verdict
	shall be locked to prevent self-loosening. The state of the fastening shall be verifiable.		
5.10	Pneumatic equipment		N/A
5.10.1	General		N/A
	Pneumatic equipment shall be in accordance with EN ISO 4414.		N/A
	All components and materials of equipment shall be compatible and suitable for the anticipated ambient conditions.		N/A
	Sufficient air pressure shall be available for all operating modes at any point of the equipment in order to fulfil all functions. A loss in pressure shall not result in hazards.		N/A
5.10.2	Energy converters		N/A
5.10.2.1	Motors		N/A
	Motors shall not create additional hazards by heating up nor by icing up.		N/A
5.10.2.2	Brakes		N/A
	Hoists using pneumatically released brakes shall be such that unexpected load lowering is prevented.		N/A
5.10.3	Control devices/controls		N/A
	Control devices shall be selected so that no pressure and flow disturbances can occur and their level of performance is kept		N/A
	Control devices shall be arranged in the control system so that no unintended movements can occur.		N/A
	Control devices in control systems shall be selected and arranged in such a way that in the case of a power failure switching positions are automatically reached by spring force, bringing the control into a neutral position. For direct-controlled hoists this requirement applies only, when the actuators are released.		N/A
5.10.4	Control units/control systems		N/A
	System reaction times as a function of control		N/A

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Clause	Requirement – Test	Result - Remark	Verdict
	line lengths shall be reduced to a minimum.		
	Triggering of machine movements by venting control lines is not permissible.		N/A
5.10.5	Protective measures		P
5.10.5.1	Emergency stop function		P
	The emergency stop function shall conform to EN ISO 13850 with the following deviations.		P
	The emergency stop function shall correspond to stop category 0 according to EN ISO 13850:2015,4.1.4.		P
	—hoists with a single operating station and with the only emergency stop located at that operating station;		P
	—hoists with cable-less control as the only means of control, with a single operating control device active at a time and no emergency stops are provided.		P
5.10.5.2	Pneumatic protection		N/A
	Disconnection from the pressurized air supply shall not result in load dropping		N/A
5.10.5.3	Mechanical protection		N/A
	Moveable elements (e.g. cylinders) shall be arranged and/or covered so that hazards for persons or objects are excluded.		N/A
5.10.5.4	Adjustable safety device		N/A
	Those adjustable safety devices which can cause a hazardous situation, if their pre-set values are modified, shall have means to prevent their readjustment by non-authorized persons. External devices shall have visible means, such as:		N/A
	a)lead-seals;		N/A
	b)tamper-evident covers;		N/A
	c)tamper-evident cups		N/A
5.11	Hydraulic equipment		N/A
5.11.1	General		N/A

EN 14492-2:2019			
Clause	Requirement – Test	Result - Remark	Verdict
	Hydraulic equipment shall be in accordance with EN ISO 4413, EN 13135 and the following clauses		N/A
5.11.2	Materials and auxiliary materials		N/A
	Materials used, e.g. metals, elastomeric materials (e.g. pressure liquids, grease, coolant), shall be compatible with each other.		N/A
	Pressure liquids shall be selected so that under the given operating conditions, leakage and its effects are minimized.		N/A
	The composition of the liquids shall be such that it is not hazardous to the personnel operating the hoist. If there is a possibility that the grease used can come into contact with the pressure liquid, it shall be compatible with the pressure liquid.		N/A
5.11.3	Energy converters		N/A
	The piston and the piston rod shall be connected to each other so that they cannot detach during operation.		N/A
	Telescopic cylinders with two or more telescopic sections shall be such that the pistons cannot move out of the cylinders.		N/A
	The composition of the seals shall be selected so that they are compatible with the chemical composition of the fluid used and shall continuously withstand the given operating temperature, rated pressure and rated speed, without any impermissible leakage or extrusion.		N/A
5.11.3.2	Motors		N/A
	For motors where internal leakage cannot be avoided, there shall be a device to ensure that the load is not moved due to internal leakage. This requirement can be fulfilled for example by mechanical spring loaded brakes or by self-locking gears.		N/A
5.11.4	Connecting elements and accessories		N/A
5.11.4.1	Tubing		P

EN 14492-2:2019			
Clause	Requirement – Test	Result - Remark	Verdict
	Tubing shall be secured so that impermissible additional load (pressure, bending, temperature) does not occur during operation, and wear and corrosion is avoided.		P
5.11.4.2	Hoses		P
	Hoses shall be fitted in such a way that no torsional strain occurs during assembling. The permissible bending radius specified by the hose manufacturer shall be observed		P
	In order to avoid the risk of fatigue fracture of hoses, the installation requirements of the hose manufacturer shall be fulfilled.		P
5.11.4.3	Reservoir		N/A
	The reservoir shall be equipped with a fluid-level gauge. The reservoir size shall be selected so that the fluid cannot overflow at all operating states.		N/A
	The reservoir shall be located in the installation so that the necessary inflow into the pump is ensured.		N/A
	The reservoir size shall be selected so that a sufficient fluid quantity within the permissible temperature range is available at all operating states.		N/A
5.11.4.4	Cooler/heating		N/A
	If the permissible upper operating temperature cannot be kept in the circuit by the container, a cooler shall be provided. If the ambient temperature is lower than the lowest operating temperature, the manufacturer shall provide for possibilities by means ofwhich the liquid can be heated up to the required temperature.		N/A
5.11.4.5	Accumulator		N/A
	Accumulators are used for storing hydraulic energy, e.g. compressed gas. In this case, liquid and gas shall be separated by means of suitable separated elements. Nitrogen or other inert gases should be used as gas.		N/A
5.11.4.6	Filters		N/A

EN 14492-2:2019			
Clause	Requirement – Test	Result - Remark	Verdict
	Filters shall be provided in circuits where contamination continuously occurs.		N/A
5.11.5	Control devices/controls		N/A
	Control devices shall be selected so that no pressure and flow disturbances can occur and their level of performance is kept.		N/A
	Control devices shall be arranged in the control system so that no unwanted functions ofthe systems (by reaction or similar) can occur.		N/A
	Control devices in control systems shall be selected and arranged in such a way that in the case of a power failure, switching positions are reached automatically, bringing the installation to a standstill.		N/A
5.11.6	Protective measures		P
5.11.6.1	Emergency stop function		P
	The emergency stop function shall conform to EN ISO 13850 with the following deviations.		P
	The emergency stop function shall correspond to stop category 0 according to EN ISO 13850:2015,4.1.4.		P
	—hoists with a single operating station and with the only emergency stop located at that operating station;		P
	—hoists with cable-less control as the only means of control, with a single operating control device active at a time and no emergency stops are provided.		P
5.11.6.2	Hydraulic protection		N/A
	Hydraulic systems shall be protected against overpressure of the fluid and overspeed of the load. These protective devices shall act on the hydraulic circuits and elements so that the flow rate and pressure are limited to permissible values. In the case of a power failure, all movements shall be stopped.		N/A

EN 14492-2:2019			
Clause	Requirement – Test	Result - Remark	Verdict
5.11.6.3	Mechanical protection		N/A
	Moveable elements (e.g. cylinders) shall be arranged and/or covered so that hazards fbr persons or objects are excluded.		N/A
5.11.6.4	Adjustable safety device		N/A
	Those adjustable safety devices which can cause a hazardous situation, if their pre-set values are modified shall have means to prevent their readjustment by non-authorized persons.		N/A
	a)lead-seals;		N/A
	b)tamper-evident covers;		N/A
	c)tamper-evident cups		N/A
5.11.6.5	Fire		N/A
	Hydraulic systems shall be such that leaking fluid cannot cause a fire. Devices reaching higher temperatures when being operated (also electrical equipment through sparks or short-circuit) shall be thermally separated from devices carrying oil by means of a suitable enclosure, in order to avoid ignition.		N/A
5.11.6.6	Explosion hazards		N/A
	Hydraulic systems with chambers or hollows shall be equipped with aeration equipment, in order to prevent an explosion hazard. If hydraulic systems are used in environment with an explosion hazard, only flame-retardant hydraulic liquids shall be used.		N/A
5.12	Trolleys		N/A
5.12.1	General		N/A
	Trolleys can be designed either as an integral part of a hoist, or as an independent design for attaching the load or the hoist.		N/A
	Wheels for trolleys shall be designed in accordance with EN 13001-3-3.		N/A
	Motion limiters shall be in accordance with EN 12077-2 and with the relevant Free Hoist standards where appropriate.		N/A

EN 14492-2:2019			
Clause	Requirement – Test	Result - Remark	Verdict
5.12.2	Braking		N/A
	Trolleys which, when traversed, also change levels shall be under the control of a braking system at all times.		N/A
	Power-driven trolleys shall be under the control of a braking system at all times. The braking system shall be such, that movements can be decelerated, the trolley can be held, and unintended movements are avoided.		N/A
	a)the control device returns to its neutral position;		N/A
	b)the emergency stop function is activated;		N/A
	c)the external power supply to the brake is interrupted;		N/A
	d)the power supply of the corresponding drive (= motor) is interrupted and/or switched off.		N/A
5.12.3	Operating chains (hand chain)		N/A
	The operating chain of mechanically-propelled trolleys shall be guided in such a way that the chain is prevented from coming off.		N/A
5.12.4	Derailment safety device		N/A
	Trolleys shall incorporate features to prevent derailment or fall. This requirement can be fulfilled by the use of devices such as guide rollers and/or wheel flanges.		N/A
	Means shall be provided to prevent the trolley from falling or overturning in the event of a single wheel failure. Suitable measures include trolley drop stops integrated into the design, or derailment protection by suitable geometry of the wheel bolts.		N/A
5.13	Electrical equipment of hoists and their trolleys		N/A
5.13.1	General		N/A
	The electrical equipment of hoists and their trolleys shall conform to EN 60204-32 with the following deviations.		N/A
5.13.2	Electrical supply		N/A

EN 14492-2:2019			
Clause	Requirement – Test	Result - Remark	Verdict
	In addition to EN 60204-32:2008, 4.3.1, the following applies:		N/A
	The hoist shall be designed such that it operates reliably in the event of a voltage drop at the hoist of up to 5 % between no-load operation and the peak current of the largest motor.		N/A
5.13.3	Ambient and operating conditions		P
5.13.3.1	Electromagnetic compatibility		P
	Hoists shall be in accordance with EN 60204-32:2008,4.4.2.		P
5.13.3.2	Degree of protection of enclosures for outdoor application		P
	The enclosures for electrical equipment, with exception of the motor, shall have at least a degree of protection IP 55 according to EN 60529.		P
	The enclosure of the motor shall have a degree of protection of at least IP 54.		P
	An opening may be provided in the base of enclosures so that moisture due to condensation may drain away.		P
5.13.4	Supply disconnecting (isolating) and switching devices		P
	Remark concerning the application of EN 60204-32:2008, 5.3. The electrical equipment of a hoist shall contain devices for the following functions:		P
	a)isolation of the electrical equipment from the mains power supply so that work may be performed without the risk of electric shock or burning;		P
	b)switching-off in the event of emergency switching off or emergency stop.		P
5.13.5	Overload protection of motors		P
	Hoist motors specified according to 5.13.8 require no protective measures according to EN 60204-32:2008, 7.3.		P

EN 14492-2:2019			
Clause	Requirement – Test	Result - Remark	Verdict
5.13.6	Control circuits and control functions		P
	With regard to EN 60204-32:2008, 9.2.2, certain control systems (e.g. for converters) may have a short time delay before the supply power is removed, for ensuring that no additional hazard occurs.		P
5.13.7	Emergency stop function		P
	Hoists shall be provided with an emergency stop function in accordance with EN 60204-32, or with a stop function for cable-less controls in EN 60204-32:2008,9.2.7.3.		P
	The requirement in EN 60204-32:2008, according to which the resetting of the emergency stop or the stop function for cable-less controls, shall not initiate restarting, does not apply in the following cases:		P
	—hoists with a single operating station and with the only emergency stop located at that operating station;		P
	—hoists with cable-less control as the only means of control, with a single operating control device active at a time and no emergency stops are provided.		P
5.13.8	Electric motors		P
5.13.8.1	General		P
	Electric motors shall be in accordance with EN 13135 except as otherwise given in this clause. General guidance on the selection of motors is given in Annex L.		P
5.13.8.2	Failure of the power supply		P
	Electric hoists shall incorporate features so that:		P
	a)the load cannot lower in an uncontrolled manner if a phase should fail;		P
	b)the load cannot drop if a phase should fail.		P
5.13.8.3	Mechanical speed limit		P

EN 14492-2:2019			
Clause	Requirement – Test	Result - Remark	Verdict
	A motor with its drive and control system shall be selected so that the mechanical speed limit will not be exceeded		P
	—in the event of power loss, with the braking delay taken into consideration;		P
	—in case oftriggering of an over speed protection during lowering at the maximum working speed and with the corresponding maximum load; and		P
	—in case of malfunction of the drive or control system.		P
5.13.8.4	Design methods for thermal power capacity		N/A
	For motors under speed and torque control of drive systems, e.g. inverter motors, DC-motors and slipring motors, the proof of thermal power capacity shall be in accordance with EN 13135.		N/A
	For calculation of the thermal capacity of squirrel cage motors with direct starting and in intermittent duty, high starting currents and consequent thermal impact shall be taken into consideration.		N/A
5.13.8.5	Degree of protection		P
	Protection of motors against environmental effects shall be as follows, in accordance with EN 60034-5:		P
	—for indoor applications under normal conditions IP 23 or better;		P
	—for indoor applications in dusty environment IP 54 or better;		P
	—for outdoor applications IP 54 or better.		P
	In case of water condensation risk, motors shall be provided with water drain holes.		P
5.13.9	Electric motion limiters		N/A

EN 14492-2:2019			
Clause	Requirement – Test	Result - Remark	Verdict
5.13.9.1	General		N/A
	Electrical motion limiters shall be realized electromechanically, with a positive-opening function (definition as in EN 60204-32:2008, 3.46), or they shall possess a comparable safety, for electronic systems at least category 2 of EN ISO 13849-1.		N/A
5.13.9.2	Second limiter (back-up limiter)		N/A
	Where for the switching off of a movement a second limiter is provided behind the first one, such a second limiter should have a different circuit from the first one and initiate a category 0 stop function according to EN 60204-32:2008, 9.2.2.		N/A
5.13.9.3	Temperature		N/A
	The provision of EN 60204-32:2008, 4.4.3 shall apply unless otherwise specified between the user and the supplier.		N/A
	Beyond the temperature range given in EN 60204-32:2008, 4.4.3 (0 °C to 40 °C), outdoor-Free Hoists may need a wider temperature range, such as -20 °C to 55 °C).		N/A
5.14	Reduction of noise by design		P
5.14.1	General		P
	Noise can be a significant hazard where the position of the operator is located in the vicinity of one or more of the noise sources mentioned in 5.14.2 and they have a:		P
	a)high energy level; and/or		P
	b)high operating speed.		P
	If noise constitutes a significant hazard, the design shall provide for a low noise level. In this case, the recommended practice for the design of low-noise machinery and equipment according with EN ISO 11688-1 shall be taken into consideration.		P

EN 14492-2:2019			
Clause	Requirement – Test	Result - Remark	Verdict
5.14.2	Main noise sources on hoist units		P
	a)hoist mechanisms (motor, gearbox, brake, chain or rope drives);		P
	b)trolleys (motor, gearbox, brake);		P
	c)control cabinets;		P
	d)external devices, e.g. motor fans;		P
	e)hydraulic pumps;		P
	f)pneumatic drives.		P
5.14.3	Measures for noise reduction at source		P
	a)selection of low-noise components;		P
	b)use of flexible securing means which prevent the transmission of structure-borne sound between the components and the structure.		P
5.14.4	Protective measures		P
5.14.5	Information on noise		P
5.15	Hoists for use in potentially explosive atmosphere		N/A
5.16	Equipment for warning		P
5.16.1	General		P
	Warning labels and markings shall be provided to inform the Free Hoist operator, service personnel, inspectors, slingers and other persons on or near the hoists about the hazards related to the hoist and its operations, and on the action they would need to take to minimize the risks.		P
5.16.2	Warning markings		P
	Warning markings shall be of contrasting colours, which will cause the markings to stand out in the operating environment, in accordance with ISO 3864 (all parts). Warning markings shall have a reasonable life for the anticipated operating environment		P
5.16.3	Warning means for cableless control		P
5.16.4	Acoustic warning means		P
6	Verification of the safety requirements and/or protective measures		P

EN 14492-2:2019			
Clause	Requirement – Test	Result - Remark	Verdict
6.1	Hoists manufactured in series		P
	Conformity with each safety requirement and/or measure (given in Clause 5) shall be verified by a type verification for the first sample of a series of hoists of the same type (column 3 of Table 5) and by an individual verification for each hoist of the series (column 4 of Table 5). Individual verification shall be carried out either during manufacture, assembly or taking into service.		P
6.2	Hoists designed individually		N/A
7	User information		P
7.1	General		P
	The manufacturer shall provide operating instructions containing information and instructions for the commissioning, use, regular tests and inspections and maintenance of the hoist Information for use of the hoist shall be provided in accordance with EN 12644-1 and EN ISO 12100.		P
7.2	Special requirements		P
	The operating instructions shall describe the type of the hoist with clear reference to the present hoist.		P
	The use for which the hoist mechanism is intended shall be clearly described. Warnings shall be provided with regard to foreseeable misuse of the hoists. This shall also contain design limitations, e.g. the theoretical duration of service. The measures to be taken when the hoist mechanism has reached the end of its theoretical duration of service shall be described in accordance with ISO 12482.		P
	Optional features of the hoist, e.g. devices for lowering the load in the event of a power failure, shall be described.		P
	The operating instructions shall always include the following instructions: the necessary training for the operating personnel shall be described;		P

EN 14492-2:2019			
Clause	Requirement – Test	Result - Remark	Verdict
	the user shall ensure that the operating personnel are given the necessary training the operator shall always work in compliance with the operating instructions; the operator shall lift the load from the ground with the minimum speed available at the hoist. The rope (chain, belt) shall be tightened and shall not be in the slack-condition when the load is being lifted from the ground; the hoist is not designed to lift loads above the rated capacity of the hoist; do not try to lift fixed or obstructed loads; do not side-pull loads; excessive inching (e.g. giving short pulses to the motor) shall be avoided; the hoist is not designed for lifting of persons.		
	Information for the use of Power driven hoists designed for holding stationary loads above persons. The information of use shall give the following information for load lifting attachments and slings: The used load lifting attachments shall have a rated capacity of at least 2 times (fixing point) the total load (load, load lifting attachment) actually suspended. The used slings shall have a rated capacity of at least 2 times the total load (load) actually suspended c)Loads shall be attached only with positive-locking means.		P
	All maintenance and repair work required to ensure the safe functioning of the hoist mechanism shall be described: lubrication of ropes, chains, gearboxes, bearings, hooks etc.;		P

EN 14492-2:2019			
Clause	Requirement – Test	Result - Remark	Verdict
	Inspection of wearing parts such as ropes, chains, hooks, belts and brake linings. Specification of test and inspection intervals and discard criteria; measures for checking of grooves operating principle of safety devices and requirements in the event that these devices are triggered, e.g. resetting the emergency stop device; in order to prevent hazards with heavy trolleys when changing wheels or guide rollers, the correct use of jacking or slinging points; information shall be given how to verify the proper function of the limiters; 7)measures to avoid possible damage of the hoist in case of incorrect phase sequence.		
	The following information shall be provided, if necessary: — limitations for operation, e.g. setting down the load when in the vicinity of the upper hook position.		N/A
	For pneumatic and hydraulic hoists the following data shall be provided in the user information regarding the supply of pressurized fluid: —pressure; —flow; —quality.		N/A
	Regarding airborne noise emission, the following information a) to f) shall be given: the A-weighted emission sound pressure level at the operator position, where this exceeds 70		N/A

EN 14492-2:2019			
Clause	Requirement – Test	Result - Remark	Verdict
	dB(A); where this level does not exceed 70 dB(A), this fact shall be indicated; the peak C-weighted instantaneous emission sound pressure value at the operator position, where this exceeds 63 Pa (130 dB in relation to 20 μPa); the A-weighted sound power level, where the A-weighted emission sound pressure level at the operator position exceeds 80 dB(A); for hoists that are subject to the Outdoor Noise Directive 2000/14/EC, the A-weighted guaranteed sound power level shall always be stated; the measurement procedure and detailed operating conditions during noise emission measurements shall be stated; f)a recommendation for operators and servicemen to wear hearing protection when the hoist is used in a noisy environment or the A-weighted emission sound pressure level due to the hoist is high at the operator position.		
7.3	Marking		P
	Marking shall be in accordance with EN 12644-2.		P
	Every hoist shall be provided with the following information in a lasting and easily legible manner on a part which cannot be removed:		P
	a)business name and full address of the manufacturer and, where applicable, information on his authorized representative;		P
	b)designation of the machinery with type designation;		P
	c)the prescribed marking;		P

EN 14492-2:2019			
Clause	Requirement – Test	Result - Remark	Verdict
	d)year of construction, that is the year in which the manufacturing process is completed. It is prohibited to pre-date or to post-date the year of manufacture of the hoist when affixing the CE mark;		P
	e)rated capacity; the rated capacity shall also be specified on the bottom block or hook with accessories;		P
	f)duty classification of the hoist;		P
	g)rope/chain: ident number of the manufacturer or information concerning the load bearing means, i.e. for ropes: minimum breaking force, diameter and design; for chains: diameter, pitch and grade;		P
	h)characteristics of the power supply;		P
	i)rated hoisting speed;		P
	j)operating temperature limits;		P
	k)guaranteed sound power level for hoists which are subject to Outdoor Noise Directive.		P
	l)material/materials;		P
	m)tensile strength or breaking force of the belt;		P
	n)dimensions;		P
	o)operating limit temperatures.		P

3.2 Airborne noise Report

I. Applicable standards

1. EN ISO 3744:2010 Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Engineering methods for an essentially free field over a reflecting plane.
2. EN ISO 11202: Acoustics-Noise emitted by machinery and equipment-Measurement of emission sound pressure levels at the work station and at other specified positions-Survey method in situ.
3. ISO/TR 11688-1: Acoustics-Recommended practice for the design of low-noise machinery and equipment -Part 1 : Planning.

II. Review instrument

The sound level meter used in the noise measurement is TES1350A manufactured by TES Electrical Electronic Corp. with the following features

- Portable with light weight easy operation.
- Measurement range from 35 to 130 dBA.
- Type 1 precision.
- With “F”&“S” detect mode in accordance with IEC 651 type 1.
- Built in A-weighting network.
- Equipped with a high prepoarized condenser microphone.
- With automatic&manual display.
- DC output for level recorder.

III. Measurement method

The measurements of this review have been carried out by a hand-held sound level meter, and readings are taken by A-frequency weighting at each measuring position. For operator positions in process of measurement, the measuring instrument is to be set at a distance of 1 m from the machine and 1.5 m above the floor.

IV. Review environment

The review was carried out in the location of machine inside the factory, and the background noise has been ensured that its measuring value is lower than that of machine.

V. Review result

1. Sound pressure level (machine on “Stand by” and normal load condition)

Position	1	2	3	4	5
Reading (dB (A))	69.2	68.3	69.3	69.8	68.7

2. Sound pressure level (machine on full load condition)

Position	1	2	3	4	5
Reading (dB (A))	78.5	78.8	77.4	77.6	78.6

The following is the calculation formula of L_W (Sound power level):

$Lw = Lpf + 10 \times \log (S/S_o)$

· Lpf is the A-weighted or frequency bank surface sound pressure level
· S is the area of the measurement surface in square meters20 m^2
· S^0 is 1 m^2

3.3 EN 60204-32 Report

EN 60204-32:2008 Safety of machinery. Electrical equipment of machines - Requirements for hoisting machines	
Report reference No.....:	MD-TCF-240529-58442
Date of issue .....:	2024/05/31
Total number of pages.....:	68
The third party.....:	Shanghai Global Testing Services Co., Ltd.
Address.....:	Floor 3rd, Building D-1, No. 128, Shenfu Road, Minhang District, Shanghai, China
Applicant.....:	MODE CHINA
Address.....:	Room 01.8/f#7 Tower. 4th Area, No. 186, South 4th Ring west Road.Fengtai District, Beijing, China
Manufacturer.....:	Zhuozhou Mude Industrial Technology Co., Ltd
Address.....:	No.C55, Zhongguaneun Hegu Innovatien Industrial Park, Chaoyang EastRoad,ZhuozhouDevelopment Zone, BaodingCity, Hebei Province
TCF specification:	
Standard.....:	EN 60204-32:2008
TCF procedure.....:	CE
Non-standard Review method……..:	N/A
TCF Form No.....:	EN 60204_32
TCF Form(s) Originator.....:	GTS
Master TRF.....:	Dated 2008
TCF item description.....:	Free Hoist
Model/Type reference.....:	Free Hoist

Reviewing procedure and Reviewing location:	
☒ Reviewing procedure: TMP Reviewed by (name + signature)... : Approved by (+ signature)..... : Reviewing location/ address..... :	Floor 3rd, Building D-1, No. 128, Shenfu Road, Minhang District, Shanghai, China
☐ Reviewing procedure: WMT Reviewed by (name + signature)... : Witnessed by (+ signature)..... : Approved by (+ signature)..... : Reviewing location/ address..... :	
☐ Reviewing procedure: SMT Reviewed by (name + signature)... : Approved by (+ signature)..... : Supervised by (+ signature)..... : Reviewing location/ address..... :	
☐ Reviewing procedure: RMT Reviewed by (name + signature)... : Approved by (+ signature)..... : Supervised by (+ signature)..... : Reviewing location/ address..... :	

Summary of Reviewing:

Reviews performed (name of Review and Review clause): **All of Review are performed at:** Floor 3rd, Building D-1, No. 128, Shenfu Road, Minhang District, Shanghai, China	**Reviewing location:** Floor 3rd, Building D-1, No. 128, Shenfu Road, Minhang District, Shanghai, China

Summary of compliance with National Differences:

N/A

Copy of marking plate

CE

Review item particulars.....:	
Classification of installation and use.....:	Class I
Supply Connection.....:	Terminal
.....:	
.....:	
Possible Review case verdicts:	
- Review case does not apply to the Review object.....:	N/A
- Review object does meet the requirement.....:	Pass
- Review object does not meet the requirement.....:	Fail
Reviewing.....:	
Date of receipt of Review item.....:	2024/05/28
Date (s) of performance of Reviews.....:	2024/05/31

General remarks:

The review results presented in this report relate only to the object reviewed.
This report shall not be reproduced, except in full, without the written approval of the Issuing reviewing laboratory.
"(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.

EN 60204-32:2008			
Clause	Requirement – Review	Result - Remark	Verdict
4.	GENERAL REQUIREMENTS		–
4.1	General considerations		–
	hazard and risk assessment	Complied	P
4.2	Selection of equipment		–
4.2.1	electrical components/devices suitable for their intended use; and	Major electrical components and devices confirm to relevant EN/IEC standards.	P
	conform to the relevant IEC or EN standards..... :	See above	P
	and be applied in accordance with the supplier's instructions	Complied	P
4.2.2	The electrical equipment of the machine satisfies the safety requirements identified by the risk assessment of the machine.	Complied	P
	Depending upon the machine, its intended use and its electrical equipment, parts of the electrical equipment of the machine are in compliance with EN 60439-1 and, as necessary, other relevant parts of the EN 60439 series (see also Annex F).		N
4.3	Power supply and related conditions:		–
4.3.1	Electrical equipment to be designed for correct operation with conditions of mains power supply	See 4.3.2 and 4.3.3	P
4.3.2	Supply Voltage..... :		N
	Frequency..... :		N
	Harmonics..... :		N
	Voltage unbalance ..... :		N
	Voltage interruption..... :		N
	Voltage dips ..... :		N
4.3.3	DC Voltage ..... :		N
	Voltage interruption..... :		N
	Ripple (peak-peak) ..... :		N
4.3.4	Onboard power supply acc. to cl. 4.3.2 and 4.3.3	No on-board generator	N
4.4	Physical environment and operating conditions		–
4.4.1	Electrical equipment to be suitable for use in physical environment and operating conditions	See 4.4.2 to 4.4.8.	P
	An agreement between user and supplier (see 4.1	See above	N

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Clause	Requirement – Review	Result - Remark	Verdict
	and Annex B).		
4.4.2	Electromagnetic compatibility (EMC)		–
	Equipment not to generate electromagnetic disturbances above harmful levels ..... : (applicable generic EMC-standard: EN 61000-6-3 or EN 61000-6-4)		P
	Equipment has adequate level of immunity to EMC (applicable generic EMC-standards: EN 61000-6-1 or EN 61000-6-2) .....:		P
4.4.3	Electrical equipment to be capable for correct operation at intended ambient air temperature		P
4.4.4	Electrical equipment to be capable for correct operation at specified relative humidity: at and	Relative humidity rating of major electrical components and devices is not less than 50% at a temperature of +40 C	P
4.4.5	Electrical equipment capable of operating correctly at altitudes up to 1000 m above m.s.l.	Up to 1000 m	P
4.4.6	Electrical equipment shall be adequately protected against ingress of solid properties and liquids		P
4.4.7	Equipment subject to radiation, additional measures to be taken to avoid equipment malfunction	No radiation and additional measures to be taken to avoid equipment malfunction	N
4.4.8	Undesirable effects of vibration, shock and bump avoided	See instruction manual	P
4.5	Electrical equipment designed to withstand the effects of transportation and storage within a temperature range of -25 to +55 °C		P
	A special agreement between supplier and user (see Annex B).	See above	N
4.6	Heavy or bulky electrical equipment of the machine provided with suitable means for handling	Information for transportation and installation is provided in instructions and handling devices are equipped where necessary.	P
4.7	Electrical equipment installed and operated in accordance with the supplier’s instruction	See instruction manual	P
5.	INCOMING SUPPLY CONDUCTOR TERMINATIONS AND DEVICES FOR DISCONNECTING AND SWITCHING OFF		–
5.1	Incoming supply conductor terminal		–
	electrical equipment of a machine connected to a		P

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Clause	Requirement – Review	Result - Remark	Verdict
	single power supply		
	power supply conductors terminated to main disconnecting device of electrical equipment	Incoming supply is directly connected to the supply terminal of the main circuit breaker. (see installation instruction)	P
	neutral conductor ”N” clearly indicated in technical documentation (see 16.1 and also annex B).		N
	no connection between neutral conductor and protective bonding circuit nor combined PEN-terminals.		N
	All terminals of incoming supply clearly marked (symbols acc. to EN 60445 and 16.1)		P
5.2	Terminal for connection to external protective earthing system		–
	Terminal for connection of external protective conductor provided and marked with ”PE”		N
	Cross section of incoming PE conductor acc. to cl. 5.2, table 1		N
	Terminals allow connection of external protective earth conductors PE (see EN 60445 and also 8.2.6)		N
5.3	Supply disconnecting device		–
5.3.1	Power supply disconnecting device provided for electrical equipment	Verified at installation	N
5.3.2	Type of power supply disconnecting device:		–
	a) Switch-disconnector, acc. to EN 60947-3 for appliance category AC-23 B or DC-23 B		N
	b) Disconnector with or without fuses, with aux. contact (acc. to EN 60947-3)		N
	c) Power CB suitable for isolation (acc. to EN 60947-2)		N
	d) Any other switching device in accordance with an IEC product standard for that device and which meets the isolation requirements of EN 60947-1 as well as a utilization category defined in the product standard as appropriate for on-load switching of motors or other inductive loads		N
	e) plug and socket outlets or appliance couplers for flexible cable supply		N
5.3.3	When the supply disconnecting device is one of the types specified in 5.3.2 a) to d):		–

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Clause	Requirement – Review	Result - Remark	Verdict
	Isolator for electrical equipment from supply (acc. to EN 60947-2)		N
	One OFF (isolated) and one ON position only		N
	Clearly marked with ”0” and ”I”		N
	visible isolating distance or		N
	Position indication which cannot indicate the OFF-position until all contacts are actually open		N
	External operating device provided (except power operated CB’s)		N
	Colour black or grey preferred, where the external operating means is not intended for emergency operations (see 10.7.4 and 10.8.4)		N
	If used as an emergency stop, red/yellow combination selected		N
	Locking means provided to lock in OFF-position		N
	In locked position, remote or local closing prevented		N
	Disconnection of all live conductors (Exception: TN- supply systems, neutral conductor)		N
	Sufficient breaking capacity		N
	When the supply disconnecting device is a plug/socket combination:		–
	– have the switching capability, or be interlocked with a switching device that has a breaking capacity, sufficient to interrupt the current of the largest motor when stalled together with the sum of the normal running currents of all other motors and/or loads.		N
	When the interlocked switching device is electrically operated (for example a contactor) it has an appropriate utilization category		N
	– a) to f) of 13.4.5.		N
	Where the supply disconnecting device is a plug/socket combination,		–
	– a switching device with an appropriate utilization category provided for switching the machine on and off (e.g. by the use of the interlocked switching device described above);		N
5.3.4	Handle of disconnecting device to be easily accessible	See above	P
	Handle located between 0.6m and 1.9m above service level (upper limit of 1.7 m is recommended)		P

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Clause	Requirement – Review	Result - Remark	Verdict
5.3.5	Following circuits not disconnected by supply disconnecting device:		–
	Lighting circuits during maintenance or repair		N
	Plug/socket outlets exclusively used for maintenance or repair		N
	Undervoltage protection circuits used for automatic tripping only at power supply failures		P
	Circuits of equipment to remain normally energised for satisfactory operation		P
	Control circuits for interlocking purposes		P
	Circuits which are not disconnected by supply disconnecting device:		–
	Permanent warning labels placed in proximity of supply disconnectors (see 16.1)		P
	Corresponding statement in maintenance manual, and		P
	Warning label in proximity of circuit concerned		P
	or wiring separated from other wiring		P
	or conductors identified by colour taking into account the recommendation of 13.2.4		P
5.4	Disconnecting devices to prevent unexpected start-up:		–
	Means shall be provided to prevent inadvertent and / or mistaken closure of the disconnecting device (see also 5.6)		P
	Such devices appropriate and convenient for intended use		P
	Suitable placed		P
	Readily identifiable (see 16.1)		P
	Devices that fulfill the isolation function provided:		–
	– devices described in 5.3.2,		N
	– disconnectors, withdrawable fuse links and withdrawable links only if located in an enclosed electrical operating area (see 3.19).		P
	Devices that do not fulfill the isolation function (for example a contactor switched off by a control circuit) for the following situations only:		P
	– inspections;		P
	– adjustments;		P
	– work on the electrical equipment where:		P
	there is no hazard arising from electric shock		P

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Clause	Requirement – Review	Result - Remark	Verdict
	(see Clause 6) and burn;		
	the switching off means remains effective throughout the work;		P
	the work is of a minor nature (for example replacement of plug-in devices without disturbing existing wiring).		P
5.5	Devices provided for disconnecting (isolating) electrical equipment to enable work to be carried out when it is de-energized and isolated.		N
	Such disconnecting devices appropriate and convenient for intended use and		N
	Suitably located and		N
	readily identifiable to which part it serves (see 16.1).		N
	Provided with adequate means to prevent unauthorised, inadvertent and /or mistaken closing (see also 5.6)		N
	Supply-disconnecting device used (see 5.3)		N
	Disconnecting device provided for each separated part of the machine or partial machine where necessary		N
	In addition to the supply disconnecting device as above:		–
	Devices described in 5.3.2;		N
	Disconnectors, fuse links etc. used only in enclosed electrical operating areas (see 3.15) and		N
	and relevant information is provided with the electrical equipment (see 17.2 b) 9) and b)12)).		N
5.6	Devices acc. to cl. 5.4 and 5.5 that are located outside an enclosed electrical operating area		N
	Means provided with device to secure them in the OFF position (disconnected state), (for example by provisions for padlocking, trapped key interlocking)		N
	When so secured, remote as well as local reconnection shall be prevented.		N
	Other means of protection against reconnection (for example warning labels in accordance with 16.1) used for non-lockable disconnecting devices (for example withdrawable fuse-links, withdrawable links)		N
	Locking device not necessary for plug/ socket outlet combinations, if located in a suitable manner		N

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Clause	Requirement – Review	Result - Remark	Verdict
	and		
	Under immediate supervision of the person carrying out the work		N
6	PROTECTION AGAINST ELECTRIC SHOCK		–
6.2	Protection against direct contact:		–
6.2.1	- by means of protection by enclosure		N
	- by means of insulation of live parts		N
	- by means of protection against residual voltages		N
6.2.2	Protection by enclosure:		
	Live parts located inside enclosures conform to relevant requirements of clauses 4, 11 and 14 Protection against direct contact at least IP2X or IPXXB		N
	Where top surfaces of enclosures are readily accessible, degree of protection against direct contact is IP4X or IPXXD.		N
	Opening of enclosure possible only under following conditions:		N
	a) use of a key or a tool. Special requirements for enclosed electrical operating areas may apply		N
	live parts inside of doors with protection degree of IP1X or IPXXA		N
	live parts likely to be touched during resetting or adjustment with protection degree IP2X or IPXXB		N
	b) disconnection of live parts inside enclosure prior to opening of enclosure		N
	at door interlocking safety circuit, door will open only when main isolator is in open position		N
	- opening of disconnector possible at all times while interlock is defeated		N
	- and lock the disconnecting device in the OFF (isolated) position or otherwise prevent unauthorised closure of the disconnecting device;		N
	- upon closing the door, interlock is automatically restored		N
	– all live parts, that are likely to be touched when resetting or adjusting devices intended for such operations while the equipment is still connected, are protected against direct contact to at least IP2X or IPXXB and other live parts on the inside of doors are protected against direct contact to at least IP1X or IPXXA;		N

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Clause	Requirement – Review	Result - Remark	Verdict
	– relevant information is provided with the electrical equipment (see 17.2 b)9) and b)12)).		N
	Means provided to restrict access to live parts behind doors not directly interlocked with the disconnecting means to skilled or instructed persons. (See 17.2 b)12)).		N
	All parts remaining live after switching off mains supply to be protected against direct contact with at least IP2X or IPXXB		N
	Such parts marked with warning symbol acc. to cl.16.2.1 (see also 13.2.4 for identification of conductors by colour).		N
	Excepted from this requirement for marking are:	–	
	- Parts that can be live only due to connection to interlocking circuits, distinguished by colour as potentially live acc. to cl. 13.2.4		N
	- Terminals of supply disconnecting device when latter mounted alone in a separate enclosure		N
	c) opening of doors without use of key or tool and without disconnection of live parts possible only when all live parts are protected against direct contact by IP2X or IPXXB		N
	where protection is provided by barriers, tools required for their removal or		N
	all live parts automatically disconnected when barrier is removed		N
6.2.3	Protection by insulation of live parts:		–
	Live parts completely covered with insulation		N
	insulation can be removed only by destruction		N
	insulation capable to withstand mechanical, chemical, electrical and thermal stress occurring under normal service conditions		N
	Paint, varnish lacquer etc. not used as insulation		N
6.2.4	Protection of residual voltage:	–	
	Live parts with residual voltage > 60V after disconnection, to be discharged to ≤ 60V within 5s after disconnection, except for components with charges ≤ 60 C		N
	Where pins of plugs or similar devices after withdrawal are exposed, discharge time ≤ 1s,	None	N
	Or, such conductors protected against direct	See above	N

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Clause	Requirement – Review	Result - Remark	Verdict
	contact by at least IP2X or IPXXB		
	if above requirements cannot be achieved (for example a warning notice in accordance with 16.1), additional disconnecting devices or appropriate warning devices shall be applied. (see cl. 12.7.4)	See above	N
6.2.5	Protection by barriers acc. to EN 60364-4-41 cl. 412.2		N
6.2.6	Protection by placing out of reach or protection by obstacles acc. to EN 60364-4-41, cl. 412.4 and 412.3)		N
	For collector wire- or bar systems, with protection less than IP2X, see cl. 13.8.1		N
6.3	Protection against indirect contact:		–
6.3.2	Measures to prevent the occurrence of a hazardous touch voltage		–
6.3.2.2	use of class II electrical devices or apparatus (double insulation, reinforced insulation or by equivalent insulation acc. to EN 61140)		N
	use of switchgear and controlgear assemblies with total insulation acc. to EN 60439-1		N
	application of supplementary or reinforced insulation acc. to EN 60364-4-41, 413.2		N
6.3.2.3	Electrical separation of an individual circuit to prevent hazardous touch voltage acc. to EN 60364-4-41, cl. 413.5		N
6.3.3	Protection by automatic disconnection of supply by means of:		–
	Protective bonding of exposed conductive parts (see 8.2.3), and		N
	a) Overcurrent protective device for automatic disconnection on detection of an insulation fault in a TN-system, or		N
	b) Residual current protective devices to initiate the automatic disconnection of the supply on detection of an insulation fault from a live part to exposed conductive parts or to earth in TT systems, or		N
	c) Use of insulation monitoring or residual current protective devices to initiate automatic disconnection in a IT-System, and		N
	Except where a protective device is provided to interrupt the supply in the case of the first earth		N

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Clause	Requirement – Review	Result - Remark	Verdict
	fault, an insulation monitoring device shall be provided to indicate the occurrence of a first fault from a live part to exposed conductive parts or to earth, initiating an audible and/or visual signal which shall continue as long as the fault persists.		
	Where automatic disconnection is provided in accordance with a) and disconnection within the time specified in Clause A.1 cannot be assured, supplementary bonding shall be provided as necessary to meet the requirements of Clause A.3.		N
6.4	Protection by application of PELV circuit which have to fulfil following requirements:		-
6.4.1	a) nominal voltage not to exceed 25 AC (r.m.s.) or 60 DC (ripple-free) or		N
	6VAC or 15VDC for all other cases		N
	b) one side of PELV- circuit or one point of source of supply to be connected to PE- circuit		N
	c) live parts of PELV- circuits to be electrically separated from other live circuits.		N
	Electrical separation equal as required for safety isolating transformers (see IEC 61558-1 and IEC 61558-2-6)		N
	d) conductors of each PELV circuit to be physically separated from those of any other circuit.		N
	If not practicable, insulation provisions acc. to cl. 13.1.3 shall be applied		N
	e) plugs and socket outlets for PELV- circuits shall conform to following requirements:		–
	plugs shall not be able to enter socket outlets of other voltage systems	None	N
	socket outlets shall not admit plugs of other voltage systems	None	N
6.4.2	Sources for PELV- circuits to be one of the following:		–
	safety isolating transformers acc. to IEC 61558-1 and IEC 61558-2-6		N
	source of current providing a degree of safety, equivalent to safety isolating transformers		N
	electrochemical or other source, independent of circuit with higher voltage		N
	electronic power supply conforming to appropriate		N

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Clause	Requirement – Review	Result - Remark	Verdict
	standards		
7	PROTECTION EQUIPMENT		–
7.2	Overcurrent protection:		–
7.2.1	Overcurrent protection device provided	See manual	P
7.2.2	Overcurrent protective device at incoming feeder to the electrical equipment (see to cl. 7.2.10 and cl. 18.5)		P
	Electrical equipment supplier state data for overcurrent protective device	See instructions	P
7.2.3	Power circuits:		–
	Overcurrent protective devices applied to each live conductors except for neutral earth conductor		P
	The following conductors, as applicable, are not disconnected without disconnecting all associated live conductors:		P
	– the neutral conductor of a.c. power circuits;		N
	– the earthed conductor of d.c. power circuits;		N
	– d.c. power conductors bonded to exposed conductive parts of mobile machines.		P
	Cross sectional area of neutral conductor to be at least equal to phase conductor, no overcurrent protective/ disconnecting device required		N
	For neutral earth conductors with cross sections smaller than phase conductors, measures acc. to 524 of IEC 60364-5-52 will apply		N
	For IT-systems use of neutral earth conductor (N) is not recommended. Nevertheless if a N-conductor is used, measures acc. to cl. 473.3.2.2 of IEC 60364-4-43 shall apply.	No IT-systems	N
7.2.4	Control circuits:		–
	Conductors of control circuits directly connected to supply voltage and circuits feeding control voltage transformers protected against overcurrent acc. to cl. 7.2.3		P
	Conductors of control circuits supplied by a control circuit transformer or d.c. supply are protected against overcurrent (see also 9.4.3.1):		–
	– in control circuits connected to the protective bonding circuit, by inserting an overcurrent protective device into the switched conductor;		P
	– in control circuits not connected to the protective		–

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Clause	Requirement – Review	Result - Remark	Verdict
	bonding circuit:		
	- where the same cross sectional area conductors are used in all control circuits, by inserting an overcurrent protective device into the switched conductor, and;		P
	- where different cross sectional areas conductors are used in different sub-circuits, by inserting an overcurrent protective device into both switched and common conductors of each sub-circuit.		P
7.2.5	Socket outlets and their associated conductors:		-
	Overcurrent protection devices for socket outlets provided for non-earthed live conductors of each circuit feeding such socket outlets		P
7.2.6	Lighting circuits:		–
	All unearthed conductors of local lighting circuits protected by overcurrent protective devices		N
7.2.7	Transformers:		-
	Transformers protected against overcurrent acc. to with the manufacturer’s instructions.		N
	Avoid unnecessary tripping due to overcurrent caused by magnetising inrush currents		N
	Avoid temperature rise of transformer winding in excess of its permitted of its insulation class of transformer in case of short circuit at secondary terminals		N
	Type and setting of overcurrent protective device acc. to recommendations of transformer manufacturer		N
7.2.8	Location of protective devices:		
	Overcurrent protective device located at point where a reduction in the cross sectional area of the conductors or another change reduces the current-carrying capacity of the conductors, except		P
	Current carrying capacity of conductors at least equal to that the load, and		P
	The part of the conductor between the point of reduction of current-carrying capacity and the position of the overcurrent protective device not longer than 3 meters, and		N
	Conductor installed in such a manner as to reduce the possibility of a short-circuit, for example,		P

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Clause	Requirement – Review	Result - Remark	Verdict
	protected by an enclosure or duct		
7.2.9	Overcurrent protective devices:		
	Rated short-circuit breaking capacity at least equal to prospective fault current at point of installation		P
	Current other than those coming from supply side taken into account		P
	Reduced breaking capacity is permitted, where another protective device is installed at supply side with the necessary breaking capacity		P
	Back-up protection carefully checked, no destruction of conductor or overcurrent protective device may result		P
	Co-ordination with other protective devices in circuit required		P
	Where fuses are provided as overcurrent protective devices, a type readily available in the country of use shall be selected, or arrangements shall be made for the supply of spare parts.		P
7.2.10	Rating and setting of overcurrent protective devices:		
	The rated current or setting of an overcurrent protective device is determined by the current carrying capacity of the conductors to be protected in accordance with 12.4, D.2 and the maximum allowable interrupting time t in accordance with Clause D.3, taking into account the needs of co-ordination with other electrical devices in the protected circuit.		P
	Settings of overcurrent protective devices appropriately listed in technical documentation		P
7.3	Protection of motors against overheating:		–
7.3.1	General		–
	Protection of motors against overheating provided for each motor rated at more than 0,5 kW	See manual	P
	In applications where an automatic interruption of the motor operation is unacceptable (for example fire pumps), the means of detection shall give a warning signal to which the operator can respond.		P
	Overload protection achieved by overload protection (7.3.2), over-temperature protection (7.3.3) or current-limiting protection (7.3.4)	See manual	P

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Clause	Requirement – Review	Result - Remark	Verdict
	Automatic restarting of motors prevented after operation of overload protective device, to avoid cause of a hazardous condition		P
7.3.2	Overload protection		–
	Current overload detection provided for each live conductor except for neutral conductor		P
	However, where the motor overload detection is not used for cable overload protection (see also Clause D.2), the number of overload detection devices may be reduced at the request of the user (see also Annex B).		P
	For motors having single phase or d.c. power supply, detection in only one unearthed live conductor is permitted	See manual	P
7.3.3	Over-temperature protection		–
	The provision of motors with over-temperature protection (see IEC 60034-11) recommended in situations where the cooling can be impaired (for example dusty environments).	Verified in installation	P
	Depending upon the type of motor, protection under stalled rotor or loss of phase conditions is not always ensured by over-temperature protection, and additional protection should then be provided.		P
	Over-temperature protection also recommended for motors that cannot be overloaded (for example torque motors, motion drives that are either protected by mechanical overload protection devices or are adequately dimensioned), where the possibility of over-temperature exists (for example due to reduced cooling).		P
7.3.4	Current limiting protection		–
	Where protection against the effects of overheating in three phase motors is achieved by current limitation, the number of current limitation devices may be reduced from 3 to 2 (see 7.3.2).		P
	For motors having single phase a.c or d.c. power supplies, current limitation in only one unearthed live conductor is permitted.		P
7.4	Abnormal temperature protection:		–
	Resistance heating or similar devices which cause excessive heat, equipped with suitable	None	N

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Clause	Requirement – Review	Result - Remark	Verdict
	overtemperature (for example, due to short-time rating or loss of cooling medium) detection		
7.5	Protection against supply interruption or voltage reduction and subsequent restoration		–
	Undervoltage protection provided for applications where loss of supply or undervoltage causes a hazardous condition		P
	If interruption or reduction of supply voltage is allowed for a short period of time, delayed undervoltage protection provided.		P
	Undervoltage protection not impair any stopping control of the machine		P
	Upon restoration of supply voltage, automatic or unexpected restarting of machine prevented		P
	Undervoltage protection to initiate appropriate control responses to ensure co-ordination the groups of machines working together		P
7.6	Motor overspeed protection:		–
	Overspeed protection provided where overspeeding causes a hazardous condition		P
	Overspeed protection initiates appropriate control response and prevents automatic restarting		P
	The overspeed protection operates in such a manner that the mechanical speed limit of the motor or its load is not exceeded.		P
7.7	Earth fault / residual current protection:		–
	To reduce damage to equipment due to earth fault currents less than the detection level of the overcurrent protection, earth fault/residual protection used		N
	Detection level for earth fault protection set as low as possible		N
7.8	Phase sequence protection:		–
	Protection from incorrect phase sequence of supply voltage provided		N
7.9	Protection against overvoltages due to lightning strike or switching action:		–
	Protective devices for the suppression of overvoltages caused by lightning strikes or switching surges provided		N
	Devices for suppression of overvoltages due to lightning, connected at incoming terminals of the		N

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Clause	Requirement – Review	Result - Remark	Verdict
	supply disconnecting device		
	Devices for suppression of overvoltages due to switching surges connected across terminals of all equipment requiring such protection		N
8	EQUIPOTENTIAL BONDING		–
8.1	General:		–
	This clause provides requirements for both protective bonding and functional bonding. Figure 4 illustrates those concepts. Protective bonding is a basic provision for fault protection to enable protection of persons against electric shock from indirect contact (see 6.3.3 and 8.2).		N
8.2	Protective bonding circuit		N
	General		N
	The protective bonding circuit consists of– PE terminal(s) (see 5.2); – the conductive structural parts of the electrical equipment and the hoisting machine; – the protective conductors in the equipment of the hoisting machine, including sliding contacts where they are part of the circuit.		N
	Protective conductors		N
	Protective conductors shall be identified in accordance with 13.2.2.		N
	Continuity of the protective bonding circuit		N
	All exposed conductive parts shall be connected to the protective bonding circuit in accordance with 8.2.1.		–
	Exclusion of switching devices from the protective bonding circuit		N
	The protective bonding circuit shall not incorporate a switching device or an overcurrent protective device (for example, switch, fuse). No means of interruption of the protective bonding conductor shall be provided.		N
	Parts that need not be connected to the protective bonding circuit		N
	It is not necessary to connect exposed conductive parts to the protective bonding circuit where those parts are mounted so that they do not constitute a hazard because – they cannot be touched on large surfaces or grasped with the hand and theyare small in size		N

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Clause	Requirement – Review	Result - Remark	Verdict
	(less than approximately 50 mm× 50 mm); or– they are located so that either contact with live parts, or an insulation failure, is unlikely.		
8.3	Functional bonding		N
	Protection against mal-operation as a result of insulation failures can be achieved by connecting to a common conductor in accordance with 9.4.3.1.		–
8.4	Measures to limit the effects of high leakage current		N
	The effects of high leakage current can be restricted to the equipment having high leakage current by connection of that equipment to a dedicated supply transformer having separate windings. Where a transformer is provided for this purpose, the protective bonding circuit shall be connected to exposed conductive parts of the equipment and, in addition, to the secondary winding of the transformer. The protective conductor(s) between the equipment and the secondary winding of the transformer shall conform to one or more of the arrangements described in 8.2.7.		N
9	CONTROL CIRCUITS AND CONTROL FUNCTIONS		–
9.1	Control circuits		N
9.1.1	Control circuit supply		N
	Transformers shall be used for supplying the control circuits		N
	Transformers are not mandatory for machines with a single motor starter and a maximum of two control devices	N	N
9.1.2	Control circuit voltages		N
	The nominal voltage shall not exceed 277 V when supplied from a transformer		N
9.1.3	Protection		–
	Over current protection shall be provided according to 7.2.4 and 7.2.10		P
9.2	Control functions		–
	Start functions		
	Start functions shall operate by energizing the relevant circuit (see 9.2.5.2).	See above	P
9.2.2	Stop functions		

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Clause	Requirement – Review	Result - Remark	Verdict
	Each machine shall be equipped with appropriate stop functions		P
9.2.3	Operating modes		N
	When hazardous conditions can arise from mode selection, such selection shall be prevented by suitable means		N
	Mode selection by itself shall not initiate machine operation (A separate action by the operator shall be required)		N
	Safeguarding shall remain effective for all operating modes		N
	Indication of the selected operating mode shall be provided		N
9.2.4	Suspension of safety functions and/or protective measures		–
	Where it is necessary to suspend safety functions and/or protective measures (for example for setting or maintenance purposes), protection shall be ensured by the requirement.		N
9.2.5	Operation		–
9.2.5.1	General	None	N
	The necessary interlocks (see 9.3) shall be provided for safe operation	None	N
	Measures shall be taken to prevent movement of the machine in an unintended manner after any stopping of the machine	None	N
	Where a machine has more than one control station, measures shall be provided to ensure that initiation of commands from different control stations do not lead to a hazardous situation.	None	N
9.2.5.2	Start		
	The start of an operation shall be possible only when all the safeguards are in place and functional (except described in 9.2.4)		P
	Manual control of such operations shall be by hold-to-run controls, together with enabling devices, as appropriate.		P
	Suitable interlocks shall be provided to secure correct sequential starting		N
	The use of more than one control station to initiate a start		N
9.2.5.3	Stop		

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Clause	Requirement – Review	Result - Remark	Verdict
	Category 0, category 1 and/or category 2 stops shall be provided where indicated by the risk assessment and the functional requirements of the machines (see 4.1).		P
	Stop functions shall override related start functions (see 9.2.5.2).		P
	Where required, facilities to connect protective devices and interlocks shall be provided.		N
	The reset of the stop function shall not initiate any hazardous situation.		P
	Stop commands from any control station shall be effective when required by the risk assessment of the machine.		P
9.2.5.4	Emergency operations (emergency stop, emergency switching off)		N
9.2.5.4.1	General		–
	This part of IEC 60204 specifies the requirements for the emergency stop and the emergency switching off functions of the emergency operations listed in Annex E, both of which are, in this part of IEC 60204, initiated by a single human action.		N
	The reset of the command shall not restart the machinery but only permit restarting.		N
	It shall not be possible to restart the machinery until all emergency stop commands have been reset. It shall not be possible to reenergize the machinery until all switching off commands have been reset.		N
9.2.5.4.2	Emergency stop		N
	Shall function either as a category o stop or as a category 1 stop		N
	The choice of the emergency stop shall be determined by the risk assessment of the machine		N
	In addition to the requirements for stop (see 9.2.5.3), the emergency stop function has the following requirements: – it shall override all other functions and operations in all modes; – power to the machine actuators that can cause a		N

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Clause	Requirement – Review	Result - Remark	Verdict
	hazardous situation(s) shall be either removed immediately (stop category 0) or shall be controlled in such a way to stop the hazardous motion as quickly as possible (stop category 1) without creating other hazards; – reset shall not initiate a restart.		
9.2.5.4.3	Emergency switching off		N
	Use of emergency switching off		N
9.2.5.5	Monitoring of command actions		–
	Movement or action of a machine or part of a machine that can result in a hazardous condition shall be monitored		N
9.2.6	Other control functions		N
9.2.6.1	Hold-to-run controls		N
	Hold-to-run controls shall require continuous actuation of the control device(s) to achieve operation.		N
9.2.6.2	Two-hand control		N
	Three types of two-hand control are defined in ISO 13851, the selection of which is determined by the risk assessment.		N
9.2.6.3	Enabling control		N
	Enabling control (see also 10.9) is a manually activated control function interlock that:		N
	a) when activated allows a machine operation to be initiated by a separate start control, and		N
	b) when de-activated		N
	– initiates a stop function in accordance with 9.2.5.3, and – prevents initiation of machine operation.		–
9.2.6.4	Combined start and stop controls		N
	Push-buttons and similar control devices that, when operated, alternately initiate and stop motion shall only be provided for functions which cannot result in a hazardous situation to be controlled by that operator control station		N
9.2.7	Cableless control		N
9.2.7.1	General		–
	This subclause deals with the functional requirements of control systems employing cableless (for example radio, infra-red) techniques		N

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Clause	Requirement – Review	Result - Remark	Verdict
	for transmitting commands and signals between a machine control system and operator control station(s).		
	Means shall be provided to readily remove or disconnect the power supply of the operator control station (see also 9.2.7.3).		N
	Means (for example key operated switch, access code) shall be provided, as necessary, to prevent unauthorized use of the operator control station.		N
	Each operator control station shall carry an unambiguous indication of which machine(s) is(are) intended to be controlled by that operator control station.		N
9.2.7.2	Control limitation		–
	Measures shall be taken to prevent the machine from responding to signals other than those from the intended operator control station		P
	Where necessary, means shall be provided so that the machine can only be controlled from operator control station in one or more predetermined zones or locations		–
9.2.7.3	Stop		
	Operator control stations shall include a separate and clearly identifiable means to initiate the stop function of the machine or of all the motions that can cause a hazardous condition		P
	Measures shall be taken to prevent the machine from responding to signals other than those from the intended operator control station	None	N
	The actuating means to initiate this stop function shall not be marked or labeled as an emergency stop device	See above	N
	A machine which is equipped wit cableless control shall have a means of automatically initiating the stopping of the machine and of preventing a potentially hazardous operation	See above	N
9.2.7.4	Use of more than one operator control station		N
	Where a machine has more than one operator control station, measures shall be taken to ensure that only one control station can be enabled at a given time		N
	An indication of which operator control station is in		N

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Clause	Requirement – Review	Result - Remark	Verdict
	control of the machine shall be provided at suitable locations as determined by the risk assessment of the machine		
9.2.7.5	Battery-powered operator control stations		N
9.2.6.3	A variation in the battery voltage shall not cause a hazardous condition		–
	If one or more potentially hazardous motions are controlled using a battery-powered operator control station, a clear warning shall be given to the operator when a variation in battery voltage exceeds specified limits	None	N
	Under those circumstances, the operator control station shall remain functional long enough to put the		–
9.3	Protective interlocks		N
9.3.1	Reclosing or resetting of an interlocking safeguard		N
	The reclosing or resetting of an interlocking safeguard shall not initiate machine motion or		N
9.3.2	Exceeding operating limits	None	N
9.3.3	Operation of auxiliary functions		–
	The correct operation of auxiliary functions shall be checked by appropriate devices	None	N
	Use of appropriate interlocking	See above	N
9.3.4	Interlocks between different operations and for contrary motions	See above	N
	Interlocking shall be provided against incorrect operation		–
	For safety or for continuous operation, certain		N
	Where a failure of a mechanical brake actuator can		N
9.3.5	Reverse current braking		N
	Use of reverse current braking		N
9.4	Control functions in the event of failure		N
9.4.1	General requirements		
	Provision of control functions in case of failure according to the level of risk assessment		P
9.4.2	Measures to minimize risk in the event of failure		P
9.4.2.1	Use of proven circuit techniques and components		P

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Clause	Requirement – Review	Result - Remark	Verdict
9.4.2.2	Provisions of partial or complete redundancy		N
	Redundancy can be effective in normal operation (on-line redundancy) or designed as special circuits that take over the protective function (off-line		N
9.4.2.3	Provision of diversity		N
	The use of control circuits having different principles of operation, or using different types of components		N
	The combination of electrical and non-electrical systems (for example mechanical, hydraulic,		N
9.4.2.4	Provision for functional Reviews		N
	Functional Reviews may be carried out automatically by the control system, or manually by inspection or Reviews at start-up and at predetermined intervals, or a combination as appropriate(see also 17.2 and		N
9.4.3	Protection against maloperation due to earth faults,		–
9.4.3.1	Earth faults		N
	Earth faults on any control circuit shall not cause unintentional starting, potentially hazardous motions, or prevent stopping of the machine.		N
9.4.3.2	Voltage interruptions	None	N
	Where a memory device is used, proper functioning in the event of power failure shall be ensured to prevent any loss of memory that can result in a hazardous condition	None	N
9.4.3.3	Loss of circuit continuity		N
	Where the loss of continuity of safety-related control circuits depending upon sliding contacts can result in hazardous condition, appropriate measures shall be taken		N
10	Operator interface and machine-mounted control devices		
10.1	General		–
10.1.1	General device requirements		P
	As far as is practicable, those devices shall be selected, mounted, and identified or coded according to IEC 61310 and IEC 60447		P
10.1.2	Location and mounting		
	Appropriate location mounting for machine-mounted and hand-operated control,foot-operator control devices .		P
10.1.3	Protection		P

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Clause	Requirement – Review	Result - Remark	Verdict
	Operator and machine mounted control devices shall with stand the stress of expected use, and protect against contaminants.		P
	The operator interface control devices shall have a min. degree of protection: IPXXD		P
10.1.4	Position sensors		
	Position sensors shall not be damaged in the event of over travel		N
	Position sensors used in circuits with safety-related functions either hall have positive opening operation or shall provide similar reliability		N
10.1.5	Portable and pendant control stations		N
	Portable and pendant control stations and their control devices shall be so selected and arranged as to minimize the possibility of inadvertent machine operations caused by shocks and vibrations		N
10.2	Push-buttons		P
10.2.1	Colors		P
	Push-button actuators shall be color -coded according to table 2		P
10.2.2	Markings		P
	Use of adequate markings for push-buttons, with the symbols according to table 3.		P
10.3	Indicator lights and displays	See above	P
10.3.1	General	See above	P
	Indication and /or confirmation		–
10.3.2	Colors		P
	Color-coded according to table 4 (Unless otherwise agree between the supplier and the user)		P
10.3.3	Flashing lights and displays		N
	Use of flashing lights to display the higher priority information.		N
10.4	Illuminated push-buttons		
	Color-coded according to table 2 and 4		P
10.5	Rotary control devices	See above	N
	Devices having a rotational member shall be mounted to prevent rotation of the stationary member (Friction alone shall not be sufficient)	See above	N
10.6	Start devices		–
	Shall be constructed and mounted to minimize		P

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Clause	Requirement – Review	Result - Remark	Verdict
	inadvertent operation		
	Mushroom-type actuators may be used for two-hand control (see also ISO 13851).		N
10.7	Emergency stop devices		N
10.7.1	Location of emergency stop devices		N
	Devices for emergency stop shall be readily accessible		N
	Emergency stop devices shall be located at each operator control station and at other locations where the initiation of an emergency stop can be required		N
	Emergency stop devices shall be provided to minimize the confusion.		–
10.7.2	Types of emergency stop device		N
	Use of type - a push-button operated switch - a pull-cord operated switch - a pedal-operated switch without a mechanical guard		N
	The devices shall have direct opening operation (see IEC 60947-5-1, Annex K).		N
10.7.3	Color of actuators		N
	Actuators of emergency stop devices shall be colored RED.		–
	If a background exists immediately around the actuator, then this background shall be colored YELLOW. See also ISO 13850.	See method b) above	N
10.7.4	Local operation of the supply disconnecting device to effect emergency switching off		N
	Where the supply disconnecting device is to be locally operated for emergency switching off, it shall be readily accessible and should meet the color requirements of 10.7.3		N
10.8	Emergency switching off devices		N
10.8.1	Location of emergency switching off devices		N
	Emergency switching off devices shall be located as necessary for the given application.	No sliding contacts	N
	Those devices will be located separate from operator control stations.		–
	Where it is necessary to provide a control station with an emergency stop device and an emergency switching off device, means shall be provided to		N

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Clause	Requirement – Review	Result - Remark	Verdict
	avoid confusion between these devices.		
10.8.2	Types of emergency switching off device		N
	The devices shall have direct opening action (see IEC 60947-5-1, Annex K).		N
	The push-button operated switch may be in a break-glass enclosure.		N
10.8.3	Color of actuators		N
	Actuators of emergency switching off devices shall be coloured RED.		–
	If a background exists immediately around the actuator, then this background shall be colored YELLOW.		N
	Where confusion can occur between emergency stop and emergency switching off devices, means shall be provided to minimize confusion.		N
10.8.4	Local operation of the supply disconnecting device to effect emergency switching off		N
	Where the supply disconnecting device is to be locally operated for emergency switching off, it shall be readily accessible and should meet the colour requirements of 10.8.3	None	N
10.9	Enabling control device		N
	It shall signal the enabling control to allow operation when actuated in one position only.		N
	Enabling control devices shall be selected and arranged so as to minimize the possibility of defeating.		N
11	CONTROLGEAR: LOCATION, MOUNTING, AND ENCLOSURES		–
11.1	All controlgear located and mounted so, as to facilitate:		-
	- its accessibility and maintainability		N
	- its protection against external influences or operating conditions under which operation is intended		N
	- operation and maintenance of the machine and its associated equipment		N
11.2	Location and mounting:		-
11.2.1	all control-gear components placed and oriented so, that identification is possible without moving them or the associated wiring		N
	Components checked for correct operation or		N

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Clause	Requirement – Review	Result - Remark	Verdict
	possible replacement without dismantling other equipment or parts of the machine (except opening doors or removing covers, barriers or obstacles)		
	Terminals not associated with controlgear also to conform to this requirement		N
	Operation and maintenance of all control gear possible from front of cabinet		N
	Special tools to adjust, maintain, or remove a device provided with the equipment	None	N
	Access for regular maintenance or adjustment to equipment, relevant devices located between 0.4m to 2.0 m above servicing level		N
	Terminals located at least 0.2 m above servicing level and placed such, that conductors and cables can be easily connected		N
	No devices mounted on doors, except those for operating, indicating, measuring and cooling purposes on normally removable access-covers of enclosure		N
	Plug-in type control devices belonging functionally together, their association made clear by type (shape), marking or reference designation single or in combination (see cl. 13.4.5)	None	N
	Plug-in type control devices, that are handled during normal operation, shall be designed with non-interchangeable characteristics, where lack of such facility can result in malfunctioning	None	N
	Plug/socket combinations, handled during normal operation, shall be located and mounted so as to provide unobstructed access	None	N
	If Review points for connection of Review equipment are provided, they should be:		-
	- mounted so as to provide unobstructed access	None	N
	- clearly marked to correspond with the documentation (see cl. 17.3)	See above	N
	- adequately insulated	See above	N
	- sufficiently spaced	See above	N
11.2.2	Non-electrical parts and devices, not directly associated with the electrical equipment, not located within enclosures containing controlgear		N
	Devices such as solenoid valves separated from other electrical equipment		N

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Clause	Requirement – Review	Result - Remark	Verdict
	Control devices mounted at same location and connected to the main supply voltage, or to both main supply and control voltage, are grouped separately from those connected to control voltage only		N
	Terminals separated into groups for:		-
	power circuits or		N
	associated control circuits or		N
	other control circuits, fed from external sources		N
	Terminal groups mounted adjacently, providing that each group is readily identified		N
	When arranging the location of devices, clearances and creepage distances specified for them by the supplier shall be maintained, taking into account external influences or physical conditions of its environment		N
11.2.3	Heat generating components located so, that temperature of each component in its vicinity remains within the permitted limits		N
11.3	Degrees of protection:		-
	Protection of control gear against ingress of solid foreign objects and liquids shall be adequate.		P
	External influences under which the equipment is intended to operate is to be taken into account		P
	Its protection sufficient against dust, coolants and swarf		P
	Enclosures of control gear provide a degree of protection of at least IP22	IP54	P
	Exceptions:		-
	a) Where an electrical operating area is used as a protective enclosure for an appropriate degree of protection against ingress of solid bodies and liquids		N
	b) Where removable collectors on collector bar systems are used, and IP22 is not achieved but measures of cl. 6.2.5 are applied		N
11.4	Enclosures, doors and openings:	–	
	Enclosures to withstand mechanical, electrical and thermal stress as well as effects of humidity and other environmental factors during normal service		N
	Fasteners for doors or covers of captive type	None	N

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Clause	Requirement – Review	Result - Remark	Verdict
	Windows for viewing internally mounted indicating devices, made of material suitable to withstand mechanical stress and chemical attack	None	N
	Doors of enclosure not wider than 0,9 meter		N
	Doors with vertical hinges, preferably lift-off type		N
	Doors with opening angle of at least 95°		N
	Gaskets of doors, lids, covers and enclosures withstand the chemical effects of aggressive liquids, vapours or gases used on the machine	No such joints or gaskets	N
	Means used to maintain degree of protection of an enclosure of doors, lids and covers that require opening or removed for operational or maintenance shall:	–	
	- be securely attached to either door, cover or enclosure		N
	- not deteriorate due to removal or replacement of door or cover and so impair degree of protection		N
	Where openings in enclosures are provided (for example, for cable access), including those towards the floor or foundation or to other parts of the machine, means be provided to ensure the degree of protection specified for the equipment.		N
	Openings for cable entries at enclosure to be easily re-opened on site		N
	Suitable opening in base of enclosure within the machine provided, as to enable drainage of moisture due to condensation		N
	No opening between enclosure containing electrical equipment and compartment containing coolant, lubricating or hydraulic fluids		N
	Holes in enclosure for mounting purposes not impair required degree of protection		N
	Equipment that could attain a surface temperature sufficient to cause a risk of fire or harmful effect to an enclosure material during normal or abnormal operation shall:	–	
	- be located within an enclosure, that can withstand, without risk of fire or harmful effect, the heat emitted by the equipment or		N
	- be mounted and located at sufficient distance from adjacent equipment, so as to allow safe dissipation of heat or		N

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Clause	Requirement – Review	Result - Remark	Verdict
	- be otherwise screened by material that can withstand, without risk of fire or harmful effect, the heat emitted by the equipment		N
11.5	Access to controlgear	–	
	Doors in gangways and for access to electrical operating areas shall:	–	
	- be at least 0.7 meter wide and 2.0 meter high;	None	N
	- open outwards	See above	N
	- have a means (for example panic bolts) to allow opening from the inside without the use of a key or tool	See above	N
	Enclosures which readily allow a person to fully enter provided with means to allow escape, for example panic bolts on the inside of doors.	See above	N
	Enclosures intended for such access, for example for resetting, adjusting, maintenance, have a clear width of at least 0,7 m and a clear height of at least 2,1 m	See above	N
	In cases where equipment is likely to be live during access and/or conducting parts are exposed, the clear width be at least 1,0 m.	See above	N
	In cases where such parts are present on both sides of the access way, the clear width be at least 1,5 m	See above	N
12	CONDUCTORS AND CABLES		-
12.1	Conductors and cables selected so as to be suitable for operating conditions and external influences that are existing	Complied	P
	Requirements not applicable for integral wiring of assemblies, subassemblies and devices that are manufactured and Reviewed acc. to their relevant standard	Cable or conductors were complied with relevant IEC standard.	P
12.2	Generally conductors shall be of copper	Only copper conductors	P
	If aluminium conductors are used, the min. cross-2 sectional area to be at least 16 mm	See above	N
	To ensure adequate mechanical strength, the cross-sectional area of conductors not less than as shown in Table 5	Not less than as shown in Table 5	P
	Conductors with smaller cross-sectional areas or other constructions than shown in Table 5 used in equipment, provided adequate mechanical	See above	N

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Clause	Requirement – Review	Result - Remark	Verdict
	strength is achieved by other means and proper functioning is not impaired		
	Max. permitted conductor temperatures under normal-/ short circuit conditions will not exceed values given in table 5	According to table D.5, cable is designed to permitted temperature for short-circuit condition.	P
	Class 1 and class 2 conductors are primarily intended for use between rigid, non-moving parts	Complied	P
	All conductors which are subject to frequent movement to be of flexible stranded copper acc. to class 5 or class 6	No frequent movement	N
12.3	Types of insulation include: Polyvinyl chloride (PVC)	Insulation of internal wiring material is polyvinyl chloride (PVC) and has an appropriate flame-retardant rating.	P
	Rubber, natural and synthetic	See above	N
	Silicone rubber (SiR)	See above	N
	Mineral	See above	N
	Cross-linked Polyethylene (XLPE)	See above	N
	Ethylene Propylene Rubber compound (EPR)	See above	N
	Poly-Tetra-Fluor-Ethylene (PTFE)	See above	N
	Where insulation of conductors or cables can constitute hazards due to propagation of fire or emission of toxic/ corrosive fumes, guidance from cable supplier to be sought	Complied	P
	Special attention to integrity of a circuit having a safety-related function	Complied	P
	Dielectric strength of insulation adequate for required Review voltage with a min. of 2000VAC for cables operating with voltages >50VAC or >120 VDC	Cables > 50Vac or 120Vdc: 2kV~, 5 min;	P
	For PELV circuits, dielectric strength adequate for Review voltage of 500VAC for a duration of 5 minutes (see IEC 60364-4-41, class III equipment)	No PELV connecting cables:	N
	Mechanical strength and thickness of insulation such that, insulation cannot be damaged during cable laying or in operation	No such damage likely at normal installation	P
12.4	Current-carrying capacities for PVC insulated wiring between enclosures and individual items of	The conductor cross-sectional area complies with table 6.	P

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Clause	Requirement – Review	Result - Remark	Verdict
	equipment under steady-state conditions according to values given in table 6		
12.5	Voltage drop from point of supply to load not exceeding 5% of nominal voltage under normal operating conditions	Voltage drop of supply is not exceeding 5% of nominal voltage.	P
12.6.1	Flexible cables have cl. 5 or cl. 6 conductors	None	N
	cables exposed to severe duties shall be of adequate construction to protect against:		
	abrasion due to mechanical handling and dragging across rough surfaces	See above	N
	kinking to operation without cable guides	See above	N
	stress resulting from guide rollers and forced guiding, being wound and re-wound on cable drums	See above	N
12.6.2	Cable handling system of machine designed such, as to keep tensile stress of conductors as low as practicable during machine operation	See above	N
	tensile stress for copper conductors not to exceed 2 15 N/mm of copper cross section area	See above	N
	where tensile stress of conductors is exceeding 15 2 N/mm , cables of special design are used	See above	N
	maximum stress for flexible cables with material other than copper be within the cable manufacturer's specification	See above	N
12.6.3	Cables wound on drums selected such, as the maximum allowable conductor temperature is not exceeded	No cable drum	N
	cables for circular cross-section area, installed on drums, max. current-currying capacity in free air as declared acc. to table 7	See above	N
12.7.1	Conductor wires, conductor bars and slip-ring assemblies:		
	They shall be installed or enclosed in such way, that during normal access to the machine, protection against direct contact is achieved by application by one of the following protective measures:		
	- protection by partial insulation of live parts, or where this is not practicable;	No collector wires, collector bars and slip-ring assemblies	N
	- protection by enclosure or barriers provide a	Motor terminal box	P

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Clause	Requirement – Review	Result - Remark	Verdict
	degree of protection of at least IP2X		
	Horizontal top surfaces of barriers or enclosures which are readily accessible provide a degree of protection of at least IP4X	See above	N
	If required degree of protection is not achieved, protection by placing live parts out of reach in combination with emergency switching-off acc. to cl. 9.2.5.4.3 applied	See above	N
	Conductor wires and conductor bars placed and/or protected so as to:		
	- prevent contact, especially for unprotected conductor wires and conductor bars, with conductive items such as the cords of pull-cord	See above	N
	- prevent damage from a swinging load	See above	N
12.7.2	Where conductor wires and conductor bars and slip-ring assemblies are installed as part of the PE-circuit, they do not carry current in normal	Complied	P
12.7.3	Protective conductors of current collectors have a shape or are designed such, so that they are not interchangeable with other current collectors of the	Complied	P
12.7.4	Removable current collectors with disconnector function are designed such, that PE-circuit is interrupted only after live conductors have been disconnected and the continuity of the PE-circuit is re-established before any live conductor is	See above	N
12.7.5	Clearances between respective conductors and between adjacent systems of conductor wires, conductor bars, slip-ring assemblies and their current collectors designed for for at least a rated impulse voltage of an overvoltage category III in	Complied	P
12.7.6	Creepage distances suitable for operation in the intended environment, for example open air (IEC 60664-1), inside buildings, protected by enclosures	Complied	P
	In abnormally dusty, moist or corrosive environments, following creepage distances		
	- for unprotected conductor wires, bars and slip-ring assemblies equipped with insulators, the minimum creepage distance is 60 mm	See above	N
	- for enclosed conductor wires, insulated multipole conductor bars and insulated individual conductor bars, the minimum creepage distance is 30 mm	Complied	P

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Clause	Requirement – Review	Result - Remark	Verdict
	Gradual reduction of insulation values due to unfavourable ambient conditions regarded	See above	N
12.7.7	Suitable design measures taken, in order to prevent energisation of adjacent sections by current collectors themselves	Complied	P
12.7.8	conductor wires, conductor bar systems and slip-ring assemblies used for power circuits kept separately from those used for control circuit	See above	N
	above systems capable of withstanding without damage to mechanical forces and thermal effects of short circuit currents	See above	N
	removable covers to above systems, laid underground or under floor, designed that they cannot be opened by one person without the use of a tool	See above	N
	Conductor bars which are installed in a common metal enclosure, the individual section of it bonded together and connected to a protective bonding conductor at several points depending upon their length	See above	N
	Metal covers of conductor bars laid underground or underfloor, bonded together and connected to a protective bonding conductor	See above	N
	The protective bonding circuit to include the covers or cover plates of metal enclosures or underfloor ducts. Where metal hinges form a part of the bonding circuit, their continuity be verified (see Clause 18).	See above	N
	Underground and under floor conductor bar ducts have drainage facilities	See above	N
13	WIRING PRACTICES		-
13.1.1	All connections, especially those of the protective bonding circuit, secured against accidental loosening	Complied	P
	Means of connection suitable for cross-sectional areas and nature of conductors being terminated		P
	Connection of two or more conductors to one terminal only where terminal is designed for that purpose	None	N
	Only one PE-conductor connected to one terminal		N

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Clause	Requirement – Review	Result - Remark	Verdict
	connecting point		
	Soldered connections only, where terminals are provided which are suitable for soldering connections	None	N
	Terminals on terminal blocks plainly identified to correspond with markings on wiring diagrams	Complied	P
	Where an incorrect electrical connection (for example, arising from replacement of devices) can be a source of risk and it is not practicable to reduce the possibility of incorrect connection by design measures, the conductors and/or terminations be identified in accordance with 13.2.1.	Complied	P
	Installation of flexible conduits and cables such, that liquids are drained away from fittings and joints	No liquids drained likely from the fittings	N
	Means to retain stranded conductors together when terminating conductors at terminals/ devices provided		N
	Solder not used for that purpose	Complied	P
	Shielded conductors terminated so, as to prevent fraying of strands and to permit easy disconnection	None	N
	Identification tags legible, permanent and appropriate for physical environment	Complied	P
	Terminal blocks mounted and wired so, that internal and external wiring does not cross over terminals	Complied	P
13.1.2	Conductors and cables runned from terminal to terminal without splices or joints	Complied	P
	Connections using plug/socket combinations with suitable protection against accidental disconnection are not considered to be joints for the purpose of this Subclause.	None	N
	Exception: Where it is impracticable to provide terminals in a junction box (for example on mobile machines, on machines having long flexible cables; cable connections exceeding a length which is not practical to be supplied by the cable manufacturer on one cable drum; repair of cable due to mechanical stresses during installation and operation), splices or joints may be used	Terminals in the terminal box	N
	Where it is necessary to connect or disconnect cables, sufficient extra length provided for that	Complied	N

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Clause	Requirement – Review	Result - Remark	Verdict
	purpose		
	Terminations of cables adequately supported to prevent mechanical stress at termination points of conductors	Complied	P
	Protective conductor (PE) placed close to associated conductors in order to decrease loop impedance		N
13.1.3	Conductors of different circuits laid side by side and occupy the same duct or be in same multiconductor cable, provided that such arrangement does not impair proper functioning of respective circuits	Complied	P
	Where circuits operate at different voltage levels, conductors separated by suitable barriers or insulated for maximum voltage to which any conductor within the same duct is subjected, for example line to line voltage for unearthed systems and phase to earth voltage for earthed systems	Single voltage level	N
13.1.4	Connection between pick-up and pick-up converter of an inductive power supply system		
	The cable between the pick-up and the pick-up converter as specified by the manufacturer of the inductive power supply shall be:		
	– as short as practicable;	None	N
	– adequately protected against mechanical damage.	See above	N
13.2	Identification of conductors:		
13.2.1	Conductors identifiable at each termination point acc. to technical documentation	Conductors are identified by tags at each termination in accordance with the electrical schematic.	P
	Identification of conductors by number, alphanumeric, colour (either solid or with one or more stripes), or a combination of colour and numbers or alphanumeric	Colour is used throughout the length of the conductor.	P
	When numbers are used, they are Arabic; letters are Roman (either upper or lower case).	Complied	P
13.2.2	Protective conductor readily distinguishable by shape, location, marking or colour		N
	Bicolour combination GREEN- AND- YELLOW used throughout the length of the conductor		N
	This colour identification is strictly reserved for the		N

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Clause	Requirement – Review	Result - Remark	Verdict
	protective conductor, so that it can be easily identified by its shape		
	Ends or accessible positions of a protective conductor clearly identified by graphical symbol IEC 60417-5019 (DB:2002-10) or by bicolour combination GREEN- AND- YELLOW		N
13.2.3	Where a circuit includes a neutral conductor that is identified by colour alone, the colour used for this conductor is BLUE. In order to avoid confusion with other colours, it is recommended that an unsaturated blue be used, called here “light blue” (see 3.2.2 of IEC 60446).	None	N
	Where the selected colour is the sole identification of the neutral conductor, that colour not be used for identifying any other conductor where confusion is possible	See above	N
	Where bare conductors are used as neutral conductors and identification by colour is used, they either be coloured by a stripe, 15 to 100 mm wide in each compartment or unit, or at each accessible position or coloured throughout their length	See above	N
13.2.4	Identification by colour		–
	Where colour-coding is used for identification of conductors (other than the protective conductor (see 13.2.2) and the neutral conductor (see 13.2.3)), the following colours may be used: BLACK, BROWN, RED, ORANGE, YELLOW, GREEN, BLUE (including LIGHT BLUE), VIOLET, GREY, WHITE, PINK, TURQUOISE.	Complied	P
	If colour coding of conductors applies, conductors coded over its full length, either by colouring of insulation or coloured markers at regular intervals and at the ends or accessible location.	Complied	P
	For safety reasons, colour GREEN or colour YELLOW not used where there is a possibility or confusion with the bicolour combination: GREEN – AND - YELLOW	Complied	P
	GREEN or YELLOW as a single code must not be used, except in bicolour combination GREEN-AND-YELLOW	Complied	P
	Where colour-coding is used for identification of		

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Clause	Requirement – Review	Result - Remark	Verdict
	conductors, it is recommended that they be colour-coded as follows:		
	– BLACK: a.c. and d.c. power circuits;	Complied	P
	– RED: a.c. control circuits;	None	N
	– BLUE: d.c. control circuits;	None	N
	– ORANGE: excepted circuits in accordance with 5.3.5.	None	N
	Exceptions: to the above are permitted where:		
	– insulation is used that is not available in the colours recommended; or	See above	N
	– multiconductor cable is used, but not the bicolour combination GREEN-AND-YELLOW.	None	N
13.3	Conductors inside enclosures supported where necessary to keep it in place		N
	Non-metallic ducts permitted only when they are of flame-retardant insulating material (see the IEC 60332 series)	None	N
	Electrical equipment mounted inside cabinets, designed to permit modification of wiring from front of cabinet (see cl. 11.2.1)	None	N
	Where that is not possible, access doors or swingout panels provided	None	N
	Connections to devices mounted on doors or to other movable parts made with flexible conductors (acc. to cl.12.2 and 12.6) to allow for frequent movement of those parts	None	N
	Conductors be anchored to the fixed part and the movable part, independently of the electrical connection (see also 8.2.3 and 11.2.1)	None	N
	Conductors and cables that do not run in ducts are adequately supported	None	N
	Terminal blocks or plug /socket combinations used for control wiring, that extends beyond the enclosure	None	N
	Power cables and cables for measuring-circuits are directly connected to terminals of field located devices	None	N
13.4	Wiring outside enclosures:		
13.4.1	Introduction of cables- or ducts by means of individual glands, bushings etc. into an enclosure must not reduce degree of protection of it (see 11.3)	See manual	P

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Clause	Requirement – Review	Result - Remark	Verdict
13.4.2	Conductors and their connections outside of the enclosure, are enclosed in suitable ducts as described in cl. 13.5	See above	P
	Where devices such as position switches or proximity switches are supplied with a dedicated cable, their cable need not be enclosed in a duct when the cable is suitable for the purpose, sufficiently short, and so located or protected, that the risk of damage is minimized.		N
	Fittings used with ducts or multiconductor cables are suitable for the physical environment		N
	Flexible conduit or flexible multiconductor cable is used for flexible connections to pendant push-button stations	No pendant control	N
	Weight of pendant stations is supported by other means than flexible conduits or flexible multicore cables	See above	N
13.4.3	Connections to frequently moving elements of the machine, designed acc. to cl. 12.2 and 12.6	None	N
	Flexible cables and conduits installed so, as to avoid excessive flexing and straining, particularly at the fittings	See above	N
	Cables exposed to movement supported in such way, as to prevent mechanical strain at connecting points	See above	N
	If this is achieved by provision of a loop, it has sufficient length to provide for a bending radius of at least 10 times the diameter of the cable	See above	N
	Flexible cables of machines installed or protected in such way, as to minimise the possibility of external damage due to factors, that include the following cable use or potential abuse:		
	– being runned over by the machine itself	See above	N
	– being runned over by vehicles or other machines	See above	N
	– coming into contact with the machine structure during movements	See above	N
	– running in and out of cable baskets or, on / off cable drums	See above	N
	– acceleration and wind forces on festoon systems or suspended cables	See above	N
	– excessive rubbing by cable collector	See above	N
	– exposure to excessive radiated heat	See above	N

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Clause	Requirement – Review	Result - Remark	Verdict
	Cable sheath resistant to normal wear expected from normal movement and effects of atmospheric contaminants	See above	N
	Where cables are close to moving parts, space of at least 25mm maintained between moving parts and cables	See above	N
	Where that distance is not practicable, fixed barriers provided between cables and moving parts	See above	N
	Cable handling system designed such, that lateral cable angle does not exceed 5°, avoiding torsion at the cable when		
	– being wound on and off the cable drums and	See above	N
	– approaching and leaving cable guidance's	See above	N
	Measures taken to ensure that at least two turns of cable remain on the drum	See above	N
	Cable guides designed such, that the inner bending radius is not less than values given in table 8	See above	N
	Straight section between two bends at least 20 times the cable diameter	See above	N
	Construction and supporting means prevent damage to flexible cable under all operating conditions	See above	N
	No flexible conduit used for connections subject to rapid or frequent movements except when specifically designed for that purpose.	See above	N
13.4.4	In case where several sensors or control elements are connected in series, it is recommended to connect them via intermediate terminals	None	N
	Intermediate terminals are adequately protected	See above	N
	Intermediate terminals are indicated on the wiring diagram	See above	N
	This enables easy access for Reviewing purposes	See above	N
13.4.5	Where plug/socket combinations are provided, they fulfill one or more of the following requirements as applicable:		
	Exception: Components or devices inside an enclosure, terminated by fixed plug/socket combinations (no flexible cable), or components connected to a bus system by a plug/socket combination.	None	N
	a) When installed correctly in accordance with f),	See above	N

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Clause	Requirement – Review	Result - Remark	Verdict
	plug/socket combinations of such type and installed in such way, as to prevent unintentional contact with live parts at any time , including during insertion or removal of the connectors		
	Min. degree of protection: IPXXB.	See above	N
	PELV circuits are excepted from this requirement	See above	N
	b) Have a first make last break protective bonding contact (earthing contact) (see also 6.3, 8.2.4) if used in TN- or TT-systems.	See above	N
	c) Plug/socket combinations intended to be connected or disconnected during load conditions have sufficient load-breaking capacity.	See above	N
	Plug/socket combinations rated at 30 A, or greater, are interlocked with a switching device so that the connection and disconnection is possible only when the switching device is in the OFF position.	See above	N
	d) Plug/socket combinations rated at more than 16 A have a retaining means to prevent unintended or accidental disconnection.	See above	N
	e) Where an unintended or accidental disconnection of plug/socket combinations can cause a hazardous situation, they have a retaining means.	See above	N
	The installation of plug/socket combinations fulfill the following requirements as applicable:		
	f) Min. degree of protection for the component which remains live after disconnection (except for PELV circuits): IP2X or IPXXB, taking into account the required clearance and creepage distances	See above	N
	g) Metallic housings of plug/socket combinations connected to the protective bonding circuit (except for PELV circuits)	See above	N
	h) Plug/socket combinations intended to carry power loads but not to be disconnected during load conditions have a retaining means to prevent unintended or accidental disconnection and are clearly marked that they are not intended to be disconnected under load.	See above	N
	i) Where more than one plug/socket combination is provided in the same electrical equipment, the associated combinations are clearly identifiable. It is recommended that mechanical coding be used	See above	N

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Clause	Requirement – Review	Result - Remark	Verdict
	to prevent incorrect insertion.		
	j) Plug/socket combinations used in control circuits fulfil the applicable requirements of IEC 61984. Exception: see item k).	See above	N
	k) No plug/socket combinations intended for household and similar general purposes used for control circuits.	See above	N
	In plug/socket combinations in accordance with IEC 60309-1, only those contacts are used for control circuits which are intended for those purposes.	See above	N
	Exception: The requirements of item k) do not apply to control functions using high frequency signals on the power supply.	See above	N
13.4.6	If wiring needs to be disconnected for shipment, terminals or plug/socket combinations are provided at the disconnecting points	See above	N
13.4.7	Additional wiring for maintenance or repair purposes provided	See above	N
13.5	Ducts, connection boxes and other boxes:		
13.5.1	Ducts provide a degree of protection suitable for the application (see IEC 60529)	None	N
	All sharp edges, flash, burrs, rough surfaces or threads which the insulation of conductors can come into contact, removed from ducts and conduits	See above	N
	In order to avoid confusion between conduits for electrical installation and those for oil, water or air, either physically separated or suitably identified	See above	N
	Ducts or cable trays rigidly supported and positioned at sufficient distance from moving parts	See above	N
	Ducts or cable trays mounted at least 2 meters above the working surface in areas where human passage is required	See above	N
	Ducts provided only for mechanical protection (see cl. 8.2.3)	See above	N
	Cable trays which are partially covered, not to serve as cable trays or installation trunking	See above	N
	Conductors and cables suitable for installation with or without the use of open cable trays or cable support means	See above	N
13.5.2	Cable trays dimensioned or located such, as to	See above	N

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Clause	Requirement – Review	Result - Remark	Verdict
	enable easy access for installation of additional conductors and cables		
	Consideration given on percentage of filling of such ducts.	See above	N
13.5.3	Rigid metal conduits or trays consist of galvanised steel or corrosion-resistant material, suitable for the environmental conditions.	See above	N
	Application of cable trays of different metal avoided, due to electrolytic corrosion	See above	N
	Installation conduits secured, held in place and supported at each end	See above	N
	Joints and fittings compatible with conduits and appropriate for its application	See above	N
	Conduit-bends fabricated such, as to avoid damage or reduction of internal cross-section	See above	N
13.5.4	Flexible metallic conduits and fittings consist of flexible metal tubing or wire mesh armour.	See above	N
	They are suitable for its application and environmental conditions	See above	N
13.5.5	Flexible non-metallic conduits are resistant to buckling and with similar characteristics as the sheath of multicore cables	See above	N
	They shall be suitable for its application and environmental conditions	See above	N
	Joints and fittings compatible with conduits and appropriate for its application	See above	N
13.5.6	Cable trunking systems outside of enclosures are rigidly supported and kept clear of moving and contaminating parts of the machine	See above	N
	Covers shaped to overlap the sides; gaskets permitted	See above	N
	Covers attached to cable trunking systems by suitable means	See above	N
	On horizontal cable trunking systems, no cover on the bottom unless specifically designed for such installation	See above	N
	Where the cable trunking system is furnished in sections, the joints between sections fit tightly but need not be gasketed.	See above	N
	The only openings permitted are those required for wiring or for drainage	See above	N
	Cable trunking systems not to have opened but	See above	N

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Clause	Requirement – Review	Result - Remark	Verdict
	unused knockouts		
13.5.7	Installation of cables layed in cable trays with covers permitted within the machine-foundations, providing that they are completely closed and separated from coolant and lubrication systems (see cl. 13.5.6)	See above	N
13.5.8	Cable connection boxes and junction boxes used for wiring purposes are accessible for maintenance (see cl. 11.3)	See above	N
	They provide protection against ingress of solids or liquids, taking into account external influences during operation of the machine (see cl. 11.3)	See above	N
	Junction boxes not have openings for cable entries and are designed so, as to avoid ingress of entrained dust, lubricants and coolant	See above	N
13.5.9	Motor terminal boxes used for motor cable connection and for devices attached to the motor		P
14	ELECTRIC MOTORS AND ASSOCIATED EQUIPMENT		-
14.1	Electric motors are conform to EN 60034 series	In according to EN60034-1	P
	Electric motors and associated equipment protected against following risks:		
	overcurrent (see cl. 7.2)	See manual	P
	thermal overload (see cl. 7.3)	See manual	P
	overspeed (see cl. 7.6)		P
	Compliance ensured with the requirements stated (see clauses 5.3, 5.4, 5.5, 7.5, 7.6 and 9.4)		P
	Motor control equipment located and mounted acc. to cl. 11	No control	N
14.2	Selection of motor enclosure recommended acc. to EN 60034-5		P
	Degree of protection at least IP23		P
	Incorporated motors mounted such, as to provide adequate protection against mechanical damage	Complied	P
14.3	Dimensions of motors conform to those given in EN 60072 series	Complied	P
14.4	Each motor with associated coupling, belt, pulley or chain mounted such, as to provide adequate protection and easy access for inspection, maintenance, adjustment or alignment, lubrication and replacement	Complied	P
	Motors mounted such, as to allow easy access to	Complied	P

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Clause	Requirement – Review	Result - Remark	Verdict
	all terminal boxes		
	Motors mounted such, as to ensure proper cooling Temperature rise to be within limits of relevant insulation class	Complied	P
	Temperature rise within limits of relevant insulation class	Complied	P
	If possible, motor compartments stay clean and dry and when required, ventilated directly to the outside of the machine	Intended to be installed in an spacious area	N
	Motor-vents at an acceptable level and designed such, as to avoid ingress of swarf, dust or water spray	None	N
	No opening between motor compartment and any other compartment, which does not fulfil the requirement for motor compartments	Complied	P
14.5	Electric motors selected acc. to service and environmental conditions	Complied	P
	Design criteria for evaluation include:		
	– type of motor	See above	P
	– type of duty cycle (see IEC 60034-1)	Continues operation	P
	– fixed speed or variable speed operation	Fixed speed	P
	– mechanical vibrations	Considered	P
	– type of motor control	No control	N
	– influence of the harmonic spectrum of voltage and/or current when supplied from static converter on the temperature rise	Complied	P
	– method of starting and possible influence of inrush current	Complied	P
	– variation of counter torque load with time and speed	Complied	P
	– influence of loads with large inertia	Complied	P
	– influence of constant torque or constant power operation	Complied	P
	– possible need of inductive reactors between motor and converter	Complied	P
14.6	Operation of overload or overcurrent protective devices for mechanical brake-actuators initiate simultaneous de-energisation(release) of associated machine actuators	No mechanical brake.	N
15	ACCESSORIES AND LIGHTING		
15.1	Where the machine or its associated equipment is provided with socket-outlets		N

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Clause	Requirement – Review	Result - Remark	Verdict
	for auxiliary equipment, the following will apply:		
	socket-outlets are conform to regulations	None	N
	if not possible, they are clearly marked with voltage and current ratings	See above	N
	continuity of protective bonding circuit to be ensured except where protection is provided by PELV	See above	N
	all unearthed conductors connected to socket-outlets, protected against overcurrent	See above	N
	when required, protection against overload in accordance with cl. 7.2 and cl. 7.3 separately from protection of other circuits	See above	N
	if power supply to socket-outlets is not disconnected, than requirements of cl.5.3.5 apply	See above	N
15.2	Local lighting of the machine and equipment		
15.2.1	Connection to PE-circuit acc. to cl. 8.2.2	No local lighting	N
	ON-OFF switch not incorporated in lampholder or in flexible connecting cord	See above	N
	Stroboscopic effects from lights avoided	See above	N
	If fixed lighting is provided in an enclosure, electromagnetic compatibility (EMC) taken into account	See above	N
	Application of EMC requirements acc. to principles stated in cl. 4.4.2	See above	N
15.2.2	If higher voltages are applied, value not exceeding 250 V between conductors	See above	N
	Nominal voltage of local lighting circuits not exceeding 50 V	See above	N
	Lighting circuits supplied from one of the following sources:		
	– from a dedicated isolating transformer connected to load side or	See above	N
	– overcurrent protection provided in secondary circuit or	See above	N
	– a dedicated isolating transformer connected to line side provided or (see also 5.3.5 and 13.1.3)	See above	N
	– source permitted for maintenance purpose or	See above	N
	– lighting circuits placed in control enclosures only or	See above	N
	– overcurrent protection provided in secondary circuit or	See above	N
	– from a machine-circuit with dedicated overcurrent	See above	N

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Clause	Requirement – Review	Result - Remark	Verdict
	protection or		
	– from an isolating transformer connected to line side of supply disconnecting device, when a dedicated primary disconnecting means and a secondary overcurrent protection are provided or	See above	N
	– for an externally supplied lighting circuit, which is only permitted in a control enclosures	See above	N
	Exception: Where fixed lighting is out of reach for operator during normal operations, provisions of this subclause do not apply	See above	N
15.2.3	local lighting circuits protected	See above	N
15.2.4	adjustable lighting fittings suitable for the physical environment provided	See above	N
	lampholders in accordance with relevant IEC-publications and	See above	N
	designed of an insulating material protecting the lamp cap, as to prevent unintentional contact	See above	N
	reflectors supported by a bracket and not by the lampholder	See above	N
	Exception: Where fixed lighting is out of reach for operator during normal operations, provisions of this subclause do not apply	See above	N
16	MARKING, WARNING SIGNS AND REFERENCE DESIGNATIONS		
16.1	Warning signs, nameplates, markings- and identification plates of sufficient durability to withstand the physical environment involved	Complied	P
16.2	Warning signs		
16.2.1	Electric shock hazard		
	Enclosures that do not otherwise clearly show that they contain electrical equipment that can give rise to a risk of electric shock, are marked with the graphical symbol IEC 60417-5036 (DB:2002-10)	On the terminal box	P
	Warning sign plainly visible on the enclosure, door or cover-plate	Complied	P
	The warning sign may be omitted for (see also 6.2.2 b)):		
	– an enclosures equipped with a supply disconnecting device or	See above	P
	– an operator - machine interface or for a control-station or	See above	P
	– a single device with its own enclosure	See above	P

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Clause	Requirement – Review	Result - Remark	Verdict
16.2.2	Where the risk assessment shows the need to warn against the possibility of hazardous surface temperatures of the electrical equipment, the graphical symbol IEC 60417-5041 (DB:2002-10) is used		N
16.3	Control devices, visual indicators and displays (particularly those related to safety) clearly and durably marked with regard to their functions either on, or adjacent to it	None	N
	such markings as agreed between user and supplier	See above	N
	preference given to the use of standard symbols given in IEC 60417- DB:2002 and ISO 7000.	See above	N
16.4	Marking of equipment		
	Equipment (for example controlgear assemblies) legibly and durably marked so that it is plainly visible after equipment installation	Complied	P
	Nameplates attached to enclosures adjacent to each incoming supply shall contain the following information:		
	– name or trade mark of supplier and	Complied	P
	– certification mark, when required and	CE mark	P
	– serial number, where applicable and	Complied	P
	– rated voltage and	220V	P
	– number of phases and	/	P
	– frequency (if AC) and	/	P
	– full-load current for each supply	Complied	P
	– short-circuit interrupting capacity of overcurrent protective device, where furnished as part of device of equipment	See installation instructions	N
	– main document number (see IEC 62023)		N
	Full-load current shown on nameplate not less than the running currents of all motors and other electrical loads, that are in operation at the same time under normal conditions	Complied	P
	if a single motor controller is used, that information provided instead, on the machine nameplate	No controller	N
16.5	All enclosures, assemblies, control devices and components plainly identified with the same reference designation as shown in technical documentation	Complied	P
17	Technical documentation		-

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Clause	Requirement – Review	Result - Remark	Verdict
17.1	General		P
	The information necessary for installation, operation, and maintenance of the electrical equipment of a machine shall be supplied in the form of drawings, diagrams, charts, tales and instructions		P
	The information shall be in an agreed language	English	P
17.2	Information to be provided		
	The information provided with the electrical equipment shall include the requirements specified in this clause		P
17.3	Requirements applicable to all documentation		
	Unless otherwise agreed between manufacturer and user: – the documentation shall be in accordance with relevant parts of IEC 61082; – reference designations shall be in accordance with relevant parts of IEC 61346; – instructions/manuals shall be in accordance with IEC 62079. – parts lists where provided shall be in accordance with IEC 62027, class B.	Complied	P
	the supplier shall select one of the following methods: – where the documentation consists of a small number of documents (for example less than 5) each of the documents shall carry as a cross-reference the document numbers of all other documents belonging to the electrical equipment; or – for single level main documents only (see IEC 62023), all documents shall be listed with document numbers and titles in a drawing or document list; or – all documents of a certain level (see IEC 62023) of the document structure shall be listed, with document numbers and titles, in a parts list belonging to the same level.	Complied	P
17.4	Installation documents		
	The installation documents shall give all information necessary for the preliminary work of		P

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Clause	Requirement – Review	Result - Remark	Verdict
	setting up the machine (including commissioning).		
	The data necessary for choosing the type, characteristics, rated currents, and setting of the overcurrent protective device(s) for the supply conductors to the electrical equipment of the machine shall be stated (see 7.2.2).		P
	The size, purpose, and location of any ducts in the foundation shall be detailed (see Annex B).	No software	P
	The associated equipment shall be detailed (see Annex B).	Complied	P
	Where necessary, the diagram shall indicate where space is required for the removal or servicing of the electrical equipment.	Complied	P
	In addition, where it is appropriate, an interconnection diagram or table shall be provided.	Complied	P
	That diagram or table shall give full information about all external connections.	Complied	P
	Electrical equipment is intended to be operated from more than one source of electrical supply, the interconnection diagram or table shall indicate the modifications or interconnections required for the use of each supply	Complied	P
17.5	Overview diagrams and function diagrams		P
	Use and requirements for function diagrams.		P
17.6	Circuit diagrams		N
	Use and requirements for circuit diagrams	Complied	P
17.7	Operating manual	Complied	P
	Use and requirements for operating manual	Complied	P
17.8	Maintenance manual		
	Use and requirements for maintenance manual		P
17.9	Parts list		
	Use and requirements for parts list	Complied	P
18	VERIFICATION		P
18.1	The extent of verification will be given in the dedicated product standard for a particular machine.	Complied	P
	Where there is no dedicated product standard for the machine, the verifications always include the items a), b) and f) and may include one or more of the items c) to e):		
	a) verification, that electrical equipment is in compliance with the technical documentation	Complied	P

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Clause	Requirement – Review	Result - Remark	Verdict
	b) in case of protection against indirect contact by automatic disconnection, conditions for protection by automatic disconnection to be verified according to 18.2;	Verified according to 18.2	P
	c) insulation resistance Review (see 18.3);	Complied	P
	d) voltage Review (see 18.4);	Complied	P
	e) protection against residual voltage (see 18.5);	No capacitor	N
	f) functional Reviews (see 18.6).	Complied	P
	When these Reviews are performed, the sequence listed above recommended	Complied	P
	When the electrical equipment is modified, the requirements stated in 18.7 apply	See 18.7	N
	For Reviews in accordance with 18.2 and 18.3, measuring equipment in accordance with the EN 61557 series	Complied	P
	The results of the verification to be documented.	Complied	P
18.2	Verification of conditions for protection by automatic disconnection of supply		N
18.2.1	General		
	The conditions for automatic disconnection of supply (see 6.3.3) verified by Reviews.		N
18.2.2	Review methods in TN-systems		N
	Review 1 verifies the continuity of the protective bonding circuit.		N
	Review 2 verifies the conditions for protection by automatic disconnection of the supply		N
18.2.3	Application of the Review methods for TN-systems		N
	Review 1 of 18.2.2 shall be carried out on each protective bonding circuit of a machine.		N
	When Review 2 of 18.2.2 is carried out by measurement, it shall always be preceded by Review 1.		N
	The Reviews that are necessary for machines of different status are specified in Table 9. Table 10 can be used to enable determination of the machine status		N
18.3	Insulation resistance measured with 500VDC between power circuit conductors and protective bonding circuit is to be ≥ 1.0 MΩ		P
	Review made on individual sections of complete electrical installation	Review in complete electrical installation.	P
	For certain parts of the electrical equipment, a		N

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Clause	Requirement – Review	Result - Remark	Verdict
	lower minimum insulation value is permitted, but not less than 50 k		
	If the electrical equipment of the machine contains surge protection devices which are likely to operate during the Review, it is permitted to either:		N
	– disconnect these devices, or	None	N
	– reduce the Review voltage to a value lower than the voltage protection level of the surge protection devices, but not lower than the peak value of the upper limit of the supply (phase to neutral) voltage.	See above	N
18.4	When voltage Reviews are performed, Review equipment in accordance with IEC 61180-2	Complied	P
	Review voltage at a nominal frequency of 50Hz or 60Hz,		N
	Maximum Review voltage at a value of twice the rated supply voltage of the equipment or 1000 VAC (or 1414 VDC), whichever is the greater		P
	Maximum Review voltage applied between the power circuit conductors and the protective bonding circuit for a period of approximately 1 s.	Complied	P
	Requirements are satisfied if no disruptive discharge occurs.	Complied	P
	Components not rated to withstand these Review voltage are disconnected during Reviewing	Complied	P
	Components and devices that have been voltage Reviewed in accordance with their product standards are disconnected during Reviewing.	None	N
18.5	Reviews for protection against residual voltages are performed to ensure compliance with cl. 6.2.4	No capacitor	N
18.6	Function Reviews of the electrical equipment performed, particularly those related to function of circuits for electrical safety (for example earth fault detection)	Power on/off Review	P
18.7	Where a portion of the machine and its associated equipment is changed or modified, that portion is reverified and reReviewed as appropriate (see cl.	Brand new product	N

EN 60204-32:2008			
Clause	Requirement – Review	Result - Remark	Verdict
	18.1)		

Annex：Technical Information

File No：MD-TCF-240529-58442

Applicant:

MODE CHINA

Address of applicant:

Room 01.8/f#7 Tower. 4th Area, No. 186, South 4th Ring west Road.Fengtai District, Beijing, China

A. 1 Declaration of conformity
A.2 Safety pictures of the machine

Legal Person：_____

Product: Free Hoist
Model: Free Hoist

ANNEX 1:EC DECLARATION OF CONFORMITY

THIS IS HEREBY DECLARED THAT FOLLOWING DESIGNATED PRODUCT COMPLIED WITH THE ESSENTIAL HEALTH AND SAFETY REQUIREMENTS OF MACHINERY DIRECTIVE (MD)2006/42/EC &ELECTROMAGNETIC COMPATIBILITY DIRECTIVE 2014/30/EUON THE APPROXIMATION OF THE LAWS OF THE MEMBER STATES RELATING TO IT.

MANUFACTURER

Zhuozhou Mude Industrial Technology Co., Ltd

No.C55, Zhongguaneun Hegu Innovatien Industrial Park, Chaoyang EastRoad,ZhuozhouDevelopment Zone, BaodingCity, Hebei Province

AUTHORIZED REPRESENTATIVE ESTABLISHED WITHIN THE EU ☐

COMPANY NAME:

COMPANY ADDRESS:

DESCRIPTION OF MACHINERY

PRODUCT NAME: Free Hoist

MODEL TYPE: Free Hoist

APPLICABLE STANDARDS

EN ISO 12100:2010, EN 14492-2:2019, EN 60204-32:2008

EN IEC 61000-6-2:2019, EN IEC 61000-6-4:2019

THIS DECLARATION APPLIES TO ALL SPECIMENS MANUFACTURED IDENTICAL TO THE MODEL SUBMITTED FOR TESTING / EVALUATION. ASSESSMENT OF COMPLIANCE OF THE PRODUCT WITH THE REQUIREMENTS RELATING TO SAFETY STANDARDS LISTED ABOVE WAS PERFORMED BY MANUFACTURER.

CE

SIGNATURE:_____

TITLE: Person in Charge of Technical

PLACE: China

DATE:_____

ANNEX 2: SAFETY PICTURES OF THE MACHINE

Type of equipment:	Free Hoist

Details of:	
View: [X] general [ ] front [ ] rear [ ] right [ ] left [ ] top [ ] bottom	

Details of:	
View: [X] general [ ] front [ ] rear [ ] right [ ] left [ ] top [ ] bottom	

- End of Report -