

**TECHNICAL CONSTRUCTION FILE  
FILE NO: EBO2007161-E289**

ACCORDING TO  
2006/42/EC MACHINERY DIRECTIVE

RELATED TO THE

**Bone Saw**

MODEL: KENT440F, KENT440F-SL, KENT330F, KENT330F-SL, KENT220F-SPH, KENT220F,  
KENT220T-SPH, KENT220T, KENT550F-RO

PRESENTED BY

**Kentmaster Meat Equipment (Beijing) Co., Ltd.**

**Room 117, Building 6, No. 28, Linhe Avenue, Linhe Industrial Zone, Shunyi, Beijing,  
China**

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## **Part I : General**

### **1.1 General description**

Basically, this kind of machine doesn't belong to hazard machine and with low risk when using it. All possible risk have been analysis in the risk assessment report and been prevent by suitable ways.

The main risk of this kind of machine could be:

- The risk of access to the power transmission elements.
- The risk of access to the electrical parts

In order to prevent the main risks mentioned above, the protection guarding systems are provided, and all the detail safety provision are constructed in accordance with the requirement of EN13857.

In order to ensure the conformity for CE marking for these machines, some main

European and/or International standards have been used to made assessment of conformity, they are:

- EN 60204-1 for checking of electrical equipment
- EN ISO 12100, EN 12268, EN 1672-1 and EN 1672-2 for checking the machinery safety

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

## **1.2 Quality control system**

In order to ensure the conformity of the series production, the **Kentmaster Meat Equipment (Beijing) Co., Ltd.** has taken the related procedures mentioned below:

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

Before the assemblies of the series production, the QC engineers of **Kentmaster Meat Equipment (Beijing) Co., Ltd.** 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.

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

Before packing the products, the QC engineers of **Kentmaster Meat Equipment (Beijing) Co., Ltd.** have to do the necessary inspection and testing to ensure the conformity of related requirements. In particular, the testing and inspection of electrical characteristics and outer feature.

( 3 ) 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.

( 4 ) 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 **Kentmaster Meat Equipment (Beijing) Co., Ltd.** The change may effects the related electrical or mechanical characteristics.

( 5 ) Provision for the Quality Assurance

For the provisions of internal control measures to ensure the conformity of series production of the machines, **Kentmaster Meat Equipment (Beijing) Co., Ltd.** has built an internal quality control system in accordance with the international standard of ISO-9001.

### 1.3 Declaration of conformity

## EC DECLARATION OF CONFORMITY



according to the following EC Directive  
- Machinery Directive: 2006/42/EC

The undersigned, representing

**Applicant Name:** Kentmaster Meat Equipment (Beijing) Co., Ltd.

**Applicant Address:** Room 117, Building 6, No. 28, Linhe Avenue, Linhe Industrial Zone, Shunyi, Beijing, China

**Manufacturer Name:** Kentmaster Meat Equipment (Beijing) Co., Ltd.

**Manufacturer Address:** Room 117, Building 6, No. 28, Linhe Avenue, Linhe Industrial Zone, Shunyi, Beijing, China

**Name and address of the person(established in the Community) authorised to compile the technical file:** \_\_\_\_\_

declaring that the machine

**Product Name:** Bone Saw

**Commercial Name:** Bone Saw

**Function:** \_\_\_\_\_

**Brand Name:** KENTMASTER

**Model:** KENT440F, KENT440F-SL, KENT330F, KENT330F-SL, KENT220F-SPH, KENT220F, KENT220T-SPH, KENT220T, KENT550F-RO

**Type:** KENT440F

**Serial Number:** \_\_\_\_\_

Fulfils all the relevant provisions of Directive  
2006/42/EC

And tested in accordance with below standards:

EN 60204-1: 2018, Safety of machinery — Electrical equipment of machines, Part 1: General Requirements

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

EN 12268: 2014, Food Machines — Band Saw Machines — Safety and hygiene requirements

EN 1672-1: 2014, Food processing machinery — Basic concepts — Part 1: Safety requirements

EN 1672-2: 2005+A1:2009, Food processing machinery — Basic concepts — Part 2: Hygiene requirements

EN ISO 13857: 2019, Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs

EN ISO 13849-1: 2015, Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design

EN ISO 13850: 2015, Safety of machinery — Emergency stop function — Principles for design

EN ISO 14118: 2018, Safety of machinery — Prevention of unexpected start-up

Person responsible for making this declaration

Name, Surname : Jorena

Position/Title : General manager

Beijing, P.R.CHINA

(place)

August 5, 2020

(date)



## **1.4 List of applicable regulations and standards**

### Regulations

- Machinery Directive: 2006/42/EC
- Standards
- EN 60204-1:2018, Safety of machinery — Electrical equipment of machines, Part 1: General Requirements
- EN ISO 12100: 2010, Safety of machinery — General principles for design — Risk assessment and risk reduction
- EN 12268: 2014, Food Machines — Band Saw Machines — Safety and hygiene requirements
- EN 1672-1: 2014, Food processing machinery — Basic concepts — Part 1: Safety requirements
- EN 1672-2: 2005+A1:2009, Food processing machinery — Basic concepts — Part 2: Hygiene requirements
- EN ISO 13857: 2019, Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs
- EN ISO 13849-1: 2015, Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design
- EN ISO 13850:2015, Safety of machinery — Emergency stop function — Principles for design
- EN ISO 14118: 2018, Safety of machinery — Prevention of unexpected start-up

**Part II: Assessment of conformity**

<p><b>Council Directive 2006/42/EC, Annex I</b>  <b>Essential health and safety requirements relating to the design and construction of machinery and safety components</b>  <b>EN 60204-1: 2018</b>  <b>Safety of machinery – Electrical equipment of machines, Part 1: General requirements</b>  <b>EN ISO 12100:2010</b>  <b>Safety of machinery – General principles for design</b>  <b>– Risk assessment and risk reduction</b>  <b>EN 12268: 2014,</b>  <b>Food Machines — Band Saw Machines — Safety and hygiene requirements</b>  <b>EN 1672-1: 2014,</b>  <b>Food processing machinery — Basic concepts — Part 1: Safety requirements</b>  <b>EN 1672-2: 2005+A1:2009,</b>  <b>Food processing machinery — Basic concepts — Part 2: Hygiene requirements</b></p>	
Tested by(name and signature)..... :	Bernie Xia 
Approved by(name and signature...:	Kevin Wang 
Date of issue .....	August 10, 2020
<b>Testing Laboratory</b> .....	Shenzhen EBO Testing Center
Address.....:	Building A, Qinye Business Center , Xin'an Sixth Road, 82th District, Bao'an, Shenzhen, China.
Testing location/procedure.....:	Kentmaster Meat Equipment (Beijing) Co., Ltd.
Address.....:	Room 117, Building 6, No. 28, Linhe Avenue, Linhe Industrial Zone, Shunyi, Beijing, China
<b>Applicant's name</b> .....:	Kentmaster Meat Equipment (Beijing) Co., Ltd.
Address.....:	Room 117, Building 6, No. 28, Linhe Avenue, Linhe Industrial Zone, Shunyi, Beijing, China
<b>Test specification:</b>	
Directive.....:	2006/42/EC
Test procedure .....	CE-MD
Manufacturer.....:	Kentmaster Meat Equipment (Beijing) Co., Ltd.
Address	Room 117, Building 6, No. 28, Linhe Avenue, Linhe Industrial Zone, Shunyi, Beijing, China
<b>Test item description</b> .....:	Bone Saw
Brand name.....:	KENTMASTER
Main model/Type reference .....	KENT440F, KENT440F-SL, KENT330F, KENT330F-SL, KENT220F-SPH, KENT220F, KENT220T-SPH, KENT220T, KENT550F-RO
	Remark: All models are identical in the same PCB layout, interior structure and electrical circuits. The only differences are the model name and appearance color for commercial purpose.
Test model no. ....:	KENT440F
Rating(s) .....	AC 380V~, 50HZ, 3PH, 2.2KW



<b>1.</b>	<b>Essential Health and Safety Requirements</b>		—
<b>1.1</b>	<b>General remarks</b>		—
1.1.1	Definitions	Information only	P
1.1.2	Principles of safety integration	Considered for the machine	P
a)	Machinery must be designed and constructed so that it is fitted for its function, and can be operated, adjusted and maintained without putting persons at risk when these operations are carried out under the conditions foreseen but also taking into account any reasonably foreseeable misuse thereof.	These requirements have been complied with.	P
	The aim of measures taken must be to eliminate any risk throughout the foreseeable lifetime of the machinery including the phases of transport, assembly, dismantling, disabling and scrapping.	These requirements have been complied with.	P
b)	In selecting the most appropriate methods, the manufacturer or his authorized representative must apply the following principles, in the order given:		P
	-eliminate or reduce risks as far as possible (inherently safe machinery design and construction),	The measures have been taken to eliminate or reduce risks as far as possible.	P
	-take the necessary protective measures in relation to risks that cannot be eliminated	Appropriate guards and warning signs are used.	P
	-inform users of the residual risks due to any shortcomings of the protective measures adopted, indicate whether any particular training is required and specify any need to provide personal protective equipment.	The related safety information for the users to operate the machine has been included in the instruction manual.	P
c)	When designing and constructing machinery and when drafting the instructions, the manufacturer or his authorised representative must envisage not only the intended use of the machinery but also any reasonably foreseeable misuse thereof.	All safety principles have been taken into account as far as possible during the design of these machines.	P
	The machinery must be designed and constructed in such a way as to prevent abnormal use if such use would engender a risk. Where appropriate, the instructions must draw the user's attention to ways -which experience has shown might occur - in which	These requirements have been complied with, and the related information also has been provided within the instruction manual.	P



	the machinery should not be used.		
d)	Machinery must be designed and constructed to take account of the constraints to which the operator is subject as a result of the necessary or foreseeable use of personal protective equipment.	These requirements have been taken into account during the design of this machine.	P
e)	Machinery must be supplied with all the special equipment and accessories essential to enable it to be adjusted, maintained and used safely.	It has been complied with.	P
1.1.3	Materials and products	The machine comprise of metal.	P
	The materials used to construct machinery or products used and created during its use must not endanger exposed persons' safety or health	Materials and products cannot endanger exposed person's safety or health.	P
	In particular, where fluids are used, machinery must be designed and constructed for use without risks due to filling, use, recovery or draining.	It has been complied with.	P
1.1.4	Lighting		P
	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.		P
	Machinery must be designed and constructed so that there is no area of shadow likely to cause nuisance, that there is no irritating dazzle and that there are no dangerous stroboscopic effects on moving parts due to the lighting.	It has been complied with..	P
	Internal parts requiring frequent inspection and adjustment and maintenance areas must be provided with appropriate lighting.		P
1.1.5	Design of machinery to facilitate its Handling	Wood package and transporting vehicle used	--
	Machinery or each component part thereof must:		--
	-be capable of being handled and transported safely,		P
	-be packaged or designed so that it can be stored safely and without damage	The machinery can be stored safely and without damage.	P
	During the transportation of the machinery and/or its component parts, there must be no possibility of sudden movements or of hazards due to instability as long as the machinery	movements or of hazards due to instability as long as the machinery and/or its component parts are handled.	P

	and/or its component parts are handled in accordance with the instructions.		
	Where the weight, size or shape of machinery or its various component parts prevents them from being moved by hand, the machinery or each components part must:		--
	-Either be fitted with attachments for lifting gear, or		N
	-Be designed so that it can be fitted with such attachments, or		P
	- Be shaped in such a way that standard lifting gear can easily be attached		N
	Where machinery or one of its component parts is to be moved by hand, it must:		--
	-Either be easily movable, or		N
	-Be equipped for picking up and moving in complete safety		N
	Special arrangement must be made for the handling of tools and/or machinery parts, even if lightweight, which could be dangerous.		N
1.1.6	Ergonomics		--
	Under the intended conditions of use, the discomfort, fatigue and physical and psychological stress faced by the operator must be reduced to the minimum possible, taking into account ergonomic principles such as:		--
	-allowing for the variability of the operator's physical dimensions, strength and stamina,	The requirement has been complied with.	P
	- providing enough space for movements of the parts of the operator's body,	The requirement has been complied with.	P
	-avoiding a machine-determined work rate,	The requirement has been complied with.	P
	- avoiding monitoring that requires lengthy concentration,	The requirement has been complied with.	P
	- adapting the man/machinery interface to the foreseeable characteristics of the operators.		N
1.1.7	Operating positions		P
	The operating position must be designed and constructed in such a way as to avoid any risk due to exhaust gases and/or lack of oxygen.	The requirement has been complied with.	P
	If the machinery is intended to be used in a hazardous environment presenting risks to the		N

	health and safety of the operator or if the machinery itself gives rise to a hazardous environment, adequate means must be provided to ensure that the operator has good working conditions and is protected against any foreseeable hazards.		
	Where appropriate, the operating position must be fitted with an adequate cabin designed, constructed and/or equipped to fulfill the above requirements. The exit must allow rapid evacuation. Moreover, when applicable, an emergency exit must be provided in a direction which is different from the usual exit.		N
1.1.8	Seating		N
	Where appropriate and where the working conditions so permit, work stations constituting an integral part of the machinery must be designed for the installation of seats.	Not applicable.	N
	If the operator is intended to sit during operation and the operating position is an integral part of the machinery, the seat must be provided with the machinery.		N
	The operator's seat must enable him to maintain a stable position. Furthermore, the seat and its distance from the control devices must be capable of being adapted to the operator.		N
	If the machinery is subject to vibrations, the seat must be designed and constructed in such a way as to reduce the vibrations transmitted to the operator to the lowest level that is reasonably possible. The seat mountings must withstand all stresses to which they can be subjected. Where there is no floor beneath the feet of the operator, footrests covered with a slip-resistant material must be provided.		N
1.2	<b>Controls</b>	See below	P
1.2.1	Safety and reliability of control systems		P
	Control systems must be designed and constructed so that they are safe and reliable, in a way that will prevent a dangerous situation arising.	All related safe and reliable technologies have been used adequately for these machines.	P

	Above all they must be designed and constructed:		--
	- They can withstand the rigors of normal use and external influences	The whole control system can withstand the rigors of normal use and external factors.	P
	-a fault in the hardware or the software of the control system does not lead to hazardous situations,	The requirement has been complied with.	P
	-Errors in control system logic don't lead to dangerous situations	Errors in logic don't lead to dangerous situations.	P
	- reasonably foreseeable human error during operation does not lead to hazardous situations.	The requirement has been complied with.	P
	Particular attention must be given to the following points:		--
	- the machinery must not start unexpectedly,	The machinery cannot start unexpectedly.	P
	-the parameters of the machinery must not change in an uncontrolled way, where such change may lead to hazardous situations,	The requirement has been complied with.	P
	- the machinery must not be prevented from stopping if the stop command has already been given,	The machinery cannot be prevented from stopping when the stop command has already been given.	P
	-no moving part of the machinery or piece held by the machinery must fall or be ejected,		P
	-automatic or manual stopping of the moving parts, whatever they may be, must be unimpeded,	The requirement has been complied with.	P
	-the protective devices must remain fully effective or give a stop command,	Remain fully effective.	P
	-the safety-related parts of the control system must apply in a coherent way to the whole of an assembly of machinery and/or partly completed machinery.	The requirement has been complied with.	P
	For cable-less control, an automatic stop must be activated when correct control signals are not received, including loss of communication.		N
1.2.2	Control devices		--
	Control devices must be:		--
	-clearly visible and identifiable, using pictograms where appropriate,	It has been complied with.	P

	- positioned in such a way as to be safely operated without hesitation or loss of time and without ambiguity,	Suitable position for each control device has been taken.	P
	-Designed so that the movement of the control is consistent with its effect	The movement of the control is consistent with its effect.	P
	- located outside the danger zones, except where necessary for certain control devices such as an emergency stop or a teach pendant,	They are located outside the danger zones.	P
	- Positioned so that their operation can't cause additional risk	Suitable position for each control device has been taken.	P
	-designed or protected in such a way that the desired effect, where a hazard is involved, can only be achieved by a deliberate action,		N
	-made in such a way as to withstand foreseeable forces; particular attention must be paid to emergency stop devices liable to be subjected to considerable forces.		P
	Where a control is designed and constructed to perform several different actions, namely where there is no one-to-one correspondence, the action to be performed must be clearly displayed and subject to confirmation where necessary.		N
	Controls devices 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	All control devices have been arranged adequately and taking account of ergonomic principles.	P
	Constraints due to the necessary foreseeable use of personal protection equipment must be taken into account		N
	Machinery must be fitted with indicators as required for safe operation		P
	The operator must be able to read them from the control position		P
	From each control position, the operator must be able to ensure that no-one is in the danger zones, or the control system must be designed and constructed in such a way that starting is prevented while someone is in the danger zone.	The operator can be able to ensure the no-one is in the danger zones from the control position.	P
	If neither of these possibilities is applicable, before the machinery starts, an acoustic and/or visual warning signal must be given. The		N

	exposed persons must have time to leave the danger zone or prevent the machinery starting up.		
	If necessary, means must be provided to ensure that the machinery can be controlled only from control positions located in one or more predetermined zones or locations.		P
	Where there is more than one control position, the control system must be designed in such a way that the use of one of them precludes the use of the others, except for stop controls and emergency stops.		N
	When machinery has two or more operating positions, each position must be provided with all the required control devices without the operators hindering or putting each other into a hazardous situation.		N
1.2.3	Starting		P
	It must be possible to start machinery only by voluntary actuation of a control provided for the purpose	These machines shall be started only by voluntary actuation of a control.	P
	The same requirement applies:		
	-When restarting the machinery after stoppage, whatever the cause		P
	- When effecting a significant change in the operating conditions		P
	However, the restarting of the machinery or a change in operating conditions may be effected by voluntary actuation of a device other than the control device provided for the purpose, on condition that this does not lead to a hazardous situation.		N
	For machinery functioning in automatic mode, the starting of the machinery, restarting after a stoppage, or a change in operating conditions may be possible without intervention, provided this does not lead to a hazardous situation.		N
	Where machinery has several starting control devices and the operators can therefore put each other in danger, additional devices must be fitted to rule out such risks. If safety requires that starting and/or stopping must be performed		N

	in a specific sequence, there must be devices which ensure that these operations are performed in the correct order.		
1.2.4	Stopping devices		P
1.2.4.1	Normal stopping		P
	Each machine must be fitted with a control whereby the machine can be brought safely to a complete stop	The normal stopping devices have been used for these machines.	P
	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	Workstation has fitted with a normal stopping device.	P
	The machinery's stop control must have priority over the start controls	They have priority over the start controls.	P
	Once the machinery or its dangerous parts have stopped, the energy supply to the actuators concerned must be cut off	The energy supply has been cut off after the machine is stopped.	P
1.2.4.2	Operational stop		--
	Where, for operational reasons, a stop control that does not cut off the energy supply to the actuators is required, the stop condition must be monitored and maintained.		P
1.2.4.3	Emergency stop		P
	machinery must be fitted with one or more emergency stop devices to enable actual or impending danger to be averted	The requirement has been complied with.	P
	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		N
	- Hand-held portable machines and hand-guided machines		N
	The emergency stop device must:		--
	- Have clearly identifiable, clearly visible and quickly accessible controls	The requirement has been complied with.	P
	-Stop the dangerous process as quickly as possible, without creating additional hazards	The requirement has been complied with.	P
	-Where necessary, trigger or permit the triggering of certain safeguard movements	No this kind of application	N
	Once active operation of the emergency stop		N

	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 be possible to disengage the device only by an appropriate operation, and disengaging the device must not restart the machinery but only permit restarting		N
	The emergency stop function must be available and operational at all times, regardless of the operating mode.		N
	Emergency stop devices must be a backup to other safeguarding measures and not a substitute for them.		N
1.2.4.4	Complex installations		P
	In the case of machinery or parts of machinery designed to work together, 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 can be dangerous		N
1.2.5	Mode Selection		P
	The control mode selected must override all other control systems with the exception of the emergency stop	These specified requirements have been complied with.	P
	If machinery has been designed and built to allow for its use in several control or operating modes presenting different safety levels, it must be fitted with a mode selector which can be locked in each position	Not applicable.	N
	Each position of the selector must correspond to a single operating or control mode	Each of them is corresponding to a single operating or control mode.	P
	The selector may be replaced by another selection method which restricts the use of certain functions of the machinery to certain categories of operator	No this kind of application.	N
	If, for certain operations, the machinery must be able to operate with its protection devices neutralized, the mode selector must simultaneously:		N



	-disable all other control or operating modes,		N
	-Permit movements only by controls requiring sustained action		N
	-Permit the operation of dangerous moving parts only in enhanced safety conditions while preventing hazards from linked sequences		N
	-Prevent any movement liable to pose a danger by acting voluntarily or involuntarily on the machine's internal sensors		N
	If these four conditions cannot be fulfilled simultaneously, the control or operating mode selector must activate other protective measures designed and constructed to ensure a safe intervention zone.		N
	In addition, the operator must be able to control operation of the parts he is working on at the adjustment point.		N
1.2.6	Failure of the power supply		P
	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	No risk is generated from these accidental situations.	P
	In particular:		--
	-The machinery must not start unexpectedly		P
	-the parameters of the machinery must not change in an uncontrolled way when such change can lead to hazardous situations,	the parameters of the machinery will not change in an uncontrolled way	P
	-The machinery must not be prevented from stopping if the command has already been given	This requirement has been complied with.	P
	- No moving part of the machinery or piece held by the machinery must fall or be ejected	This clause has been met.	P
	- Automatic or manual stopping of the moving parts whatever they must be unimpeded	This requirement has been complied with.	P
	- The protection devices must remain fully effective	All protection devices can remain effective fully.	P
1.2.7	Failure of the control circuit		P
1.2.8	Software		P
1.3	Protection against mechanical hazards	See below	P
1.3.1	Risk of loss of stability	Square construction and low center of gravity, no overturn, drop and movement	P

	Machinery, components and fittings thereof must be so designed and constructed that they are stable enough, under the foreseen operating conditions for use without risk of overturning, falling or unexpected movement	The stability of machines, components and fittings has been taken into consideration.	P
	If the shape of the machinery itself or its intended installation doesn't offer sufficient stability, appropriate means of anchorage must be incorporated and indicated in the instructions		N
1.3.2	Risk of break-up during Operation		P
	The various parts of machinery and their linkages must be able to withstand the stress to which they are subject when used as foreseen by the manufacturer	All parts used can withstand sufficient stress for working.	P
	The durability of the materials used must be adequate for the nature of the workplace foreseen by the manufacturer, in particular as regards the phenomena of fatigue, aging, corrosion and abrasion	All materials used have adequate durability.	P
	The manufacturer must indicate in the instructions the type and frequency of inspection and maintenance required for safety reasons, where appropriate, indicate the parts subject to wear and the criteria for replacement	This information in relation to inspection and maintenance etc. are indicated in the instruction manual.	P
	Where a risk of rupture or disintegration remains despite the measures taken the moving parts must be mounted and positioned in such a way that in case of rupture their fragments will be contained	No this kind of situation.	N
	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; precaution must be taken to ensure that no risk is posed by a rupture		N
	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:		--
	-When the work piece comes into contact with the tool the later must have attained its normal	This requirement has been complied with.	P

	working conditions		
	- When the tool starts and/or stops the feed movement and the tool movement must be coordinated	This requirement has been complied with.	P
1.3.3	Risks due to falling or ejected Objects	No object falling and ejecting	P
	Precautions must be taken to prevent risks from falling or ejected objects		N
1.3.4	Risks due to surfaces, edges or angles	Smooth surface and edges	P
	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	All parts have been processed carefully so that they have no sharp edges, no sharp angles, and no rough surfaces likely to cause injury.	P
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, 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		N
	For this purpose, it must be possible to start and stop separately and elements that are not protected		N
1.3.6	Risks relating to variations in the rotational speed of tools		--
	Where the machinery performs operations under different conditions of use, it must be designed and constructed in such a way that selection and adjustment of these conditions can be carried out safely and reliably		P
1.3.7	Prevention of risks related to moving parts		P
	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	Appropriate protective guards have been fitted to avoid hazards.	P
	All necessary steps must be taken to prevent accidental blockage of moving parts involved in the work		P
	In cases where, despite the precautions taken,		N

	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		
	The instructions and, where possible, a sign on the machinery shall identify these specific protective devices and how they are to be used.		N
1.3.8	Choice of protection against risks arising from moving parts	A nip warning symbol provided	P
	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	Guards or protection devices have been used appropriately.	P
	The following guidelines must be used to help make the choice		--
1.3.8.1	Moving transmission parts		
	Guards designed to protect exposed persons against the risks associated with moving transmission parts must be:		--
	-Either fixed, complying with requirements 1.4.1 and 1.4.2.1 or	The fixed guards are used.	P
	- interlocking movable guards as referred to in section 1.4.2.2.		N
	Interlocking movable guards should be used where frequent access is envisaged.		N
1.3.8.2	Moving parts involved in the process		--
	guards or protection devices designed to protect exposed persons against the risks associated with moving parts contributing to the work must be:		--
	- either fixed guards complying with requirements 1.4.1 and 1.4.2.1	fixed guards complying with requirements 1.4.1 and 1.4.2.1	P
	- interlocking movable guards as referred to in section 1.4.2.2, or		N
	- protective devices as referred to in section 1.4.3, or		N
	- a combination of the above.		N
	However, when certain moving parts directly involved in the process can't be made completely or partially inaccessible during operation owing to operations requiring near-by operator intervention, where technically		--

	possible such parts must be fitted with:		
	- fixed guards or interlocking movable guards preventing access to those sections of the parts that are not used in the work, and		N
	-adjustable guards as referred to in section 1.4.2.3 restricting access to those sections of the moving parts where access is necessary.		N
1.3.9	Risks of uncontrolled movements		--
	When a part of the machinery has been stopped, any drift away from the stopping position, for whatever reason other than action on the control devices, must be prevented or must be such that it does not present a hazard.	The requirement has been complied with.	P
1.4	Required characteristics of guard and protection devices		P
1.4.1	General requirements	Steel used	P
	Guards and protection devices must:		--
	-Be of robust construction	They are of robust construction.	P
	-be securely held in place,	be securely held in place,	P
	-Not give rise to any additional risk	No additional risk is generated.	P
	-Not be easy to bypass or render nonoperational	They cannot be easy to bypass or render non-operational.	P
	-Be located at an adequate distance from the danger zone	Appropriate safety distances according to EN ISO13857 has been complied with.	P
	-Cause minimum obstruction to the view of the production process	This requirement has been complied with.	P
	-enable essential work to be carried out on the installation and/or replacement of tools and for maintenance purposes by restricting access exclusively to the area where the work has to be done, if possible without the guard having to be removed or the protective device having to be disabled.		P
	In addition, guards must, where possible, protect against the ejection or falling of materials or objects and against emissions generated by the machinery.		N
1.4.2	Special requirements for guards		P
1.4.2.1	Fixed guards		P
	Fixed guards must be fixed by systems that can be opened or removed only with tools.		P

	Their fixing systems must remain attached to the guards or to the machinery when the guards are removed.		P
	Where possible, guards must be unable to remain in place without their fixings		P
1.4.2.2	Movable guards	Not provided	N
	Interlocking movable guards must:		
	-As far as possible remain fixed to the machinery when open		N
	-be designed and constructed in such a way that they can be adjusted only by means of an intentional action.		N
	Interlocking movable guards must be associated with an interlocking device that:		--
	-prevents the start of hazardous machinery functions until they are closed and		N
	-gives a stop command whenever they are no longer closed.		N
	Where it is possible for an operator to reach the danger zone before the risk due to the hazardous machinery functions has ceased, movable guards must be associated with a guard locking device in addition to an interlocking device that:		N
	-prevents the start of hazardous machinery functions until the guard is closed and locked, and		N
	-keeps the guard closed and locked until the risk of injury from the hazardous machinery functions has ceased.		N
	Interlocking movable guards must be designed in such a way that the absence or failure of one of their components prevents starting or stops the hazardous machinery functions.		N
1.4.2.3	Adjustable guards restricting access	Not provided	N
	Adjustable guards restricting access to those areas of the moving parts strictly necessary for the work must:		N
	- Be adjustable manually or automatically according to the type of work involved		N
	-Be readily adjustable without the use of tools		N
1.4.3	Special requirements for protection devices		N

	Protection devices must be designed and incorporated into the control system so that:		N
	- Moving parts can't start up while they are within the operator's reach		N
	-persons cannot reach moving parts while the parts are moving, and		N
	- The absence or failure of one of their components prevents starting or stops the moving parts		N
	Protective devices must be adjustable only by means of an intentional action.		N
1.5	Protection against other hazards	See below	P
1.5.1	Electricity supply	All electrical parts, protecting by enclosure and reinforced insulation construction, protective earthing used. Overcurrent, overvoltage, overload, overspeed, overtemperature, overvoltage and undervoltage protection provided by circuit breaker. No residual voltage hazard No electric shock hazard All connection comply with requirements, identification correct. The details pls see EN60204-1 safety report	P
	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		P
	The safety objectives set out in Directive 2006/95/EC shall apply to machinery. However, the obligations concerning conformity assessment and the placing on the market and/or putting into service of machinery with regard to electrical hazards are governed solely by this Directive.		P
1.5.2	Static electricity	Protective earthing circuits used	P
	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 discharging system	Adequate safety design for this requirement has been taken.	P

1.5.3	Energy supply other than electricity		N
	Where machinery is powered by an energy other than electricity, it must be so designed, constructed and equipped as to avoid all potential hazards associated with these types of energy		N
1.5.4	Errors of fitting	Machine design to avoid assembly Errors. machine assembly by manufacturer relevant identification and tag provided	P
	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 on moving parts and/or their housings where the direction of movement must be known to avoid a risk	Appropriate design has been taken during design and attention has been paid during fitting.	P
	Where necessary, the instructions must give further information on these risks.	Adequate instructions are given in the instruction manual.	P
	Where a faulty connection can be the source of risk, incorrect connections must be made impossible by design or, failing this, by information given on the elements to be connected and, where appropriate, on the means of connection.		P
1.5.5	Extreme temperature	No hazard	P
	Step 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		N
	The necessary steps must also be taken to avoid or protect against the risk of hot or very cold material being ejected.		N
1.5.6	Fire	No hazard	P
	Machinery must be designed and constructed to avoid all risk of fire or overheating posed by the machinery itself or by gases, liquids, dusts, vapors or the other substances produced or used by the machinery		N
1.5.7	Explosion		--
	Machinery must be designed and constructed to avoid any risk of explosion posed by the		N



	machinery itself or by gases, liquids, dusts, vapors or other substances produced or used by the machinery		
	Machinery must comply, as far as the risk of explosion due to its use in a potentially explosive atmosphere is concerned, with the provisions of the specific Community Directives.		N
1.5.8	Noise	No infective noise, comply with requirement <80dB	P
	Machinery must be so designed and constructed that risks resulting from the emission of airborne noise are reduced to the lowest level taking accounting of technical progress and the availability of means of reducing noise, in particular at source	Appropriate measure has been taken.	P
	The level of noise emission may be assessed with reference to comparative emission data for similar machinery.		N
1.5.9	Vibration	Shock-proof washer used	P
	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		N
	The level of vibration emission may be assessed with reference to comparative emission data for similar machinery.		N
1.5.10	Radiation	No hazard	P
	Undesirable radiation emissions from the machinery must be eliminated or be reduced to levels that do not have adverse effects on persons.	The requirement has been complied with.	P
	Any functional ionising radiation emissions must be limited to the lowest level which is sufficient for the proper functioning of the machinery during setting, operation and cleaning. Where a risk exists, the necessary protective measures must be taken.	No harmful emission of radiation has been found.	P
	Any functional non-ionising radiation emissions during setting, operation and cleaning must be limited to levels that do not have adverse effects on persons.	No harmful emission of radiation has been found.	N

1.5.11	External radiation		N
	Machinery must be so designed and constructed that external radiation doesn't interfere with its operation		N
1.5.12	Laser equipment		N
	Where laser equipment is used, the following provisions should be taken into account;		N
	-Laser equipment on machinery must be designed and constructed so as to prevent any accidental radiation		N
	-Laser equipment on machinery must be protected so that effective radiation, radiation produced by reflection or diffusion and secondary radiation don't damage health		N
	-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		N
1.5.13	Emission of dust, gases, etc.	No dust emission	N
	Machinery must be so designed, constructed and/or equipped that risks due to gases, liquids, dust, vapors and other waste materials which it produces can be avoided		N
	Where a hazard cannot be eliminated, the machinery must be so equipped that hazardous materials and substances can be contained, evacuated, precipitated by water spraying, filtered or treated by another equally effective method.		N
	Where the process is not totally enclosed during normal operation of the machinery, the devices for containment and/or evacuation must be situated in such a way as to have the maximum effect.		N
1.5.14	Risk of being trapped in a machine	Can't stand into machine	N
	Machinery must be so designed, constructed or fitted with a means of preventing a exposed person from being enclosed within it or, if that is impossible, with a means of summoning help		N
1.5.15	Risk of slipping, tripping or falling		N
	Parts of the machinery where persons are liable to move about or stand must be designed and		N

	constructed to prevent persons slipping, tripping or falling on or off these parts		
	Where appropriate, these parts must be fitted with handholds that are fixed relative to the user and that enable them to maintain their stability.		N
1.6	Maintenance		P
1.6.1	Machinery maintenance	Requirement in instruction Adjustment, lubricate and maintenance under disconnecting power and no hazard to person	P
	Adjustment and maintenance points must be located outside danger zones.	They are located outside danger zones.	P
	It must be possible to carry out adjustment, maintenance, repair, cleaning and servicing operations while machinery is at a standstill		P
	If one or more of the above conditions can't be satisfied for technical reasons, these operations must be possible without risk		N
	In the case of automated machinery and, where necessary, other machinery, the manufacturer must take provision for a connecting device for mounting diagnostic fault-finding equipment	The requirement has been complied with	P
	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	The relative components can be removed and replaced easily and in safety.	P
	Access to the components must enable these tasks to be carried out with the necessary technical means in accordance with an operating method specified by the manufacturer	Appropriate means have been given in the instruction manual.	P
1.6.2	Access to operating position and servicing points		P
	Machinery must be designed and constructed in such a way as to allow access in safety to all areas where intervention is necessary during operation, adjustment and maintenance of the machinery.	Appropriate protection measures have been taken so that all areas can be accessed safely.	P
1.6.3	Isolation of energy source	Power system provided by user Separated by single trunk cable	P

		system Connection and requirement in instruction	
	All machinery must be fitted with means to isolate it from all energy sources	Circuit breaker has been taken into used.	P
	Such isolators must be clearly identified		P
	They must be capable of being locked if reconnection could endanger exposed persons		N
	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		N
	In the case of machinery supplied with electricity through a plug capable of being plugged into a circuit, separation of the plug is sufficient		N
	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		P
	As an exception to the above requirements, certain circuits may remain connected to their energy source in order, for example, to hold parts, protect information, light interiors, etc. In this case, special steps must be taken to ensure operator safety		N
1.6.4	Operator intervention	Maintenance by skilled person.	P
	Machinery must be so designed, constructed and equipped that the need for operator intervention is limited		P
	If operator intervention can't be avoided, it must be possible to carry it out easily and in safety		P
1.6.5	Cleaning of internal parts	No dangerous residual object.	P
	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		P
	If it is absolutely impossible to avoid entering the machinery, the manufacturer must take steps during its construction to allow cleaning to take place safely.		P

1.7	INFORMATION	See below	P
1.7.1	Information and warnings on the machinery		N
	Information and warnings on the machinery should preferably be provided in the form of readily understandable symbols or pictograms.	Information and warnings are readily understandable pictograms.	P
	Any written or verbal information and warnings must be expressed in an official Community language or languages, which may be determined in accordance with the Treaty by the Member State in which the machinery is placed on the market and/or put into service and may be accompanied, on request, by versions in any other official Community language or languages understood by the operators.	The requirement has been complied with.	P
1.7.1.1	Information and information devices		
	The information needed to control machinery must be provided in a form that is unambiguous and easily understood. It must not be excessive to the extent of overloading the operator.		P
	Visual display units or any other interactive means of communication between the operator and the machine must be easily understood and easy to use.		N
1.7.1.2	Warning devices		--
	Where the health and safety of persons may be endangered by a fault in the operation of unsupervised machinery, the machinery must be equipped in such a way as to give an appropriate acoustic or light signal as a warning.	It has been complied with.	P
	Where machinery is equipped with warning devices these must be unambiguous and easily perceived. The operator must have facilities to check the operation of such warning devices at all times.		P
	The requirements of the specific Community Directives concerning colors and safety signals must be complied with	It has been complied with.	P
1.7.2	Warning of residual risks		--
	Where risks remain despite the inherent safe design measures, safeguarding and		P

	complementary protective measures adopted, the necessary warnings, including warning devices, must be provided.		
1.7.3	Marking		--
	All machinery must be marked legibly and indelibly with the following minimum particular:		--
	-the business name and full address of the manufacturer and, where applicable, his authorised representative,	It has been marked.	P
	- designation of the machinery,	It has been marked.	P
	-the CE Marking (see Annex III),	It has been marked.	P
	-designation of series or type,	It has been marked.	P
	-serial number, if any,	It has been marked.	P
	-the year of construction, that is the year in which the manufacturing process is completed.	This information has been provided.	P
	It is prohibited to pre-date or post-date the machinery when affixing the CE marking.	This information has been provided.	P
	Furthermore, machinery designed and constructed for use in a potentially explosive atmosphere must be marked accordingly.		N
	Machinery must also bear full information relevant to its type and essential for safe use. Such information is subject to the requirements set out in section 1.7.1.	The requirement has been complied with.	P
	Where a machine part must be handled during use with lifting equipment, its mass must be indicated legibly, indelibly and unambiguously.		P
1.7.4	Instructions		P
	All machinery must be accompanied by instructions in the official Community language or languages of the Member State in which it is placed on the market and/or put into service.	The language of the instructions is english.	P
	The instructions accompanying the machinery must be either 'Original instructions' or a 'Translation of the original instructions', in which case the translation must be accompanied by the original instructions.	It has been included in the instructions.	P
	By way of exception, the maintenance instructions intended for use by specialised personnel mandated by the manufacturer or his authorized representative may be supplied in only one Community language which the	It has been included in the instructions.	P

	specialised personnel understand.		
	The instructions must be drafted in accordance with the principles set out below.	It has been included in the instructions.	P
1.7.4.1	General principles for the drafting of instructions		P
	a) The instructions must be drafted in one or more official Community languages. The words 'Original instructions' must appear on the language version(s) verified by the manufacturer or his authorized representative.	In english.	P
	(b) Where no 'Original instructions' exist in the official language(s) of the country where the machinery is to be used, a translation into that/those language(s) must be provided by the manufacturer or his authorized representative or by the person bringing the machinery into the language area in question. The translations must bear the words 'Translation of the original instructions'.		P
	(c) The contents of the instructions must cover not only the intended use of the machinery but also take into account any reasonably foreseeable misuse thereof.	It is included in the instructions.	P
	(d) In the case of machinery intended for use by non-professional operators, the wording and layout of the instructions for use must take into account the level of general education and acumen that can reasonably be expected from such operators.		P
1.7.4.2	Contents of the instructions		--
	Each instruction manual must contain, where applicable, at least the following information:		--
	a) the business name and full address of the manufacturer and of his authorized representative;	it is included.	P
	b) the designation of the machinery as marked on the machinery itself, except for the serial number (see section 1.7.3);	it is included.	P
	(c) the EC declaration of conformity, or a document setting out the contents of the EC declaration of conformity, showing the particulars of the machinery, not necessarily including the serial number and the signature;	it is included.	P

	(d) a general description of the machinery;	it is included.	P
	(e) the drawings, diagrams, descriptions and explanations necessary for the use, maintenance and repair of the machinery and for checking its correct functioning;	it is included.	P
	(f) a description of the workstation(s) likely to be occupied by operators;	it is included.	P
	(g) a description of the intended use of the machinery;	it is included.	P
	(h) warnings concerning ways in which the machinery must not be used that experience has shown might occur;	it is included.	P
	(i) assembly, installation and connection instructions, including drawings, diagrams and the means of attachment and the designation of the chassis or installation on which the machinery is to be mounted;	it is included.	P
	(j) instructions relating to installation and assembly for reducing noise or vibration;	it is included.	P
	(k) instructions for the putting into service and use of the machinery and, if necessary, instructions for the training of operators;	it is included.	P
	(l) information about the residual risks that remain despite the inherent safe design measures, safeguarding and complementary protective measures adopted;	it is included.	P
	(m) instructions on the protective measures to be taken by the user, including, where appropriate, the personal protective equipment to be provided;		N
	(n) the essential characteristics of tools which may be fitted to the machinery;		P
	(o) the conditions in which the machinery meets the requirement of stability during use, transportation, assembly, dismantling when out of service, testing or foreseeable breakdowns;		P
	(p) instructions with a view to ensuring that transport, handling and storage operations can be made safely, giving the mass of the machinery and of its various parts where these are regularly to be transported separately;		P
	(q) the operating method to be followed in the		P



	event of accident or breakdown; if a blockage is likely to occur, the operating method to be followed so as to enable the equipment to be safely unblocked;		
	(r) the description of the adjustment and maintenance operations that should be carried out by the user and the preventive maintenance measures that should be observed;		P
	(s) instructions designed to enable adjustment and maintenance to be carried out safely, including the protective measures that should be taken during these operations;		P
	(t) the specifications of the spare parts to be used, when these affect the health and safety of operators;		P
	(u) the following information on airborne noise emissions:		--
	- Equivalent continuous A-weighted pressure level at workstations, where this exceeds 70 dB (A); where this level doesn't exceed 70 dB (A), this fact must be indicated		P
	-Peak C-weighted instantaneous sound pressure value at workstations, where this exceeds 63 Pa (130 dB in relation to 20 uPa)		N
	-Sound power level emitted by the machinery where the equivalent continuous A-weight sound pressure level at workstations exceeds 80 dB (A)		N
	These values must be either those actually measured for the machinery in question or those established on the basis of measurements taken for technically comparable machinery which is representative of the machinery to be produced.	The requirement has been complied with.	P
	In the case of very large machinery, instead of the A-weighted sound power level, the A-weighted emission sound pressure levels at specified positions around the machinery may be indicated.		N
	Where the harmonized standards are not applied, sound levels must be measured using the most appropriate method for the machinery		N
	Whenever sound emission values are indicated		P

	the uncertainties surrounding these values must be specified. The operating conditions of the machinery during measurement and the measuring methods used must be described.		
	Where the workstation(s) are undefined or cannot be defined, A-weighted sound pressure levels must be measured at a distance of 1 metre from the surface of the machinery and at a height of 1,6 metres from the floor or access platform.		P
	The position and value of the maximum sound pressure must be indicated		P
	Where specific Community Directives lay down other requirements for the measurement of sound pressure levels or sound power levels, those Directives must be applied and the corresponding provisions of this section shall not apply;		N
	(v) Where machinery is likely to emit nonionising radiation which may cause harm to persons, in particular persons with active or non-active implantable medical devices, information concerning the radiation emitted for the operator and exposed persons.		N
1.7.4.3	Sales literature		--
	Sales literature describing the machinery must not contradict the instructions as regards health and safety aspects. Sales literature describing the performance characteristics of machinery must contain the same information on emissions as is contained in the instructions.	The requirement has been complied with.	P
<b>2.</b>	<b>Essential Health and Safety Requirements for Certain Categories of Machinery</b>		<b>—</b>
<b>2.1</b>	<b>Agri-foodstuffs machinery</b>		N
2.1.1	General		N
	Machinery intended for use with foodstuffs or with cosmetics or pharmaceutical products		N
	must be designed and constructed in such a way as to avoid any risk of infection, sickness or contagion. The following requirements must be observed:		N
	(a) materials in contact with, or intended to		N

	come into contact with, foodstuffs or cosmetics or pharmaceutical products must satisfy the conditions set down in the relevant Directives. The machinery must be designed and constructed in such a way that these materials can be cleaned before each use. Where this is not possible disposable parts must be used;		
	(b) all surfaces in contact with foodstuffs or cosmetics or pharmaceutical products, other than surfaces of disposable parts, must:		N
	– be smooth and have neither ridges nor crevices which could harbour organic materials. The same applies to their joinings,		N
	– be designed and constructed in such a way as to reduce the projections, edges and recesses of assemblies to a minimum		N
	– be easily cleaned and disinfected, where necessary after removing easily dismantled parts; the inside surfaces must have curves with a radius sufficient to allow thorough cleaning;		N
	(c) it must be possible for liquids, gases and aerosols deriving from foodstuffs, cosmetics or pharmaceutical products as well as from cleaning, disinfecting and rinsing fluids to be completely discharged from the machinery (if possible, in a ‘cleaning’ position);		N
	(d) machinery must be designed and constructed in such a way as to prevent any substances or living creatures, in particular insects, from entering, or any organic matter from accumulating in areas that cannot be cleaned;		N
	(e) machinery must be designed and constructed in such a way that no ancillary substances hazardous to health, including the lubricants used, can come into contact with foodstuffs, cosmetics or pharmaceutical products. Where necessary, machinery must be designed and constructed in such a way that continuing compliance with this requirement can be checked.		N
2.1.2	Instructions		N

	The instructions for foodstuffs machinery and machinery for use with cosmetics or pharmaceutical products must indicate recommended products and methods for cleaning, disinfecting and rinsing, not only for easily accessible areas but also for areas to which access is impossible or inadvisable		N
2.2	<b>Portable hand-held and/or hand-guided machinery</b>	The machine is not a portable hand-held or hand-guided type	N
2.3	<b>Machinery for working wood and analogous materials</b>	The machine is not used in the wood working industry	N
3.	<b>Essential Health and Safety Requirements to Offset due to the Mobility of Machinery</b>		—
3.1	<b>General</b>	The machine is not intended for mobility application	N
3.1.1	Definition	Information only	N
3.1.2	Lighting		N
3.1.3	Design of machinery to facilitate its handling		N
3.2	<b>Work stations</b>		N
3.2.1	Driving position		N
3.2.2	Seating		N
3.2.3	Other places		N
3.3	<b>Controls</b>		N
3.3.1	Control devices		N
3.3.2	Starting/moving		N
3.3.3	Travelling function		N
3.3.4	Movement of pedestrian-controlled machinery		N
3.3.5	Control circuit failure		N
3.4	<b>Protection against mechanical hazards</b>		N
3.4.1	Uncontrolled movements		N
3.4.2	Risk of break-up during operation		N
3.4.3	Rollover		N
3.4.4	Falling objects		N
3.4.5	Means of access		N
3.4.6	Towing devices		N
3.4.7	Transmission of power between self-propelled machinery (or tractor) and recipient machinery		N
3.4.8	Moving transmission parts		N
3.5	Protection against other hazards		N
3.5.1	Batteries		N

3.5.2	Fire		N
3.5.3	Emissions of dust, gases, etc.		N
3.6	Indications		N
3.6.1	Signs and warning		N
3.6.2	Marking		N
3.6.3	Instruction handbook		N
4.	Essential Health and Safety Requirements to Offset the Particular Hazards due to a Lifting Operation		—
4.1	General remarks	The machine is not intended for any lifting operations	N
4.1.1	Definition	Information only	N
4.1.2	Protection against mechanical hazards		N
4.1.2.	Risk due to lack of stability		N
4.1.2.	Guide rails and rail tracks		N
4.1.2.	Mechanical strength		N
4.1.2.	Pulleys, drums, chains or ropes		N
4.1.2.	Separate lifting accessories		N
4.1.2.	Control of movements		N
4.1.2.	Handling of loads		N
4.1.2.	Lightning		N
4.2	Special requirements for machinery whose power source is other than manual effort		N
4.2.1	Controls		N
4.2.1.1	Driving position		N
4.2.1.2	Seating		N
4.2.1.3	Control devices		N
4.2.1.4	Loading control		N
4.2.2	Installation guided by cables		N
4.2.3	Risks to exposed persons. Means of access to driving position and intervention points		N
4.2.4	Fitness for purpose		N
4.3	Marking		N
4.3.1	Chains and ropes		N
4.3.2	Lifting accessories		N
4.3.3	Machinery		N
4.4	Instruction handbook		N
4.4.1	Lifting accessories		N
4.4.2	Machinery		N

5.	Essential Health and Safety Requirements for Machinery Intended for Underground Work		—
5.1	Risks due to lack of stability	The machine is not intended for underground work	N
5.2	Movement		N
5.3	Lighting		N
5.4	Control devices		N
5.5	Stopping		N
5.6	Fire		N
5.7	Emissions of dust, gases, etc.		N

**Part II: 2.2 Risk assessment**

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

S: Severity of possible harm

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

S : Severity of possible harm

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

A : Frequency any duration of exposure

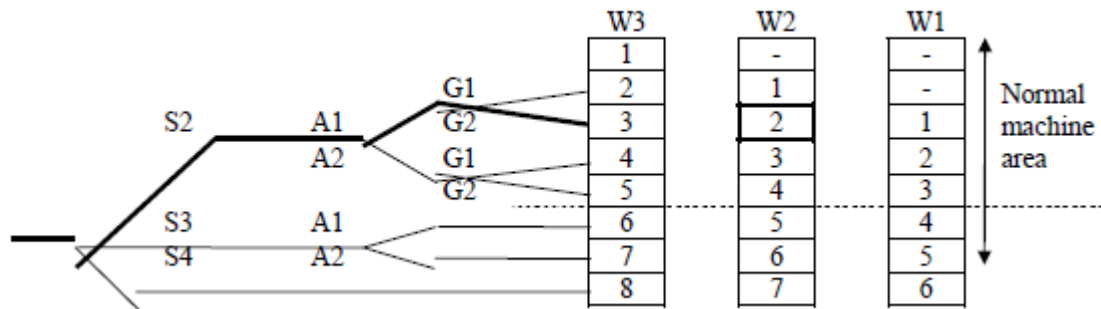
- A1 : Seldom to very often
- A2 : Frequent to continuous

G : Possibilities of avoidance

- G1 : Possible
- G2 : Impossible

W : Probability of occurrence of harm

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



## Solutions for the level of hazards

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

No.	Hazards source	S	A	G	W	Level
Mechanical hazards						
1.0-1	Mechanical hazards due to machine parts or work pieces	-	-	-	-	-
1.0-2	Mechanical hazards due to accumulation of energy inside the machinery	-	-	-	-	-
1.1	Crushing	-	-	-	-	-
1.2	Shearing	-	-	-	-	-
1.3	Cutting or severing	2	2	2	2	2
1.4	Entanglement	-	-	-	-	-
1.5	Drawing-in or trapping	2	1	1	2	1
1.6	Impact	-	-	-	-	-
1.7	Stabbing or puncture	-	-	-	-	-
1.8	Friction or abrasion	-	-	-	-	-
1.9	High pressure fluid injection or ejection	-	-	-	-	-
Electrical hazards						
2.1	Contact with live parts	1	1	1	1	-
2.2	Contact with parts which have become live under faulty conditions	1	1	1	1	-
2.3	Approach to live part under high voltage	-	-	-	-	-
2.4	Electrostatic phenomena	-	-	-	-	-
2.5	Thermal radiation or other phenomena such as projection of molten particles and chemical effects from short circuits, overloads etc.	-	-	-	-	-
Thermal hazards						
3.1	Burns, scalds and other injuries by a possible contact of persons with objects or materials with an extreme high or low temperature, by flames or explosions and also by the radiation of heat sources	-	-	-	-	-
3.2	Damage to health by hot or cold working environment	-	-	-	-	-
Hazards generated by noise						
4.1	Hearing loss	-	-	-	-	-
4.2	Interference with speech communication, acoustic signals, etc.	-	-	-	-	-
Hazards generated by vibration						
5.1	Use of hand held machines resulting in a variety of neurological and vascular disorder	-	-	-	-	-
5.2	Whole body vibration, particular when combined with poor postures	-	-	-	-	-
Hazards generated by radiation						
6.1	Low frequency, radio frequency radiation, microwaves	-	-	-	-	-



6.2	Infrared, visible and ultraviolet light	-	-	-	-	-
6.3	Lasers	-	-	-	-	-
6.4	X and gamma rays	-	-	-	-	-
6.5	Alpha, beta rays, electron or ion beams, neutrons	-	-	-	-	-
Hazards generated by materials and substances processed or used by the machinery						
7.1	Hazards from contact with or inhalation of harmful fluids, gases, mists, fumes and dusts	-	-	-	-	-
7.2	Fire and explosion hazard	-	-	-	-	-
7.3	Biological and microbiological (viral or bacterial) Hazards	-	-	-	-	-
Hazards generated by neglecting ergonomic principles in machine design						
8.1	Unhealthy postures or excessive effort	-	-	-	-	-
8.2	Inadequate consideration of hand-arm or foot-leg anatomy	-	-	-	-	-
8.3	Neglected use of personal protection equipment	-	-	-	-	-
8.4	Inadequate local lighting	-	-	-	-	-
8.5	Mental overload or underload, stress	-	-	-	-	-
8.6	Human error, human behavior	1	1	1	1	-
8.7	Inadequate design, location or identification of manual controls	-	-	-	-	-
8.8	Inadequate design, location or identification of manual controls	-	-	-	-	-
Combination of hazards						
9	Combination of hazards	-	-	-	-	-
Unexpected start-up, unexpected overrun/over-speed						
10.1	Failure/disorder of the control system	-	-	-	-	-
10.2	Restoration of energy on supply after an interruption	-	-	-	-	-
10.3	External influences on electrical equipment	-	-	-	-	-
10.4	Other external influences (gravity, wind, etc.)	-	-	-	-	-
10.5	Errors in the software	-	-	-	-	-
10.6	Error made by the operator (due to mismatch of machinery with human characteristics and abilities, see 8.6)	-	-	-	-	-
Impossibility of stopping the machine in the best possible conditions						
11	Impossibility of stopping the machine in the best possible conditions	-	-	-	-	-
Variations in the rotational speed of tools						
12	Variations in the rotational speed of tools	-	-	-	-	-
Failure of the power supply						
13	Failure of the power supply	-	-	-	-	-
Failure of the control circuit						
14	Failure of the control circuit	-	-	-	-	-
Errors of fitting						
15	Errors of fitting	-	-	-	-	-
Break-up during operation						
16	Break-up during operation	-	-	-	-	-
Falling or ejected objects or fluids						
17	Falling or ejected objects or fluids	-	-	-	-	-
Loss of stability / overturning of machinery						

18	Loss of stability / overturning of machinery	-	-	-	-	-
Slip, trip and fall of persons(related to machinery)						
19	Slip, trip and fall of persons(related to machinery)	-	-	-	-	-
Additional hazards, hazardous situations and hazardous events due to mobility						
20	Relating to the traveling function	-	-	-	-	-
20.1	Movement when starting the engine	-	-	-	-	-
20.2	Movement without a driver at the driving position	-	-	-	-	-
20.3	Movement without all parts in a safe position	-	-	-	-	-
20.4	Excessive speed of pedestrian controlled machinery	-	-	-	-	-
20.5	Excessive oscillations when moving	-	-	-	-	-
20.6	Insufficient ability of machinery to be slowed down, stopped and immobilised	-	-	-	-	-
Linked to the work position (including driving station) on the machine						
	21.1 Fall of persons during access to (or at/from) the work position	-	-	-	-	-
21.2	Exhaust gases/lack of oxygen at the work position	-	-	-	-	-
21.3	Fire (flammability of the cab, lack of extinguishing means)	-	-	-	-	-
21.4	Mechanical hazards at the work position: contact with the wheels; rollover; fall of objects, penetration by objects; break-up of parts rotation at high speed; contact of persons with machine parts or tools (pedestrian controlled machines)	-	-	-	-	-
21.5	Insufficient visibility form the work positions	-	-	-	-	-
21.6	Inadequate lighting	-	-	-	-	-
21.7	Inadequate seating	-	-	-	-	-
21.8	Noise at the work position	-	-	-	-	-
21.9	Vibration at the work position	-	-	-	-	-
21.10	Insufficient means for evacuation/emergency exit	-	-	-	-	-
Due to the control system						
22.1	Inadequate location of manual controls	-	-	-	-	-
22.2	Inadequate design of manual controls and their mode of operation	-	-	-	-	-
Form handling the machine (lack of stability)						
23	Form handling the machine (lack of stability)	-	-	-	-	-
Due to the power source and to the transmission of power						
24.1	Hazards form the engine and the batteries	-	-	-	-	-
24.2	Hazards form the transmission of power between machines	-	-	-	-	-
24.3	Hazards form coupling and towing	-	-	-	-	-
Form/to third persons						
25.1	Unauthorized start-up/use	1	1	1	1	-
25.2	Drift of a part away from its stopping position	-	-	-	-	-
25.3	Lack or inadequacy of visual or acoustic warning means	-	-	-	-	-
Insufficient instructions for the driver/operator						
26	Insufficient instructions for the driver/operator	1	1	1	1	-
Additional hazards, hazardous situations and hazardous events due to lifting						
27	Mechanical hazards and hazardous events	-	-	-	-	-
27.1	Form load falls, collisions, machine tipping caused by:	-	-	-	-	-

27.1.1	Lack of stability	-	-	-	-	-
27.1.2	Uncontrolled loading-overloading-overturning moments exceeded	-	-	-	-	-
27.1.3	Uncontrolled amplitude of movements	-	-	-	-	-
27.1.4	Unexpected/unintended movement of loads	-	-	-	-	-
27.1.5	Inadequate holding devices/accessories	-	-	-	-	-
27.1.6	Collision of more than one machine	-	-	-	-	-
27.2	Form access of persons to load support	-	-	-	-	-
27.3	Form derailment	-	-	-	-	-
27.4	Form insufficient mechanical strength of parts	-	-	-	-	-
27.5	Form inadequate selection of chains, ropes, lifting and accessories and their inadequate integration into the machine	-	-	-	-	-
27.6	Form inadequate selection of chains, ropes, lifting and accessories and their inadequate integration into the machine	-	-	-	-	-
27.7	Form lowering of the load under the control of friction brake	-	-	-	-	-
27.8	Form abnormal conditions of assembly/testing/use/maintenance	-	-	-	-	-
27.9	Form the effect of load on persons (impact by load or counterweight)	-	-	-	-	-
Electrical hazards						
28.1	Form lightning	-	-	-	-	-
Hazards generated by neglecting ergonomic principles						
29.1	Insufficient visibility from the driving position	-	-	-	-	-
Additional hazards, hazardous and situations and hazardous events due to underground work						
30	Mechanical hazards and hazardous events due to:	-	-	-	-	-
30.1	Lack of stability of powered roof supports	-	-	-	-	-
30.2	Failing accelerator or brake control of machinery running on rails	-	-	-	-	-
30.3	Failing or lack of dead man's control of machinery running on rails	-	-	-	-	-
31	Restricted movement of persons	-	-	-	-	-
32	Fire and explosion	-	-	-	-	-
33	Emission of dust, gases etc.	-	-	-	-	-
Additional hazards, hazardous situations and hazardous events due to the lifting or moving of persons						
34	Mechanical hazards and hazardous events due to:	-	-	-	-	-
34.1	Inadequate mechanical strength-inadequate working coefficients	-	-	-	-	-
34.2	Failing of loading control	-	-	-	-	-
34.3	Failing of controls in person carrier (function, priority)	-	-	-	-	-
34.4	Over speed of person carrier	-	-	-	-	-
35	Falling of person from person carrier	-	-	-	-	-
36	Falling or overturning of person carrier	-	-	-	-	-
37	Human error, human behavior	-	-	-	-	-

NO.	Hazards source	S	A	G	W	Level
1.5	Drawing-in or trapping	2	1	1	1	1

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

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

NO.	Hazards source	S	A	G	W	Level
8.6	Human error, human behavior	2	1	1	1	1
Where	<i>Whole machine</i>					
When	<i>Operation, adjustment or maintenance of the machine</i>					
Improvement result						
Improvement result	S	A	G	W	Level	
1 <i>Only authorized person can use the machine.</i>	1	1	1	1	-	

2 Training before using this machine.					
3 Make reference to the instruction manual before using this machine.					

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

NO.	Hazards source	S	A	G	W	Level
10.3	External influences on electrical equipment	1	1	1	1	1
Where	<i>All electrical equipment equipped on the machine</i>					
When	<i>Working of the electrical equipments</i>					
Improvement result						
Method		S	A	G	W	Level
1 All electrical equipments have been submitted to carry out the MEC testing according to relevant EN standards and get the CE E-mark.		1	1	1	1	-
2 Connection of protective earthing indeed.						
3 Excellent electrical shielded housing.						

NO.	Hazards source	S	A	G	W	Level
14	Failure of the control circuit	1	1	1	1	1
Where	<i>Control circuit/ control compenents</i>					
When	<i>During operation of the machine</i>					
Improvement result						
Method		S	A	G	W	Level
● <i>checking before operation</i>		1	1	1	1	-
● <i>make reference to the instruction manual before operate this machine.</i>						
● <i>Daily / periodie inspection and maintenance.</i>						

NO.	Hazards source	S	A	G	W	Level
25.1	Unauthorized start-up/use	1	1	1	1	1
Where	<i>Control system</i>					
When	<i>Operation. Adjustment or maintenance of the machine</i>					
Improvement result						
Method		S	A	G	W	Level
● <i>Always starting the machine by training/authorized persons.</i>		1	1	1	1	-
● <i>During adjustment or maintenance, put a warning nameplate near the working area.</i>						
● <i>Lock the power switch of the machine.</i>						

NO.	Hazards source	S	A	G	W	Level
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25.1	Insufficient instructions for the driver / operator	1	1	1	1	1
Where	<i>Whole machine</i>					
When	<i>Installation, assembly/disassembly, operation, adjustment or maintenance of the machine</i>					
Improvement result						
Method		S	A	G	W	Level
1. <i>Edit the instruction manual in conformity with those requirement of Machinery Directive and EN ISO 12100:2010 standard.</i>		1	1	1	1	-
2. <i>each machine accompanied with a complete instruction manual.</i>						

## Part III : Test report

## EN 60204-1 test report

4.	GENERAL REQUIREMENTS		
4.1	General considerations	See below	P
	Hazard and risk assessment		P
4.2	Electrical components/devices suitable for their intended use	Suitable for their intended use	P
	and conform to the relevant IEC or EN standards	(See appended table 4.2)	P
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 below	P
4.3.2	Supply Voltage :	380V~, comply with $\pm 10\%$ rated voltage	P
	Frequency :	50Hz, comply with $\pm 1\%$ rated frequency	P
	Harmonics :	Exceed evaluation scope	N
	Voltage unbalance :	Exceed evaluation scope	N
	Voltage interruption :	Exceed evaluation scope	N
	Voltage dips :	Exceed evaluation scope	N
4.3.3	DC Supplies Voltage :	AC power supply	N
	Voltage interruption		N
	Ripple (peak-peak) :		N
4.3.4	Onboard power supply acc. to cl. 4.3.2 and 4.3.3	Comply with clause 4.2	P
4.4	Physical environment and operating conditions		
4.4.1	Electrical equipment to be suitable for use in physical environment and operating conditions	Operation temperature 0~+50°C Operation humidity 20~95%	P
4.4.2	Electromagnetic compatibility (EMC)		
	Equipment not to generate electromagnetic disturbances above harmful levels: (applicable EMC-standard: EN 50081-2)		N
	Equipment has adequate level of immunity to EMC: (applicable EMC-standards: EN 50082-2)		N
4.4.3	Electrical equipment to be capable for correct operation at intended ambient air temperature	0 ~ +50°C	P
4.4.4	Electrical equipment to be capable for correct operation at specified relative humidity: at and	20% ~ 95%	P
4.4.5	Electrical equipment capable of operating correctly at altitudes up to 1000 m above m.s.l.	machine equipment used for less than 1000m altitudes	N

4.4.6	Electrical equipment shall be adequately protected against ingress of solid properties and liquids	For electrical equipment, IP22	P
4.4.7	Ionizing and non-ionizing radiation Electrical equipment subject to radiation, additional measures to be taken to avoid equipment malfunction	No ionizing and non-ionizing radiation outside this equipment	N
4.4.8	Undesirable effects of vibration, shock and bump avoided	The machine equip with cushion reduced vibration	P
4.5	Electrical equipment designed to withstand the effects of transportation and storage within a temperature range of -25 to +55 °C	-25 to +55 °C applied	P
4.6	Heavy or bulky electrical equipment of the machine provided with suitable means for handling	Wood package and transporting vehicle used	P
4.7	Electrical equipment installed and operated in accordance with the supplier's instruction	Skilled person for installing and See instruction	P
<b>5.</b>	<b>INCOMING SUPPLY CONDUCTOR TERMINATIONS AND DEVICES FOR DISCONNECTING AND SWITCHING OFF</b>		P
5.1	Incoming supply conductor terminal		P
	electrical equipment of a machine connected to a single power supply	Incoming supply conductor provided by user and detail specification refer to manual instruction	P
	power supply conductors terminated to main disconnecting device of electrical equipment	Circuit Breaker used	P
	neutral conductor "N" clearly indicated in technical documentation.	Labelled by Letter N	P
	no connection between neutral conductor and protective bonding circuit nor combined PEN-terminals.	No connection between neutral and protective bonding circuit	N
	All terminals of incoming supply clearly marked (symbols acc. to EN 60445)	All terminals marked correct label	P
5.2	Terminal for connection to external protective earthing system		
	Terminal for connection of external protective conductor provided and marked with "PE"	PE letter and grounding sign used	P
	Cross section of incoming PE conductor acc. to cl. 5.2, table 1	2.5mm <sup>2</sup> copper board applied	P
	Terminals allow connection of external protective earth conductors PE	Copper board used	P
	other protective earth identified either by graphic symbol, letters "PE", or bicolour combination green / yellow	Identified by graphic symbol Green/Yellow bicolour used	P
5.3	Supply disconnecting device		



5.3.1	Power supply disconnecting device provided for electrical equipment		N
5.3.2	The power supply disconnecting device shall be one of the following type:		
	a) Switch-disconnector, acc. to EN 60947-2 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)	circuit breaker	P
	d) Plug/socket combination for electrical load =3kW or 16A.		N
	e) plug and socket outlets or appliance couplers for flexible cable supply under following conditions:		
	- not possible to connect or disconnect while load is connected		N
	-wired such with equipment, that IP-Protection degree is at least IP2X or IPXXB		N
	plug/socket-outlet combination as supply disconnecting device have sufficient breaking capacity		N
	plug/socket-outlet combination as overload connecting device have sufficient overload capacity		N
	equipment has a switching device		N
5.3.3	When supply disconnecting device is a switch-disconnector or a circuit- breaker		P
	Isolate electrical equipment from supply(acc. to EN 60947-2)	circuit breaker	P
	One OFF (isolated) and one ON position only	By padlocks	P
	Clearly marked with "0" and "I"	Marked with "O" and "I" for used.	P
	CB's with additional reset position between "0" and "I"		N
	visible isolating distance or	Visible gap and position indicator for used.	P
	Position indication which cannot indicate the OFF-position until all contacts are actually open	Comply with requirement	P
	External operating device provided (except power operated CB's)		N
	Colour black or grey preferred.	Black or grey handle used	P
	If used as an emergency stop, red/yellow combination selected		N
	Locking means provided to lock in OFF-position	Lock Off-position applied	P

	In locked position an unintended closing for local or remote operation mode possible	Padlocks used and must be operated the device manually	P
	Disconnection of all live conductors (Exception: TN- supply systems, neutral conductor)	Single system used	P
	Sufficient breaking capacity	Enough breaking capacity	P
5.3.4	Handle of disconnecting device to be easily accessible	Easy to access	P
	Handle located between 0.6m and 1.9m above service level	The servicing height between 0.6m and 1.9m.	P

5.3.5	Following circuits not disconnect by supply disconnecting device:		
	Lighting circuits during maintenance or repair	Not such circuits	N
	Plug/socket outlets exclusively used for maintenance or repair		N
	Undervoltage protection circuits used for automatic tripping only at power supply failures		N
	Circuits of equipment to remain normally energised for satisfactory operation		N
	Control circuits for interlocking purposes		N
	Circuits which are not disconnected by supply disconnecting device:		
	Permanent warning labels placed in proximity of supply disconnectors		N
	Appropriate remark in maintenance manual		N
	Warning label in proximity of circuit concerned		N
	or wiring separated from other wiring		N
	Wiring of safety interlocking circuits installed with different colour of insulation.		N
5.4	Devices for switching off for prevention of unexpected start-up:		
	Means shall be provided to prevent inadvertent and / or mistaken closure of the disconnecting device	Circuit breaker used Off position locked for used and must be operated the device manually Device in 5.3 applied	P
	Such devices appropriate and convenient for intended use		P
	Suitable placed	Easy accessible	P
	Readily identifiable	Identification used	P
	Disconnecting devices acc. to cl. 5.3.2 used:	Comply with requirements	P
	Other disconnecting devices for the following situations only:		
	- no significant dismantling of the machine		N
	- adjustments requiring a relatively short time		N
	No work at the electrical equipment of the machine except:		

	- no hazard arising of electric shock or burn		N
	- switched-off status cannot be released due to maintenance work		N
	- work of minor nature		N
5.5	Devices provided for disconnecting electrical equipment	Device in 5.3 applied	P
	Supply-disconnecting device used	Circuit breaker used	P
	Disconnecting device provided for each separated part of the machine or partial machine where necessary		N
	Disconnectors, fuse links etc. used only in enclosed electrical operating areas	Used in operation areas	P
	Such disconnecting devices appropriate and convenient for intended use and	Appropriate and convenient for intended use	P
	Suitably located and	Location suitable	P
	readily identifiable to which part it serves and	Marking used	P
5.6	Provided with adequate means to prevent unauthorised, inadvertent and /or mistaken closing	Device in 5.3 applied Circuit breaker used By padlock	P
	Devices acc. to cl. 5.4 and 5.5 provided with locking means	Manually operate the device	P
	Locking means provided with device	Lock off-position applied	P
	Other means of protection against unintended energising used for non-lockable disconnecting devices (for electrical operating areas only)		N
	Locking device not necessary for plug/ socket outlet combinations, if located in a suitable manner and		N
	Under immediate supervision of the person carrying out the work	Easy access	P

<b>6</b>	<b>PROTECTION AGAINST ELECTRIC SHOCK</b>		<b>P</b>
6.2	Protection against direct contact:		
6.2.1	- by means of protection by enclosure	Enclosure used	P
	- by means of insulation of live parts	Insulation applied	P
	- by means of protection against residual voltages	Residual voltage less than 60V after 5s	P
6.2.2	Protection by enclosure:		

	Live parts located inside enclosures conform to relevant requirements of clauses 4, 11 and 15 Protection against direct contact at least IP2X or IPXXB	Protected by grounded metal enclosure, which only can be opened by using key and screwdriver. and IP22 used	P
	Where top surfaces of enclosures are readily accessible, degree of protection against direct contact is IP4X or IPXXD.	IP4X used	P
Opening of enclosure possible only under one of the following conditions:			
	a) use of a key or a tool. Special requirements for enclosed electrical operating areas may apply	The key used for door of electrical controlgear	P
	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
For skilled persons a special device provided, to defeat interlocking circuit under following conditions:			
Special device or tool provided to permit skilled persons to defeat the interlock provided that:			
	- opening of disconnecter possible at all times while interlock is defeated		N
	- upon closing the door, interlock is automatically restored		N
	If more than one door allows access to live parts, care must be taken, at implementation of this subclause		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		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	Completely covered	P
	insulation can be removed only by destruction	Only removed by destruction	P
	insulation capable to withstand mechanical, chemical, electrical and thermal stress occurring under normal service conditions	CE approved component	P
	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 are components with charges of = 60 $\mu$ C	Residual voltage less than 60V after 5s No residual voltage	P
	where pins of plugs or similar devices after withdrawal are exposed, discharge time = 1s		N
	such conductors protected against direct contact by at least IP2X or IPXXB		N
	if above requirements cannot be achieved, additional disconnecting devices or appropriate warning devices shall be applied. (see cl. 12.8.4)		N
6.2.5	Protection by barriers acc. to EN 60364-4-41 cl. 412.2		
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)		
	For collector wire- or bar systems, with protection less than IP2X, see cl. 12.8.1		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 60536)	Accessible Class II devices are used and enough gap	P
	use of switchgear and control gear assemblies with total insulation acc. to EN 60439-1	Compy with requirements	P

	application of supplementary or reinforced insulation acc. to EN 60364-4-41, 413.2	Enough gap used	P
6.3.2.3	Electrical separation of an individual circuit to prevent hazardous touch voltage acc. to EN 60364-4-41, cl. 413.5	Electrical clearance and creepage distance comply relevant requirements	P
6.3.2.4	Protection provided by use of a supply system, where its neutral point is either insulated or of high impedance to earth, so that an earth-fault will not produce a hazardous touch voltage	N point to earth have a 60M $\Omega$ insulation resistance	P
6.3.3	Protection by automatic disconnection of supply:		
	This protective measure comprise both:		
	Connection of all exposed conductive parts to protective earth bonding circuit	Connect the protective bonding circuit See Clause 8	P
	a) Use of protective device for automatic cut-off in the event of an insulation failure in a TN – or TT-system	Circuit breaker disconnected	P
	b) Use of earth fault detection device to initiate automatic disconnection in an IT-System.	Not used	N
	initiation of warning signal only in case of first occurrence of a fault permitted		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		P
	6VAC or 15VDC for all other cases		N
	b) one side of the 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 60742)		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:		N
	plugs shall not be able to enter socket outlets of other voltage systems		N
	socket outlets shall not admit plugs of other voltage systems		N

6.4.2	Sources for PELV- circuits to be one of the following:		
	safety isolating transformers		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 standards		N
<b>7</b>	<b>PROTECTION EQUIPMENT</b>		<b>P</b>
7.2	Overcurrent protection:		
7.2.1	Overcurrent protection device provided	Power supply circuit breaker have overcurrent protection function: General circuit-breakers and Branch circuit-breakers used. Fuse used.	P
7.2.2	Supply conductors		
	Overcurrent protective device at incoming feeder to the electrical equipment (see to cl. 7.2.10 and cl. 17.5)		N
	Electrical equipment supplier state data for overcurrent protective device	See instruction	N
7.2.3	Power circuits:		
	Overcurrent protective devices applied to each live conductors except for neutral earth conductor		P
	Cross section area of neutral conductor to be at least equal to phase conductor, no overcurrent protective/ disconnecting device required	Cross section area for neutral equal to other phase conductor No overcurrent for neutral conductor	P
	For neutral earth conductors with cross sections smaller than phase conductors, measures acc. to item b, cl 473.3.2.1 of IEC 60364-4-473 will apply		N
	For IT-systems use of neutral earth conductor (N) is not recommended. Nevertheless if an N-conductor is used, measures acc. to cl. 473.3.2.2 of IEC 60364-4-473 shall apply.		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	Branch circuit-breakers and Fuse used	P

	Control circuits fed via transformers of which one end of secondary winding is connected to PE circuit, will require overcurrent protective device only in the other secondary conductor		N
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		N
7.2.6	Lighting circuits:		
	All unearthed conductors of local lighting circuits protected by overcurrent protective devices		P
7.2.7	Transformers:		
	Transformers protected against overcurrent acc. to EN 60076-5 or EN 60742		N
	Avoid unnecessary tripping due to overcurrent caused by magnetizing 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 conductor is connected to the supply	located at point where conductor is connected to the supply	P
	Current carrying capacity of conductors at least equal to that required for electrical load	Comply with requirement	P
	Each connecting conductor to overcurrent protective devices not longer than 3 meters	No longer than 3 meters	P
	Conductor protected by enclosure or duct	By enclosure and duct	P
7.2.9	Overcurrent protective devices:		
	Rated short-circuit breaking capacity at least equal to prospective fault current at point of installation	Rated short-circuit breaking capacity of circuit breaker and fuse used complying with requirement	P
	Current other than those coming from supply side taken into account	complying with requirement	P
	Reduced breaking capacity is permitted, where another protective device is installed at supply side with the necessary breaking capacity		N



	Back-up protection carefully checked, no destruction of conductor or overcurrent protective device may result		N
	Co-ordination with other protective devices in circuit required		N
	Overcurrent protective devices in power circuits include fuses and circuit breakers. Electronic current limiting devices may also be used in protected circuits	circuit breaker and fuse used	P
7.2.10	Rating and setting of overcurrent protective devices:		
	Rated current of fuses or overcurrent setting of other protective devices selected as low as possible, but adequate for anticipated overcurrents.	See above	P
	Settings of overcurrent protective devices appropriately listed in technical documentation		N
7.3	Overload protection of motors:		
	Overload protection for all motors provided for ratings of > 0.5 kW in continuous operation.		P
	Protective device may be omitted for motors which cannot be overloaded		N
	Overload protection achieved by current sensing or limiting devices or temperature sensors.		P
	Current overload detection provided for each live conductor except for neutral conductor	Each live conductor use overload protection	P
	For motors supplied by single phase AC or DC power supply, current detection in one non-earthed live conductor only is permitted	Comply with requirement	P
	If overload protection is achieved by switching-off device, all live conductors cut from power supply except neutral conductor		P
	For special duty motors, appropriate protective devices are recommended		P
	For motors where cooling can be impaired, a built-in thermal protection is recommended		N
	Automatic restarting of motors prevented after operation of overload protective device, to avoid cause of a hazardous condition		P
7.4	Abnormal temperature protection:		
	Resistance heating or similar devices which cause excessive heat, equipped with suitable overtemperature detection		P
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	unexpected restarting prevented.	P
	If interruption or reduction of supply voltage is allowed for a short period of time, delayed undervoltage protection provided.		N
	Undervoltage protection not impair any stopping control of the machine	No hazard	P
	Upon restoration of supply voltage, automatic or unexpected restarting of machine prevented	unexpected restarting prevented.	P
	Undervoltage protection to initiate appropriate control responses to ensure co-ordination the groups of machines working together		N
7.6	Motor overspeed protection:		
	Overspeed protection provided where overspeeding causes a hazardous condition	unexpected restarting prevented.	P
	Overspeed protection initiates appropriate control response and prevents automatic restarting	unexpected restarting prevented.	P
7.7	Earth fault / residual current protection:		
	To reduce damage to equipment due to earth fault currents below detection level, earth fault/residual protect 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		P
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 supply disconnecting device		N
	Devices for suppression of overvoltages due to switching surges connected across terminals of all equipment requiring such protection		N
<b>8</b>	<b>EQUIPOTENTIAL BONDING</b>		P
8.2.1	General:		
	On mobile machines with on-board power supplies, protective circuits, exposed conductive parts connected to a protective bonding terminal	Copper used for protective bonding	P

	when mobile machines will be connected to an external incoming power supply, protective bonding terminal (PE) fixed to connecting point for the protective conductor.	PE font used	N
	All parts of protective bonding circuit capable to withstand max. thermal and mechanical stress, caused by earth-fault currents		N
	Any structural part of electrical equipment or of a machine used as part of protective bonding circuit		N
	When an IT distribution system is used, machine structure will be used as part of protective bonding circuit in conjunction with an earth fault supervision system.	No IT system used	N
8.2.2	Protective conductors:		
8.2.2	Identification and marking of protective conductors acc. to cl. 13.2.2	Comply with clause 13.2.2, PE marking used	P
	Copper conductors used as protective conductors	Copper used, 6mm <sup>2</sup> <35A 2.5 mm <sup>2</sup> <18.3A 0.75 mm <sup>2</sup> <7.6A	P
	Other conductor materials allowed, if cross section of such conductors is not less than 16 mm <sup>2</sup>		N
	Cross-sectional area of protective conductors determined acc. to IEC 60364-5-54, cl. 543 or EN 60439-1, cl. 7.4.3.1.7, table 4		N
	Relationship between cross-section area of phase conductor and PE acc. to table 1	PE used	P
8.2.3	Continuity of protective bonding circuit:		
	All exposed conductive parts of electrical equipment and machine(s) connected to protective bonding circuit.	Connect to protective bonding circuits	P
	In case of removal of parts of PE system, remaining parts not to be interrupted	All metal part are protective earth as double protection	P
	Current-carrying capacity of connections and bonding points not impaired by mechanical, chemical or electrochemical influences	Not impaired by mechanical, chemical or electrochemical influences	P
	Particular consideration should be given if enclosure consists of aluminium and its alloys	No aluminium and its alloys used	P
	Metal ducts and cable sheaths not used as protective conductors and not connected to protective bonding circuit	No metal ducts used	N

	If electrical equipment is mounted on lids, doors or cover plates, continuity of protective bonding circuit ensured	Whole metal frame use for protective bonding circuit. if one terminal removed, PBC still continue	P
	Continuity of protective conductor ensured at cables which are exposed to damage		N
8.2.4	Exclusions of switching devices from protective bonding circuit:		
	Protective bonding circuit not incorporate a switching-/overcurrent protective device nor a means for current detection	Protective bonding circuit have not been incorporated switching and overcurrent protective devices	P
	Interruption of protective conductors permitted by links, intended to be opened by instructed/skilled persons for test or measurement purposes by using a tool	Screw fixed protective bonding point	P
8.2.5	Equipment parts that need not to be connected to protective bonding circuit:		
	Parts which cannot be touched on large surfaces or grasped by hand due to its small size (less than approx. 50 x 50 mm), small parts such as screws, rivets, nameplates or	Small parts have not connected to PBC	P
	are located in such way, that either contact with live parts or an insulation failure is unlikely	No such live parts	N
8.2.6	Interruption of the protective bonding circuit:		
	PE- circuit shall not be interrupted prior to disconnection of live conductors by means of removable current collectors or plug/socket combinations and re-established prior to reconnection of live conductors	PE circuit have not been interrupted except for destructing	P
	Metallic housings of plug /socket combinations connected to the protective bonding circuit except where used for PELV circuits		N
	PE conductors connected to protective bonding circuit acc. to cl. 13.1.5		N
8.2.7	Protective conductor connecting points:		
	PE conductor connecting points have no other functions and not used for connection of appliances or other parts	Green/yellow have not been used, PE marking used	P
	Each PE connecting point identified by using the protective earth symbol	Protective earth symbol used	P
	Alternatively, terminals for connection of protective conductors identified by bicolour combination GREEN-YELLOW or letter PE	Protective earth symbol used	P

8.3	Equipotential bonding connections for functional reasons:		
8.3.2	Connecting of one side of control circuit fed by a transformer to PE-circuit.		N
	PE- connection located at source of control circuit supply		N
	Connection of control devices acc. to cl. 9.1.4		N
8.3.3	Bonding to a common reference potential:		
	Effects of disturbances reduced by using a conductor with low resistance at a low impedance network		N
	Terminals identified by symbol		N
	Bonding to a common reference potential other than PE- circuit allowed (requirements in cl. 6 and 7 fulfilled).		N
	Single point bonding connected close to PE terminal or to its own terminal. Identification by symbol		N
<b>9</b>	<b>CONTROL CIRCUITS AND CONTROL FUNCTIONS</b>		<b>P</b>
9.1.1	Control circuits supplied by transformers have separately isolated windings		P
	If several transformers used, secondary voltages in phase		N
	DC- control circuits connected to PE circuit supplied from a separate winding of the control circuit transformer or supplied from another control circuit transformer		N
	Transformers not mandatory for machines with a single motor starter and maximum of two control devices		N
9.1.2	Nominal voltage not exceed 277VAC when supplied from a transformer		P
9.1.3	Control circuits provided with overcurrent protection Section 7.2.4	Fuse used	P
9.1.4	Connection of control devices in control circuits with one side connected to PE circuit:		
	one terminal of each operating coil of an electromagnetically operated device or any other control device connected to PE circuit	One side connected to PE in control circuit	P
	switching elements of control devices that operate coils of it, connected between other terminal of coil or device and the non-earthed side of the control circuit		N
	Exceptions:		

	Contacts elements of protective devices may be connected between PE- side and coil of such control devices, providing they are in same enclosure and the connections to it are so short, that an earth fault is unlikely		N
	Requirements of cl. 9.4.3.1 are fulfilled		N
9.2	Control functions:		
9.2.1	Start function initiated by energising relevant starting circuit	Circuit breaker connected incoming supply + start switch open to start.	P
9.2.2	Stop functions:		
	Category 0: Stopping by immediate removal of power to machine actuators	Category 0 stop switch off or Circuit breaker disconnected incoming supply	P
	Category 1: A controlled stop with power available to machine actuators. Then removal of power when stop condition has been achieved.		N
	Category 2: A controlled stop with power left available to machine actuators		N
	With exception for actions in emergency situations and basing on a risk analysis, shut down of power supply can be realised by: Electromechanical devices or Solid state devices		N
9.2.3	Mode of operations of machines:		
	Hazardous condition, resulting from a mode selection, prevented by suitable means		P
	Mode selection does not start up the machine	Each mode setted can't start equipment	P
	Separate control action required by operator		N
	Safeguarding means to remain effective for all operating modes	Each mode operation independently.	P
	Indication of selected operating mode provided		P
9.2.4	If technical safeguard measures need to be suspended, a mode selection device be provided, capable to be secured in locked position to prevent automatic operation	Not applicable	N
	In addition, one or more of following safety means to be provided:		
	Initiation of a motion by means of a hold to run or similar control device		N

	Portable control station with an emergency stop device and an enabling control device		N
	Initiation of motion possible only from portable control station		N
	Limitation of speed or power of motion		N
	Limitation of range of motion		N
9.2.5	Operation:		
9.2.5.1	Necessary interlocking devices provided for safe operation		N
	Unintended movement of machine prevented after any stopping of machine	The key used for locking main circuit breaker	P
9.2.5.2	Start of operation possible only when all safeguards are functional, except for conditions stated in cl.9.2.4		P
	For machines where under certain operating conditions no safeguard devices can be applied, manual control of such operations by hold-to-run controls, together with enabling devices		N
	Suitable interlocks provided to secure correct sequential start	Enough secure correct sequential start	P
	On machines requiring the use of more than one control station to initiate a start:		
	Each control station has a separate, manually actuated start control device	Only one control station for each machines	N
	Separate control action required by operator		N
	Safeguarding means to remain effective for all operating modes		N
	Indication of selected operating mode provided		N
	All required conditions for automatic machine operation are fulfilled		N
	All start control devices in released position (OFF), before a start is permitted		N
	All start control devices simultaneously actuated		N
9.2.5.3	Stop functions of categories 0, 1 and/or 2 shall be provided, based on a risk-assessment and functional requirements of the machine	Category 0 stop switch off or Circuit breaker disconnected incoming supply	P
	Stop functions of categories 0 and 1 functionally independent of selected operating mode.		N
	Category 0 stop has priority over cat. 1 and 2	Category 0	P
	Stop functions have priority over start functions	Stop functions have priority over start functions	P
	Facilities provided for connection of protective devices / interlocks		N

	If such protective device/ interlock causes a machine stop, it may be necessary to send such condition to the logic of the control system (PLC)		P
	Resetting of stop function must not initiate any hazardous condition	No hazardous	P
9.2.5.4.2	Emergency stop has priority over all other functions and over all modes of operation	When emergency stop function starting, all power supply disconnected and other control function can not operate.	P
	Power to machine actuators that can cause hazardous condition(s) removed as quickly as possible without creating other hazards	When emergency stop function starting, all power supply disconnected and hazardous conditions removed	P
	Resetting must not initiate a restart	Comply with requirement	P
	Emergency stop acts either as stop of category 0 or as stop of category 1	Category 1 act used	P
	For determination of category of emergency stop, see risk assessment		P
	If a category 0 stop is used for emergency stop function, it have hard-wired electromechanical components	Category 1 used	P
	Operation must not depend on electronic logic control devices (hardware or software) or on transmission of stop commands via communications network or link		N
	Where a category 1 stop is used for an emergency stop function, final removal of power to machine actuators ensured by means of electromechanical components		N
9.2.5.4.3	Functional aspects of emergency switching-off function are given in IEC 60364-4-46 and should be provided where:		
	Protection against direct contact is achieved only by placing out of reach or by obstacles		N
	There is the possibility of other hazards or damage by electricity		N
	Emergency switching- off is accomplished by disconnecting incoming supply of the machine, effecting in a category 0 stop		N
	When a machine cannot tolerate a category 0 stop, other means of protection is to be provided so that emergency switching-off is not necessary		N
9.2.5.5	Monitoring of command actions:		



	Movement or action of a machine or parts of it, that can result in a hazardous condition be monitored	Flash light for alarm monitor Micro-switch used for door closed position	P
	On manually controlled machines, operators to provide some monitoring		N
	Conditions expected to be unreasonable for monitoring by the operator, require means to monitor such conditions		N
9.2.6.1	Hold-to-run controls (inching switches) require continuous actuation of control devices to achieve operation		P
9.2.6.2	Type of two-hand control:	Not two-hand control	N
	Type I:		
	Two control devices and their and their simultaneous actuation by both hands		N
	Continuous simultaneous actuation during the hazardous condition		N
	Machine operation to cease upon the release of either one or both control devices when the hazardous conditions are still present		N
	Type II:		
	Type I control, requiring release of both control devices before machine operation may be re-initiated		N
	Type III:		
	It shall be necessary to actuate the control de-vices within a certain time limit of each other, not exceeding 0.5 s		N
	After exceeding this time limit, both controls shall be released before an operation may be re-initiated		N
9.2.6.3	If an enabling device is part of the system, it shall be designed to allow motion when actuated in one position only		N
	In any other position motion shall be stopped		N
	It shall have following features:		
	Connected to a category 0 or to a cat. 1 stop		N
	Designed in consideration with ergonomic principles		N
	Requirements for a two-position type:		
	Position 1: OFF-function of switch (actuator is not operated)		N
	Position 2: enabling function (actuator is operated)		N

	Requirements for a three-position type:		
	Position 1: OFF-function of switch, (actuator is not operated)		N
	Position 2: enabling function of switch, (actuator is operated and in its mid position)		N
	Position 3: OFF-function of switch, (actuator is operated past its mid position)		N
	When returning from position 3 to 2, function not enabled		N
9.2.6.4	Push-buttons and similar control devices, that when operated, alternately initiate and stop motion use only for functions which cannot produce a hazardous condition		N
9.2.7	Cableless control	Not provided	N
9.2.7.1	Means provided to readily remove or disconnect power supply of operator control station		N
	Means provided as necessary to prevent unauthorised use of operator control station		N
	Each operator control station shall carry an unambiguous indication of which machine is intended to be controlled by that operator control station		N
9.2.7.2	Measures shall be taken to ensure that control commands:		
	Affect intended machine only and		N
	Affect intended functions only		N
	Measures taken to prevent machine from responding signals other than those from intended operator control station(s)		N
	If necessary, means shall be provided so that machine can be controlled only from operator control stations in one or more predetermined zones or locations		N
9.2.7.3	Operator control station include a separate, clearly identifiable mean to indicate stop function of machine or of all motions which could cause a hazardous condition		N
	Actuating means to indicate this stop function, not marked or labelled as emergency stop device		N
	A machine equipped with cableless control to have means automatically initiating a stop to prevent a hazardous operation for the following situations:		
	a stop signal is received		N
	a fault is detected in the system		N

	a valid signal has not been detected within a certain time, outside of range of cableless control, where no hazardous condition can occur (see annex B)		N
9.2.7.4	Where safety related functions rely on serial data transfer, correct data transfer ensured by applying an error detection method which can cope with up to 3 error bits in any command sequence		N
9.2.7.5	For machines with more than one operator control station, measures taken to ensure, that one control station only can be enabled at a given time		N
	Indication of which operator control station is in control of the machine, provided at suitable locations, as determined by risk assessment of the machine		N
	Exception: stop commands from any one of the control stations shall be effective		N
9.2.7.6	Variation in battery voltage not cause a hazardous condition		N
	Clear warning given to operator of battery powered control stations, if the are controlling one or more potentially hazardous motions when the battery voltage exceeds specified limits		N
	Under those circumstances, operator control station remain functional long enough to bring machine in a non-hazardous condition		N
9.3	Protective interlocks:		
9.3.1	Reclosing or resetting of an interlocking safeguard not to initiate a machine motion or operation which can produce a hazardous condition	The reclosing or resetting of all interlocking safeguard have not initiate other devices.	P
9.3.2	Where an overtravel causes a hazardous condition, a position sensor or limit switch provided, to initiate appropriate control action		P
9.3.3	Where non-operation of devices for auxiliary functions causes a hazardous condition, damage to the machine or to the process, appropriate interlocking be provided		N
9.3.4	Interlocks of contactors, relays, etc. between different operations and for opposite motions, interlocks against such incorrect operation provided		P
	Reversing contactors interlocked in such way, that in normal service no short circuit occurs during switching operation		P

	Where, for safety or for continuous operation, certain functions on the machine are required to be interrelated, proper co-ordination ensured by suitable interlocks		N
	For a group of machines working together in a co-ordinated manner and having more than one controller, provisions made for co-ordination of this controller		N
	If a failure of a mechanical brake actuator can result that the brake, is applied when the associated machine actuator is energised and a hazardous condition results, interlocks be provided to switch off the machine actuator		N
9.3.5	Reverse current breaking on a motor, effective measures taken to avoid motor starting in opposite direction at end of breaking where that reversal causes a hazardous condition, damage to the machine or to the process		P
	Control circuits arranged so, that rotation of a motor shaft, not to result in a hazardous condition		N
9.4	Control functions in the event of failure:		
	Measures to reduce those risks include but are not limited to:		
	protective devices on the machine, (e.g. interlocking guards, trip devices)	Flash light used in order to attract user to cut power supply.	P
	protective interlocking of electrical circuit	Not such components	N
	use of proven circuit techniques and components (see cl. 9.4.2.)	CE approved component used	P
	provision of partial or complete redundancy (see cl. 9.4.2.2) or diversity (see cl. 9.4.2.3)		P
	provision for functional tests (see cl. 9.4.2.4)	Comply with clause 18.6	P
	single failures only are to be considered	Single failure used	P
	for higher levels of risks, it may be necessary to ensure, that more than one failure cannot result in a hazardous condition	No hazard	P
9.4.2	Measures to reduce the risk in case of failure:		
9.4.2.1	bonding of control circuits to protective circuit for operational purposes (see cl. 9.4.3.1)	see cl. 9.4.3.1	P
	connection of control devices in accordance with cl. 9.1.4	See cl. 9.1.4	P
	stopping by de-energising (see cl. 9.2.2)	Comply with cl.9.2.2	P
	switching of all live conductors to device being controlled (see cl. 9.4.3.1)	All live conductors disconnected by main supply switch	P

	use of switching devices having positive (or direct) opening operation (see IEC 60947-5-1)	Comply with requirements	P
	circuit design to reduce possibility of failures causing undesirable operations	Comply with requirements	P
9.4.2.2	on-line redundancy for normal operation		N
	off-line redundancy for protective functions, effective only when operating function fails		N
	where off-line redundancy is use, suitable measures taken, to ensure that those control circuits are available when required		N
9.4.2.3	Use of control circuits having different principles of operation or using different types of devices may reduce faults and failures. Examples include:		
	Combination of normally open and normally closed contacts operated by interlocking guards	Not provided	N
	Use of different types of circuit components in control circuit		N
	Combination of electromechanical and electronic circuits in redundant configurations		N
	Combination of electrical and non-electrical systems (e.g. mechanical, hydraulic, pneumatic) may perform redundant functions and provide diversity		N
9.4.2.4	Automatic functional test carried out by the control system	Comply with clause 18.6	P
	Manual function tests by inspection	Comply with clause 18.6	P
	Tests at start-up and at predetermined intervals or as a	Comply with clause 18.6	P
	Combination as appropriate (see cl.17.2 and 18.6)	Comply with clause 18.6	P
9.4.3	Protection against mal-operation due to earth faults, voltage interruptions and loss of circuit continuity:		
9.4.3.1	Earth faults on any control circuit causes no unintentional starting, potentially hazardous motions or prevent stopping of machine	No such hazard	P
	For fulfilment of this requirement, bonding to PE-circuit provided and correct connection of devices ensured (see cl. 8.2 and cl 9.1.4)		P
	Control circuits fed from transformer and not connected to PE- circuit provided with an insulation monitoring device		N

	Multi-pole control switches which interrupt all live conductors use for START or STOP functions, which could cause hazardous condition or damage to the machine, in the event of unintentional starting or failure to stop.		N
9.4.3.2	If control system uses a memory device, proper functioning in the event of power failure ensured to prevent any loss of memory that could result in a hazardous condition		N
9.4.3.3	If loss of continuity of safety-related control circuits depending upon sliding contacts which could result in a hazardous condition, appropriate measures be taken	No sliding contact used	N
<b>10</b>	<b>OPERATOR INTERFACE AND MACHINE-MOUNTED CONTROL DEVICES</b>		P
10.1.1	Devices to be selected, mounted and identified or coded acc. to EN 60073 and EN 60447	Comply with requirements	P
10.1.2	Machine-mounted control devices readily accessible for service and maintenance and	Readily accessible for service and maintenance	P
	Mounted to minimise possibility of damage from activities such as material handling	Mounting style have been not influenced by material handling	P
	Actuators of hand-operated control devices selected and installed as follows:		
	Mounted not less than 0.6 m above servicing level, and within easy reach for operator (normal working position)		P
	Placed so that operator is not exposed to a hazardous situation when operating them	Not place in the hazardous position	P
	Possibility of inadvertent operation is minimised	No possible,see user manual	P
10.1.3	Degree of protection sufficient for expected use against:		
	Effects of aggressive liquids, vapours or gases in environment of machine		N
	Ingress of contaminants		N
	Operator interface control devices have a minimum degree of protection against direct contact of IPXXD	IP3x used	P
10.1.4	Position sensors arranged so, that they will not be damaged in the event of over travel	Not be damaged	P
	Position sensors use in circuits with safety-related functions either have positive opening operation or provide similar reliability	Comply with requirements	P

10.1.5	Portable or pendant operator control stations and control devices selected or arranged in such way as to minimise possibility of inadvertent machine operations caused by shocks and vibrations		N
10.2.1	Pushbutton actuators colour-coded acc. to table 2	Push button switch used	P
10.2.2	Recommendation that pushbuttons are preferably marked directly on actuator with symbols acc. to table 2		N
10.3.1	Colours for indication lights: RED, YELLOW, GREEN, BLUE Colours for confirmation: GREEN and WHITE	Flash light used Emergency –red Abnormal- yellow Normal -green	P
10.3.2	Unless otherwise agreed between supplier and user, indicator light lenses colour-coded with respect to status of machine acc. to table 3		N
	Alternative meanings may be assigned in accordance to following criteria:		
	safety of persons and environment		N
	state of electrical equipment		N
10.3.3	Flashing lights for further information may be used for following purposes:		P
	to attract attention or	Attract attention	P
	to request immediate action or	Request immediate action	P
	to indicate a discrepancy between command and actual state or	Comply with requirement	P
	to indicate a change in process (flashing during transition)	Comply with requirement	P
	higher frequency of flashing lights (pulse/pause ratios) recommended for higher priority of information	Higher frequency of flashing lights used	P
10.4	Illuminated push-button actuators colour-coded acc. to tables 2 and 3		N
	WHITE colour shall be use, if it is difficult in assigning an appropriate colour		N
	RED colour shall be use, for emergency stop actuators, not depending upon illumination conditions (ON /OFF status) only		N
10.5	Rotary control devices having a rotational member such as potentiometers and selector switches, mounted in such way as to prevent rotation of stationary member	Not cause position move	P
10.6	Start devices use to initiate start functions or movement of machine or elements designed and mounted such as to minimise inadvertent operation		N

	Mushroom - type actuators use for two-hand control devices	Not two-hand control devices	N
10.7	Devices for emergency stop:		
10.7.1	Devices for emergency stop readily accessible	See below	P
	Devices for emergency stop located at each operator control station and other locations where initiation of emergency stop is required (see cl. 9.2.7.3 for exception)	Comply with requirement	P
10.7.2	Types of devices for emergency stop include following elements:		
	push-button operated switch or	Knob actuator used	P
	pull-cord operated switch or		N
	pedal-operated switch without mechanical guard		N
	Devices be of self- latching type and contacts are of positive (or direct) opening operation	Self-latching type used	P
10.7.3	It is not possible to restore an emergency stop circuit, until the emergency stop device has been manually reset	Reset the emergency stop position by manual	P
10.7.4	Actuators of emergency stop devices are coloured RED	Red knob actuator used	P
	Background immediately around actuator is coloured YELLOW	Yellow background used	P
	Actuator of pushbutton operated emergency stop device shall be of palm- or mushroom head type	Mushroom head type used	P
10.7.5	Supply disconnecting device may be locally operated to serve as function of emergency stop when:		
	it is readily accessible to operator		N
	it is of type described in cl. 5.3.2 a), b) or c)		N
	Supply disconnecting device shall meet colour requirements of cl. 10.7.4		N
10.8	Devices for emergency switching off:		
10.8.1	Location of emergency switching-off devices normally placed separate from operator control station		N
	Operator control station equipped with separate emergency stop device, since function effects a category 0 emergency stop		N
10.8.2	Types of emergency switching-off devices include:		N
	Push-button operated switch or		N
	Pull-cord operated switch		N
	Devices of self-latching type and ensure positive (or direct) opening operation		N
	Push-button operated switch in break-glass enclosure		N



10.8.3	Not possible to restore an emergency switching-off circuit, until device have been manually reset		N
	Where several emergency switching-off devices are in a circuit, it is not possible to restore that circuit, until all emergency switching-off devices have been reset		N
10.8.4	Actuators of emergency switching-off devices are coloured RED		N
	Background immediately around actuator (push-button) coloured YELLOW		N
	Actuators of push-button operated emergency switching-off devices be of palm- or mushroom-head type		N
10.8.5	When supply disconnecting device is locally operated for emergency switching-off, it shall be readily accessible		N
	Supply disconnecting device locally operated for emergency switching-off, shall meet colour requirement acc. to cl. 10.8.4		N
10.9	Displays selected and installed in such manner as to be visible from normal position of operator		N
	If displays are used as warning devices, it is recommended, that are of flashing or rotary type equipped with audible warning device		N
<b>11</b>	<b>CONTROLGEAR: LOCATION, MOUNTING, AND ENCLOSURES</b>		P
11.1	All control gear located and mounted so, as to cover the following points: facilitate accessibility and maintain ability	All control gear located and mounted are facilitated accessibility and maintain ability	P
	facilitate protection against external influences or operating conditions under which operation is intended		P
	facilitate easy access for operation and maintenance of the machine and its associated equipment	Easy accessible	P
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	Components placed trimly on the plane	P
	Components checked for correct operation or possible replacement without dismantling other equipment or parts of the machine	Comply with requirement	P

	Terminals not associated with control gear also to conform to this requirement	Comply with requirement	P
	Operation and maintenance of all control gear possible from front of cabinet	From front of cabinet	P
	Special tools for removal of electronic devices provided with the equipment	Key used	P
	Access for regular maintenance or adjustment to equipment, relevant devices located between 0.4m to 2.0 m above servicing level	At least 0.4m provided	P
	Terminals located at least 0.2 m above servicing level and placed such, that conductors and cables can be easily connected	At least 0.2m above servicing level	P
	No devices mounted on doors, except those for operating, indicating, measuring and cooling purposes on normally removable access-covers of enclosure	No devices mounted on doors	P
	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)	No plug-in type control devices	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	No plug-in type control devices	N
	Plug/socket combinations, handled during normal operation, shall be located and mounted so as to provide unobstructed access		P
	If test points are provided, they should be:		
	mounted so as to provide unobstructed access		N
	clearly marked to correspond with the documentation (see cl. 17.3)		N
	adequately insulated		N
	sufficiently spaced for connection of test equipment or means		N
11.2.2	Non-electrical parts and devices, not directly associated with the electrical equipment, not located within enclosures containing control gear	Comply with requirements	P
	Devices such as solenoid valves separated from other electrical equipment	Not provided	N

	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	Main supply and control voltage are grouped separately	P
	Terminals separated into groups for: power circuits or	Terminals separated into: power circuits, control circuit, protective bonding	P
	associated control circuits or		P
	other control circuits, fed from external sources		N
	Terminal groups mounted adjacently, providing that each group is readily identified	Clear mark the identified	P
	When arranging the location of devices, clearances and creepage distances specified for them shall be maintained, taking into account external influences or physical conditions of its environment	Comply with clearances and creepage distance requirement.	P
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. External influences under which the equipment is intended to operate is to be taken into account and is to be	Enclosure and barriers used	P
	Its protection sufficient against dust, coolants and swarf	Comply with requirement	P
	Enclosures of control gear provide a degree of protection of at least IP22	Above IP22	P
	Exceptions:		
	a) Where an electrical operating area is use 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 use, and IP22 is not achieved but measures of cl. 6.2.5 are applied		N
11.4	Enclosures doors and openings:		
11.4	Enclosures to withstand mechanical, electrical and thermal stress as well as effects of humidity during normal service	Metal used	P
	Fasteners for doors or covers of captive type	Covers of captive type	P

	Windows for viewing internally mounted indicating devices, made of material suitable to withstand mechanical stress and chemical attack	No windows for view	P
	Doors of enclosure not wider than 0,9 meter	Steel door used not wider than 0,9 meter	P
	Doors with vertical hinges, preferably lift-off type		P
	Doors with opening angle of at least 95 °	>95°	P
	Gaskets of doors, lids, covers and enclosures withstand the chemical effects of aggressive liquids, vapours or gases use on the machine		N
	Means use 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		P
	not deteriorate due to removal or replacement of door or cover and so impair degree of protection	Comply with requirement	P
	all openings in enclosure closed by supplier(s), ensuring degree of protection specified for equipment	Comply with requirement	P
	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	Not impair required degree of protection Hole open to down	P
	If equipment could attain a surface temperature sufficient to cause a risk of fire during normal or abnormal operation:		
	located within an enclosure, that can withstand, without risk of fire or harmful effect, the heat emitted by the equipment or		N
	mounted and located at sufficient distance from adjacent equipment, so as to allow safe dissipation of heat or		N
	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 control gear:		

	Minimum dimensions of doors and corridors for access to electrical operating areas: at least 0.7 meter wide and 2.0 meter high	Not applicable	N
	Doors open outwards		N
	Doors equipped with means to allow opening from inside without the use of a key or tool		N
<b>12</b>	<b>CONDUCTORS AND CABLES</b>		
12.1	Conductors and cables selected so as to be suitable for operating conditions and external influences that are existing	Comply with requirement	P
	Requirements not applicable for integral wiring of assemblies, subassemblies and devices that are manufactured and tested acc. to their relevant standard	Conform to relevant IEC standards	P
12.2	Generally conductors shall be of copper	Copper used	P
	Conductors of other material shall have nominal cross-section area such that, carrying the same current, max. conductor temperature does not exceed values given in table 4		N
	If aluminium conductors are used, the min. cross-sectional area to be at least 16 mm <sup>2</sup>		N
	Max. permitted conductor temperatures under normal-/ short circuit conditions will not exceed values given in table 4	Normal temperature < 60°C	P
	All conductors which are subject to frequent movement to be of flexible stranded copper acc. to class 5 or class 6 (see table C.4 in annex C)	Class 1 and 2	N
12.3	Types of insulation include: Polyvinyl chloride (PVC)	PVC used	P
	Rubber, natural and synthetic		N
	Silicone rubber (SiR)		N
	Mineral		N
	Cross-linked Polyethylene (XLPE)		N
	Ethylene Propylene Rubber compound (EPR)		N
	Poly-Tetra-Fluor-Ethylene (PTFE)		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		N
	Special attention to integrity of a circuit having a safety-related function		N

	Dielectric strength of insulation adequate for required test voltage with a 5min. of 2000VAC for cables operating with voltages >50VAC or >120 VDC	After 2000VAC for a duration of 5 minutes, insulation not damage	P
	For separate PELV circuits, dielectric strength adequate for test voltage of 500VAC for a duration of 5 minutes	After 500VAC for a duration of 5 minutes, insulation not damage	P
	Mechanical strength and thickness of insulation such that, insulation cannot be damaged during cable laying or in operation	Comply with requirement	P
12.4	Cross-sectional area of a conductor to be such, that under stated conditions, conductor temperature does not exceed the values given in table 4	PVC used Normal temperature < 60°C	P
	Current-carrying capacities for PVC insulated wiring between enclosures and individual items of equipment under steady-state conditions according to values given in table 5	Copper used, 6mm <sup>2</sup> <35A 2.5 mm <sup>2</sup> <18.3A 0.75 mm <sup>2</sup> <7.6A	P
12.5	Voltage drop from point of supply to load not exceeding 5% of nominal voltage under normal operating conditions	Voltage drop < 5%	P
12.6	To ensure adequate mechanical strength, cross-sectional area of conductors not less than values given in table 6.	Copper used, 6mm <sup>2</sup> <35A 2.5 mm <sup>2</sup> <18.3A 0.75 mm <sup>2</sup> <7.6A	P
12.7.1	Flexible cables have cl. 5 or cl. 6 conductors (see table C.4)	Not applicalbe,user provide	N
	cables exposed to severe duties shall be of adequate construction to protect against:		
	abrasion due to mechanical handling and dragging across rough surfaces		N
	kinking to operation without cable guides		N
	stress resulting from guide rollers and forced guiding, being wound and re-wound on cable drums		N
12.7.2	Cable handling system of machine designed such, as to keep tensile stress of conductors as low as practicable during machine operation		N
	tensile stress for copper conductors not to exceed 15 N/mm <sup>2</sup> of copper cross section area		N
	where tensile stress of conductors is exceeding 15 N/mm <sup>2</sup> , cables of special design are use		N
	maximum stress for flexible cables agreed with the cable manufacturer		N

12.7.3	Cables wound on drums selected such, as the maximum allowable conductor temperature is not exceeded		N
	cables for circular cross-section area, installed on drums, max. current-carrying capacity in free air as declared acc. to table 7		N
12.8.1	Collector wires, collector 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	Comply with requirement	P
	protection by enclosure or barriers provide a degree of protection of at least IP2X	Protection by enclosure, at least IP22	P
	horizontal top surfaces of barriers or enclosures which are readily accessible provide a degree of protection of at least IP4X	IP4X used	P
	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		N
	collector wires and bars placed such and / or protected as to prevent contact, especially for unprotected wires and bars, with conductive items such as, cords of pull-cord switches, strain-relief devices and drive chains and		N
	prevent damage from a swinging load		N
12.8.2	Where collector wires, collector bars and slip-ring assemblies are installed as part of the PE-circuit, they do not carry current in normal operation	No current through PE circuit	P
12.8.3	Protective conductors of current collectors have a shape or are designed such, so that they are not interchangeable with other current collectors of the sliding contact type	No interchangeable	N
12.8.4	Removable current collectors with disconnecter 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 reconnected		N

12.8.5	Clearances between respective conductors and between adjacent systems of collector wires, bars, slip-ring assemblies and their current collectors designed for operation in pollution degree 3 conditions	Enough clearances Clearance distance >3.0mm Creepage distance >6.3mm	P
12.8.6	Creepage distances suitable for operation in pollution degree 3	pollution degree 3 used Clearance distance >3.0mm Creepage distance >6.3mm	P
In abnormally dusty, moist or corrosive environments, following creepage distances apply:			
	for unprotected collector wires, bars and slip-ring assemblies equipped with insulators, the minimum creepage distance is 60 mm		N
	for enclosed collector wires, insulated multipole collector bars and insulated individual collector bars, the minimum creepage distance is 30 mm		N
	gradual reduction of insulation values due to unfavourable ambient conditions regarded		N
12.8.7	Suitable design measures taken, in order to prevent energisation of adjacent sections by current collectors themselves		N
12.8.8	Collector wires, collector bar systems and slip-ring assemblies use for power circuits kept separately from those use for control circuit applications	Power circuits kept grouped separately from control circuit applicants	P
	above systems capable of withstanding without damage to mechanical forces and thermal effects of short circuit currents	Comply with requirements	P
	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		N
	collector bars which are installed in a common metal enclosure, the individual section of it bonded together and earthed at several points depending upon their length		N
	Metal covers of collector bars laid underground or under floor, bonded together end earthed		N
	Underground and under floor collector bar ducts have drainage facilities		N
<b>13</b>	<b>WIRING PRACTICES</b>		P
13.1.1	All connections, especially those of the protective bonding circuit, secured against accidental loosening	Terminal and bonding used for fixing	P



	Means of connection suitable for cross-sectional areas and nature of conductors being terminated	Comply with requirement	P
	For aluminium or aluminium alloy conductors, consideration given due to prevention of problems of electrolytic corrosion (see cl. 12.2)	Not aluminium or aluminium ally	N
	Connection of two or more conductors to one terminal only where terminal is designed for that purpose		N
	Only one PE-conductor connected to one terminal connecting point		N
	Soldered connections only, where terminals are provided which are suitable for soldering connections	No solderd used	N
	Terminals on terminal blocks plainly identified to correspond with markings on wiring diagrams	Marking intended for using	P
	Installation of flexible conduits and cables such, that liquids are drained away from fittings and joints	No liquids	N
	Means to retain stranded conductors together when terminating conductors at terminals/ devices provided		N
	Solder not use for that purpose		N
	Shielded conductors terminated so, as to prevent fraying of strands and to permit easy disconnection	No shielded conductors used	N
	Identification tags legible, permanent and appropriate for physical environment	Marking legible and permanent	P
	Terminal blocks mounted and wired so, that internal and external wiring does not cross over terminals	No cross	P
13.1.2	Conductors and cables runned from terminal to terminal without splices or joints	No splices or joints	P
	Where it is impracticable to provide terminals in a junction box, splices or joints may be use		N
	Where it is necessary to connect or disconnect cables, sufficient extra length provided for that purpose		N
	Terminations of cables adequately supported to prevent mechanical stress at termination points of conductors	Adequately supported	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	Conductor for different circuits laid side by side or occupy the same duct	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	Enough insulation provided	P
13.2	Identification of conductors:		
13.2.1	Conductors identifiable at each termination point acc. to technical documentation	Identification at each termination	P
	If colour coding of conductors applies, conductors coded over its full length, either by colouring of insulation or coloured markings	GREEN – AND – YELLOW used	P
	As an acceptable alternative, additional identification at selected locations use		N
	For safety reasons, colour GREEN or colour YELLOW not use where there is a possibility or confusion with the bicolour combination: GREEN – AND - YELLOW	Bicolour combination Green and Yellow used in protective earthing only	P
	GREEN or YELLOW as a single code must not be use, except in bicolour combination GREEN-AND-YELLOW		N
13.2.2	Protective conductor readily distinguishable by shape, location, marking or colour	See below	P
	Bicolour combination GREEN- AND- YELLOW use throughout the length of the conductor	Bicolour combination GREEN- AND- YELLOW used throughout the length of the conductor	P
	This colour identification is strictly reserved for the protective conductor, so that it can be easily identified by its shape	Bicolour combination GREEN- AND- YELLOW used throughout the length of the conductor	P
	Ends or accessible positions of a protective conductor clearly identified by graphical symbol or by bicolour combination GREEN- AND- YELLOW	Ends or accessible positions of a protective conductor clearly identified by graphical symbol	P
13.2.3	Where a circuit includes a neutral conductor identified by colour, the colour is LIGHT BLUE	Light-blue used	P
	LIGHT BLUE must not be use for identification of any other conductor where confusion is possible	Not aprovided	N
	Where bare conductors are use as neutral conductors and identification by colour is use, they either be coloured by LIGHT BLUE stripes, 15 to 100 mm wide in each compartment or unit, or at each accessible position		N

	Bare conductor colour coloured LIGHT BLUE over its full length	Over full length	P
13.2.4	Identification of other conductors by colour, number, alphanumeric or a combination of colour and numbers or alphanumeric	Alphanumeric used Black—ac and dc power circuits Red--- ac control circuits Navy-blue---dc control circuits	P
	When numbers are use, they are in Arabic writing ; letters are in Roman characters	Arabic writing are used	P
13.3	Panel wiring supported where necessary to keep it in place	Keep in place and modify from front door,and against flame	P
	Non-metallic ducts permitted only when they are of flame-retardant insulating material	Non-metallic ducts no used	N
	Electrical equipment mounted inside cabinets, designed to permit modification of wiring from front of cabinet (see cl. 11.2.1)	Modification of wiring from front of cabinet	P
	Where that is not possible, access, doors or swingout panels provided	Doors provided	P
	Connections to devices mounted on doors or to other movable parts made with flexible conductors (acc. to cl.12.2) to allow for frequent movement of those parts		N
	Conductors be anchored to the fixed part and the movable part, independently of the electrical connection		N
	Conductors and cables that do not run in ducts are adequately supported		N
	Terminal blocks or plug /socket combinations use for control wiring, that extends beyond the enclosure	Incoming supply conductor terminal blocks used	P
	Power cables and cables for measuring-circuits are directly connected to terminals of field located devices		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	Not applicable,and user provide	N
13.4.2	Conductors and their connections outside of the enclosure, are enclosed in suitable ducts as described in cl. 13.5		N

	Exempt from above requirements are suitably protected cables, installed without ducts and with or without use of open cable trays or cable supporting means		N
	Fittings use 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		N
	Weight of pendant stations is supported by other means than flexible conduits or flexible multicore cables		N
	Flexible conduits or flexible multicore cables use, for connections involving small or infrequent movements		N
	Flexible cables also permitted to complete the connection of normal stationary motors, position switches and other externally mounted devices		N
	Where prewired devices are supplied, the integral cables not enclosed in a duct		N
13.4.3	Connections to frequently moving elements of the machine, designed acc. to cl. 12.2		N
	Flexible cables and conduits installed so, as to avoid excessive flexing and straining, particularly at the fittings		N
	Cables exposed to movement supported in such way, as to prevent mechanical strain at connecting points		N
	If this is achieved by use of a loop, it has sufficient length to provide for a bending radius of at least 10 times the diameter of the cable		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:		N
	being runned over by the machine itself		N
	being runned over by vehicles or other machines		N
	coming into contact with the machine structure during movements		N
	running in and out of cable baskets or, on / off cable drums		N

	acceleration and wind forces on festoon systems or suspended cables		N
	excessive rubbing by cable collector		N
	exposure to excessive radiated heat		N
	Cable sheath resistant to normal wear expected from normal movement and effects of atmospheric contaminants		N
	Where cables are close to moving parts, space of at least 25mm maintained between moving parts and cables		N
	Where that distance is not practicable, fixed barriers provided between cables and moving parts		N
	Cable handling system designed such, that lateral cable angle does not exceed 5°, avoiding torsion at the cable when		N
	being wound on and off the cable drums and		N
	approaching and leaving cable guidance's		N
	measures taken to ensure that at least two turns of cable remain on the drum		N
	cable guides designed such, that the inner bending radius is not less than values given in table 8		N
	straight section between two bends at least 20 times the cable diameter		N
	construction and supporting means prevent damage to flexible cable under all operating conditions		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		N
	Intermediate terminals are adequately protected		N
	Intermediate terminals are indicated on the wiring diagram		N
	This enables easy access for testing purposes		N
13.4.5	Plug /socket combinations are of adequate size and have sufficient contact pressure plus a wiping action to ensure electrical continuity		N
	Clearances between contacts are adequate for the voltage levels use		N
	Plug/socket combinations of such type and installed in such way, as to prevent unintentional contact with live parts at any time		N

	Plug/socket combinations are designed so, that PE-circuit connection is made before any live connections are made.		N
	This applies vice versa when the plug/socket combinations are disconnected		N
	Plug /socket combinations rated for 63 A or above are of interlocked type with an appropriate switch		N
	Where more than one plug /socket combination is used for the same electrical equipment, it is clearly marked for identification		N
	Plug /socket combinations in accordance with IEC 60309-1 or of a type used for domestic applications shall not be used in control circuits		N
13.4.6	If wiring needs to be disconnected for shipment, terminals or plug/socket combinations are provided at the disconnecting points		N
13.4.7	Additional wiring for maintenance or repair purposes provided		N
13.5	Ducts, connection boxes and other boxes:		
13.5.1	Ducts provide a minimum degree of protection of IP33		N
	All sharp edges, flash, burrs, rough surfaces or threads which the insulation of conductors may come into contact, removed from ducts and conduits		N
	In order to avoid confusion between conduits for electrical installation and those for oil, water or air, either physically separated or suitably identified		N
	Ducts or cable trays rigidly supported and positioned at sufficient distance from moving parts		N
	Ducts or cable trays mounted at least 2 meters above the working surface in areas where human passage is required		N
	Ducts provided only for mechanical protection (see cl. 8.2.3)		N
	Cable trays which are partially covered, not to serve as cable trays or installation trunking	Full covered of cable trunking system provided	P
	Conductors and cables suitable for installation in cable trays	Cable trunking system provided	P
13.5.2	Cable trays dimensioned or located such, as to enable easy access for installation of additional conductors and cables	Cable trunking system provided for easy access installation	P

	Consideration given on percentage of filling of such ducts.	Suitable percentage of filling of such ducts	P
13.5.3	Rigid metal conduits or trays consist of galvanised steel or corrosion-resistant material, suitable for the environmental conditions.		N
	Application of cable trays of different metal avoided, due to electrolytic corrosion		N
	Installation conduits secured, held in place and supported at each end		N
	Joints and fittings compatible with conduits and appropriate for its application		N
	Conduit-bends fabricated such, as to avoid damage or reduction of internal cross-section		N
13.5.4	Flexible metallic conduits and fittings consist of flexible metal tubing or wire mesh armour.	Flexible metal tubing used for guarding cable	P
	They are suitable for its application and environmental conditions	Comply with requirements	P
13.5.5	Flexible non-metallic conduits are resistant to buckling and with similar characteristics as the sheath of multicore cables	Nonflexible tubing used for guarding cable	P
	They shall be suitable for its application and environmental conditions	Comply with requirements	P
	Joints and fittings compatible with conduits and appropriate for its application	Compatible used	P
13.5.6	Cable trunking systems outside of enclosures are rigidly supported and kept clear of moving and contaminating parts of the machine	Rigidly supported	P
	Covers of cable trunking designed such, as to overlap at both sides of cable trunking (see cl. 13.5.6)	Overlap at both sides of cable trunking	P
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)		N
13.5.8	Cable connection boxes and junction boxes use for wiring purposes are readily accessible for maintenance (see cl. 11.3)	When open door can accessible for maintenance	P
	They provide protection against ingress of solids or liquids, taking into account external influences during operation of the machine (see cl. 11.3)	Comply with requirements	P

	Junction boxes not have openings for cable entries and are designed so, as to avoid ingress of entrained dust, lubricants and coolant	Comply with requirements	P
13.5.9	Motor terminal boxes use for motor cable connection and for devices attached to the motor	Attached to the motor	P
<b>14.</b>	<b>ELECTRIC MOTORS AND ASSOCIATED EQUIPMENT</b>		P
14.1	Electric motors are conform to EN 60034-1	Conform to EN60034-1, (see appended table 4.2)	P
	Electric motors and associated equipment protected against following risks:		
	overcurrent (see cl. 7.2)	See cl. 7.2	P
	thermal overload (see cl. 7.3)	See cl. 7.3	P
	overspeed (see cl. 7.6)	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)	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	See cl. 11	P
14.2	Selection of motor enclosure recommended acc. to EN 60034-5	Conform to EN 60034-5	P
	Degree of protection at least IP23		P
	Incorporated motors mounted such, as to provide adequate protection against mechanical damage	Adequate mechanical protection	P
14.3	Dimensions of motors conform to those given in IEC regulations (see EN 60072-1 and EN 60072-2)		N
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		N
	Motors mounted such, as to allow easy access to all terminal boxes		N
	Motors mounted such, as to ensure proper cooling Temperature rise to be within limits of relevant insulation class		N
	Temperature rise within limits of relevant insulation class		N
	If possible, motor compartments stay clean and dry and when required, ventilated directly to the outside of the machine		N
	Motor-vents at an acceptable level and designed such, as to avoid ingress of swarf, dust or water spray		N



	No opening between motor compartment and any other compartment, which does not fulfil the requirement for motor compartments		N
14.5	Electric motors selected acc. to service and environmental conditions		N
	Design criteria for evaluation include: type of motor and		N
	type of duty cycle (see IEC 60034-1) and		N
	fixed speed or variable speed operation and		N
	mechanical vibrations and		N
	type of converter for motor speed control and		N
	influence of the harmonic spectrum of voltage and/or current when supplied from static converter on the temperature rise and		N
	method of starting and possible influence of inrush current		N
	variation of counter torque load with time and speed		N
	influence of loads with large inertia and		N
	influence of constant torque or constant power operation and		N
	possible need of inductive reactors between motor and converter		N
14.6	Operation of overload or overcurrent protective devices for mechanical brake-actuators initiate simultaneous de-energisation(release) of associated machine actuators		N

<b>15.</b>	<b>ACCESSORIES AND LIGHTING</b>		<b>P</b>
	No accessories and lighting		
15.1	Where the machine or its associated equipment is provided with socket-outlets for auxiliary equipment, the following will apply:		
	socket-outlets are conform to regulations		N
	if not possible, they are clearly marked with voltage and current ratings		N
	continuity of protective bonding circuit to be ensured		N
	all unearthed conductors connected to socket-outlets, protected against overcurrent		N
	when required, protection against overload in accordance with cl. 7.2 and cl. 7.3 separately from protection of other circuits		N

	if power supply to socket-outlets is not disconnected, than requirements of cl.5.3.5 apply		N
15.2.1	Connection to PE-circuit acc. to cl. 8.2.2		N
	ON-OFF switch not incorporated in lampholder or in flexible connecting cord		N
	Stroboscopic effects from lights avoided		N
	If fixed lighting is provided in an enclosure, electromagnetic compatibility (EMC) taken into account		N
	Application of EMC requirements acc. to principles stated in cl. 4.4.2		N
15.2.2	Nominal voltage of local lighting circuits not exceeding 50 V		N
	If higher voltages are applied, value not exceeding 250 V between conductors		N
	Lighting circuits supplied from one of the following sources:		
	from a dedicated isolating transformer connected to load side or		N
	overcurrent protection provided in secondary circuit or		N
	a dedicated isolating transformer connected to line side provided or		N
	source permitted for maintenance purpose or		N
	lighting circuits placed in control enclosures only or		N
	overcurrent protection provided in secondary circuit or		N
	from a machine-circuit with dedicated overcurrent protection or		P
	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		N
	for an externally supplied lighting circuit, which is only permitted in a control enclosures		N
	where fixed lighting is out of reach for operator during normal operations, provisions of this subclause do not apply		N
15.2.3	local lighting circuits protected		N
15.2.4	adjustable lighting fittings suitable for the physical environment provided		P

	lampholders in accordance with relevant IEC-publications and		N
	designed of an insulating material protecting the lamp cap, as to prevent unintentional contact		N
	reflectors supported by a bracket and not by the lampholder		N
	where fixed lighting is out of reach for operator during normal operations, provisions of this subclause do not apply		N
<b>16.</b>	<b>MARKING, WARNING SIGNS AND REFERENCE DESIGNATIONS</b>		
16.1	Electrical equipment marked with supplier's name, trade mark or other identifying symbol and if required with a certification mark	See label	P
	Warning signs, nameplates, markings- and identification plates of sufficient durability to withstand the physical environment involved	Metal label used	P
16.2	Enclosures which do not clearly show otherwise, that they contain electrical devices, are marked with a black lightning flash on a yellow background within a black triangle	A black lightning flash on a yellow background within a black triangle used on front door	P
	Warning sign plainly visible on the enclosure, door or cover-plate	Enclosure, door, or cover-plate used	P
	The warning sign may be omitted for:		
	an enclosures equipped with a supply disconnecting device or		N
	an operator - machine interface or for a control-station or		N
	a single device with its own enclosure		N
16.3	Control devices, visual indicators and displays use for man - machine interfaces clearly and durably marked with regard to their functions either on, or adjacent to it	Marking clear and durable	P
	such markings as agreed between user and supplier		N
	preference given to the use of standard symbols	According to standard	P
16.4	Control equipment legibly and durably marked so that it is plainly visible after equipment installation	On control equipments, marking legible and durable	P
	Nameplates attached to enclosures shall contain the following information:		
	name or trade mark of supplier and	(See appended table 4.2)	P
	certification mark, when required and	CE mark used	P
	serial number, where applicable and		P
	rated voltage and	(See appended table 4.2)	P

	number of phases and	(See appended table 4.2)	P
	frequency (if AC) and	(See appended table 4.2)	P
	full-load current for each supply	(See appended table 4.2)	P
	short-circuit interrupting capacity of overcurrent protective device, where furnished as part of device of equipment	See circuit diagram	P
	electrical wiring diagram number(s) or number of index to electrical drawings	See circuit diagram	P
	Full-load current shown on nameplate not less than combined full-load currents of all motors and other electrical loads, that are in operation at the same time under normal conditions of use		N
	for unusual loads or duty cycles, thermal equivalent current included in full-load current, specified on the nameplate		N
	if a single motor controller is use, that information provided instead, on the machine nameplate		N
16.5	All enclosures, assemblies, control devices and components plainly identified with the same reference designation as shown in technical documentation	See circuit diagram	P
	All enclosures, assemblies, control devices and components in accordance with IEC 61346-1	Comply with requirements	P
	where size or location precludes the use of an individual reference designation, the group reference designation is use		N
	Requirements of above subclause not applicable to machines, on which the equipment comprises a single motor, motor-controller, pushbutton-station(s) and working light(s) only		N
<b>17</b>	<b>TECHNICAL DOCUMENTATION</b>		P
17.1	Information necessary for installation, operation and maintenance of electrical equipment for a machine supplied by means of drawings, wiring diagrams, charts, tables and instruction manuals	See instruction	P
	Information provided in an agreed language	English	
	Equipment supplier make sure, that documentation referred to under cl.17 will be provided with each supplied machine	See instruction	P
17.2	Information provided with electrical equipment shall include:		

	a) A clear, comprehensive description of the equipment, installation and mounting instructions and information regarding connection to the electrical supply(ies)	See instruction	P
	b) Electrical supply requirements	See instruction	P
	c) Information about the physical environment	See instruction	
	d) Overview (block) diagram(s)	See instruction	P
	e) Circuit / wiring diagram(s)	See instruction	P
	f) information about:		
	1) Software program documentation/ listing	See instruction	P
	2) Sequence of operation(s)	See instruction	P
	3) Frequency of inspection	See instruction	P
	4) Frequency and method of functional testing	See instruction	P
	5) Guidance on the adjustment, maintenance and repair, particularly of the protective devices and circuits	See instruction	P
	6) Parts list and recommended spare	See instruction	P
	g) Description of safeguards, interlocking functions and interlocking of separating safeguards for dangerous movements of co-ordinated operating machines	See instruction	P
	h) Description of safeguards and means provided for applications with to suspend the safeguards	See instruction	P
17.3	Documents prepared in accordance with requirements of cl.17.4 to cl.17.10 and relevant parts of EN 61082	See instruction	P
	Reference designation system to be in accordance with EN 61346-1	See instruction	P
	For referencing to different documents, the supplier has to select one of following methods:		
	Each of the documents carry a cross-reference with document numbers of all other documents belonging to the electrical equipment or		N
	All documents to be listed with document numbers and titles in a drawing or document list		N
	The first method use only where the documentation consists of a small number of documents		N
17.4	Technical documentation contains as a minimum, information on the following:		

	Normal operating conditions of electrical equipment incl. expected conditions of electrical supply and where appropriate about the physical environment	See instruction	P
	Handling, transportation or storage requirements	See instruction	P
	Inappropriate use(s) of the equipment	See instruction	P
	That information presented as a separate document or as part of the installation or operation documentation	See instruction	P
	Documentation also contains information regarding load currents, peak starting currents and permitted voltage drops	See instruction	P
	Above information included either in the system- or circuit-diagram(s)	See instruction	P
17.5	The installation diagram provides all necessary information regarding preliminary work for the setting-up of the machine	See installation diagram	P
	In complex cases, it is necessary to refer to the assembly drawings for details	See installation diagram	P
	Recommended routing, type and cross-sectional areas for the conductors of the supply cables installed on site clearly indicated	See installation diagram	P
	Necessary data or choosing type, characteristics, rated currents and setting for the overcurrent protective devices for the supply conductors stated (see cl. 7.2.2)	See installation diagram	P
	Detailed information provided about size, purpose and location of any cable ducts within the foundation, that are provided by the user	See installation diagram	P
	Detailed information provided about size, type and purpose of cable ducts, trays or supports between machine and associated equipment	See installation diagram	P
	Diagram to indicate where space is required for removal or servicing of electrical equipment	See installation diagram	P
	Where appropriate, an interconnection diagram or table provided	See installation diagram	P
17.6	Where necessary a block diagram provided for explanation of the principle of operation	See block diagram	P
	Block diagram symbolically represents the electrical equipment with its functional interrelationships without showing all the interconnections	See block diagram	P

	The function diagram use as either part of or addition to the block diagram	See block diagram	P
17.7	Circuit diagrams show the electrical circuits on the machine and its associated electrical equipment	See circuit diagram	P
	Any graphical symbol not shown in EN 60617 and EN 60417-1 must be separately shown and described on the wiring diagrams or supporting documents	See circuit diagram	P
	The symbols and identification of components consistent throughout all documents and on the machine	See circuit diagram	P
	Where appropriate, a diagram provided, showing the interface terminals and connections	See circuit diagram	P
	The diagram shows a reference to the detailed circuit diagram of each unit	See circuit diagram	P
	Switch symbols shown on the circuit diagrams with all supplies turned off and with the machine and its electrical equipment in normal starting condition	See circuit diagram	P
	Conductors identified acc. to cl.13.2	See circuit diagram	P
	Characteristics relating to the function of the control device and components which are not evident from their symbolic representation, included on the diagrams adjacent to the symbol or referenced to a footnote	See circuit diagram	P
17.8	Technical documentation containing an operating manual, outlining proper procedures for set-up and use of equipment	See instruction	P
	Particular attention given to safety measures provided and the improper methods of operation, that are anticipated	See instruction	P
	Detailed information provided on methods for equipment programming, program verification and additional safety procedures	See instruction	P
17.9	Technical documentation to contain a maintenance manual, detailing proper procedures for adjustment, servicing or preventive inspection and repair	See maintenance instruction	P
	Recommendations regarding maintenance or service records are part of it	See maintenance instruction	P
	Methods for the verification of proper operation provided	See maintenance instruction	P

17.10	The spare parts list comprises as a minimum information for ordering of spares or replacement of parts which are required for preventive or corrective maintenance and recommended spares	See list of critical components	P
	The spare parts list has to provide for each item the following information:		
	reference designation use in documentation and	See list of critical components	P
	type designation and	See list of critical components	P
	supplier and alternative sources where available and	See list of critical components	P
	general characteristics where appropriate	See list of critical components	P
<b>18</b>	<b>TESTING AND VERIFICATION</b>		P
18.1	Verification, that electrical equipment is in compliance with the technical documentation	See below	P
	The relevant tests for the particular machine type will be given in the dedicated product standard		N
	In case of absence of such product standards, the appropriate tests include the ones listed under cl. 18.2 – 18.6	See below	P
18.2	After completion of installation and electrical connection, continuity of the PE- circuit verified by a loop impedance test	(See appended table 18.2)	P
	For small or pre-manufactured machines or parts of it, with protective bonding loops not exceeding approx. 30 meters, and where the machine cannot be connected to the power supply for loop impedance tests, following method is appropriate:		
	Verify continuity of the PE-circuit by injecting a current of =10 A with 50Hz or 60Hz supply, derived from a PELV source	10A current, 50Hz applied	P
	Test made between PE- terminal and relevant points of PE-circuit (see cl. 5.2)	Incoming PE an relevant points of PE	P
	Measured voltage between PE-terminal and points of test not exceed values given in table 9	Not exceeding the values in table 9	P
18.3	Insulation resistance measured with 500VDC between power circuit conductors and PE-circuit is to be =1.0 M $\Omega$	(See appended table 18.3)	P
	Insulation value must be = 1.0 M $\Omega$	(See appended table 18.3)	P
	Test made on individual sections of complete electrical installation	(See appended table 18.3)	P
	For certain parts of the electrical equipment, a lower minimum insulation value is permitted, but not less than 50 k $\Omega$		N



18.4	Electrical equipment withstand a test voltage applied for a period of at least 1 second between live conductors of all circuits and the PE-circuit	(See appended table 18.4)	P
	Exempt from above requirements are circuits intended to operate at, or below PELV voltages		N
	The test voltage is defined as having:		
	a value of twice the rated supply voltage of the equipment or 1000 VAC, which ever applies	(See appended table 18.4)	P
	Supplied from a transformer with a min. output rating of 500VA	500VA Voltage tester applied	P
	a frequency of 50Hz or 60Hz,	50Hz applied	P
	Components not rated to withstand these test voltage are disconnected during testing		N
18.5	Tests for protection against residual voltages are performed to ensure compliance with cl. 6.2.4	Comply with clause 6.2.4	P
18.6	Functions tests of the electrical equipment performed, particularly those related to safety and safeguarding	(See appended table 18.6)	P
18.7	Where a portion of the machine and its associated equipment is changed or modified, that portion is reverified and retested as appropriate (see cl. 18.1)		N

4.2	TABLE: list of critical components				P
Object/Part No.	Manufacturer/Trademark	Type/Model	Technical Data	Standard	Mark(s) of Conformity1)
Start Switch	ZHANYUE	LA38-11	10A/AC400V	EN 60947-5-1	CE
Stop Switch	ZHANYUE	LA38-11M	10A/AC400V	EN 60947-5-1	CE
Motor	SIEMENS	1LE0001-0EB42-1KB4 1.5KW	3.7A/380V	EN 60034-1	CE
Transformer	MEIXIN	EI66*28	AC380V/AC24V	EN 61378-1	CE
AC Contactor	CHNT	NC6-0901	20A/690V	EN 60947-4-1	CE
Relay	OMRON	MY4N-GS	DC30V 5A	EN 60947-2	CE
Relay	OMRON	H3Y-2-C	DC24V 5A	EN 60947-2	CE
Relay	OMRON	H3CR-A8	DC30V 5A	EN 60947-2	CE
Relay	OMRON	MY2N-GS	DC30V 5A	EN 60947-2	CE
Electrical Wire	YONGDA	H05VV-F	4*1.5 300/500V	IEC 52	CE

1) an asterisk indicates a mark which assures the agreed level of surveillance

18.2	TABLE: Continuity of the protective bonding circuit			P
Location	Current(A)	Frequency(Hz)	Measured voltage(V)	Limit(V)
Between incoming PE terminal and relevant points that are part of the protective bonding circuit	10A	50Hz	N/A	N/A
PEΦ >1.0 mm <sup>2</sup>	10A	50Hz	N/A	<3.3V
PEΦ >1.5 mm <sup>2</sup>	10A	50Hz	0.24	<2.6V
PEΦ >2.5 mm <sup>2</sup>	10A	50Hz	N/A	<1.9V
PEΦ >4.0 mm <sup>2</sup>	10A	50Hz	N/A	<1.4V
PEΦ >6.0 mm <sup>2</sup>	10A	50Hz	N/A	<1.0V

18.3	TABLE: insulation resistance tests			P
Location	Voltage(V) d.c	Frequency(Hz)	Time(s)	Measured insulation resistance(MΩ)
Between power circuit conductors R and protective	500	---	60	100

bonding circuit				
Between power circuit conductors S and protective bonding circuit	500	---	60	100
Between power circuit conductors T and protective bonding circuit	500	---	60	100
Between power circuit conductors N and protective bonding circuit	500	---	60	60

18.4	TABLE: voltage tests		P
test voltage applied between:		test voltage (V) a.c. / d.c.	breakdown Yes / No
Between power circuit conductors R and protective bonding circuit		1000 a.c., 50Hz, 1min	No
Between power circuit conductors S and protective bonding circuit		1000 a.c., 50Hz, 1min	No
Between power circuit conductors T and protective bonding circuit		1000 a.c., 50Hz, 1min	No
Between power circuit conductors N and protective bonding circuit		1000 a.c., 50Hz, 1min	No
supplementary information			

18.6	TABLE: function tests		P
S/N	Function	requirement	Result
1	Normal Function	See instruction	Comply with requirement
2	Emergency stopping	Disconnected power circuit immediately and flash light show red	Disconnected power circuit immediately and flash light show red

## EN 12268-2014 test report

<b>5</b>	<b>Safety requirements and/or measures</b>		P
<b>5.1</b>	<b>General</b>		P
	Band-saw machines shall comply with the safety requirements and/or protective measures of this clause.		P
	In addition, they shall be designed according to the principles of EN ISO 12100 for hazards relevant but not significant, which are not dealt with by this document.		P
	Where the means of reducing the risk is by the physical arrangement or positioning of the installed band-saw machine, the manufacturer shall include in the Information for use a reference to the reduction means to be provided, and to any limiting value of the requirement, and, if appropriate, to the means of verification.		P
	The safety related parts of the control system shall present at least a performance level "c" in accordance with EN ISO 13849-1:2008.		P
	For specific intended use and/or applications some examples for work aid tools with a protective function are given in Annex C.		P
<b>5.2</b>	<b>Mechanical hazards</b>		P
<b>5.2.1</b>	<b>General</b>		P
	Saw blades shall be removed periodically. Saw blades are sharp and special measures shall be taken. For such blades, designers shall provide means of attaching a tool to the blade to avoid hand contact and a box, or surround guard, to protect against the sharp edges of the blade during handling and transportation. Explanations on the use of these protective means shall be included in the instructions for use.		P
	The interlocking system for movable guards shall be built inside of the machine housing and shall comply with EN ISO 14119:2013, 4.2 and Clause 7.		P
	In general band saw machines do not require an emergency stop device. If no emergency stop device is fitted, the normal OFF-switch shall be easily reachable from the operator position (see Figure 1 and Figure 2) and shall be protected against unintentional switch-on (e.g. by a protective collar).		P
	Cutting tool handling: cutting tools shall be removed periodically. Cutting tools are sharp and special measures shall be taken. For such blades, designers shall provide means of attaching a tool to the blade to avoid hand contact and a box, or surround guard, to protect against the sharp edges of the blade during handling and transportation. Explanations on the use of these protective means shall be included in the instructions for use.		P
	Verification: Visual inspection of the machine and its documentation.		P
<b>5.2.2</b>	<b>Saw blade protection outside of the cutting zone – Zone 1</b>		P
	Access to the saw blade outside the cutting zone shall be prevented. This can be achieved e.g. by the following measures:		P
	A closed machine casing shall be provided. The doors of the casing and the removable or tiltable feed table shall be interlocked.		P
	Fixing systems for fixed guards or for demountable parts of the		P

	machine casing (i.e. designed as fixed guards) shall remain attached to the guards or to the machine when the guards are removed.		
	For requirements relating to the interlocking system of doors and the feeding table, see 5.2.1.		P
	After opening the door or the feed table more than 10 mm, the blade shall come to a standstill as soon as is possible, but the time taken shall not exceed 4 s.		P
<b>5.2.3</b>	<b>Protection at the cutting zone – Zone 2</b>		P
<b>5.2.3.1</b>	<b>Type A</b>		N
	Access to the cutting zone of the saw blade shall be prevented. This can be achieved e.g. by the following measures:		N
	A non-detachable, movable product pusher shall be provided. The product pusher shall be designed so as to automatically revert to its protective position by its own weight. Distance A1 between the product pusher and the non-detachable feed table shall be $\leq 6$ mm. Design example, see section A – A, Figure 7.		N
	A horizontal adjustable portioning plate of a height $> 60$ mm shall be provided. The portioning plate may be designed to be tiltable and removable.		N
	It shall be possible to change the saw blade without removing the product pusher.		N
<b>5.2.3.2</b>	<b>Type B</b>		N
	Access to that portion of the cutting zone of the saw blade which is not used for cutting shall be prevented. This can be achieved e.g. by the following measures:		N
	A non-detachable blade guide and a height adjustable protective rail shall be provided (see Figures 3, 4 and 8). A maximum distance of 6 mm shall be installed, either between product pusher and table or between blade guide and table. It shall be self-blocking or capable of being blocked in position. When unblocking the height adjustable protective rail, an abrupt lowering to $< 25$ mm shall be avoided. The vertical force needed to move the guard shall not exceed $20 \text{ N} \pm 2 \text{ N}$ .		N
<b>5.2.3.3</b>	<b>Type C</b>		P
	The sliding feed table shall be provided with a system that ensures the safe handling of the product so that access to the saw blade is prevented by a table rear wall with a finger protection bar. The height of the table rear wall shall be $> 60$ mm, and the finger protection bar shall be $> 100$ mm high and $> 50$ mm wide. Tapering towards the top to 25 mm is admissible. The finger protection bar shall overlap the saw blade in the position of maximum forward travel of the sliding feed table by $> 10$ mm (see Figure 9 and Figure 10). The blade shall be protected on 2 faces and in any case, it shall be possible to adjust the protective rail to a distance $\leq 6$ mm from the table.		P
	When the sliding feed table is locked or tilted down, it shall be possible to establish a continuous table surface or this shall be present. In the case of a locked sliding feed table, it shall be		P

	possible to tilt down the table rear wall with the finger protection bar. If the finger protection bar is tilted down, the sliding feed table shall be prevented from being moved.		
	A horizontal adjustable portioning plate of a height $\geq 60$ mm shall be provided. The portioning plate may be tiltable and detachable		P
	A last slice device of a height $\geq 150$ mm shall be provided. The last slice device may be provided with spikes on the side facing the saw blade. The last slice device may be removable.		P
	A removable product pusher may be provided.		P
<b>5.2.3.4</b>	<b>Type D</b>		N
	For requirements relating to the protective rail, see 5.2.3.2.		N
	A product pusher and a portioning plate are not required.		N
<b>5.2.4</b>	<b>Bottom and top wheels – Zone 3 and Zone 4</b>		N
	Access to spokes and the in-running nips on the bottom and top wheels shall be prevented. This can be achieved e.g. by the following measures:		N
	A closed machine casing shall be provided, see 5.2.2.		N
<b>5.2.5</b>	<b>Sliding feed table – Zone 5</b>		N
	The sliding feed table at type C machines shall be designed so as to prevent any jumping out or sliding out from the slide and guide rails.		N
	A product pusher can be fitted on the machine to help on specific cuts. The product pusher shall not interfere with the use of the protective rail.		N
<b>5.2.6</b>	<b>Drive system – Zone 6</b>		N
	Access to the danger points on the drive system shall be prevented. This can be achieved e.g. by the following measures:		N
	A fixed guard or moveable interlocked guard shall be provided on the drive mechanism.		N
	Fixing systems of fixed guards shall remain attached to these guards or to the machine when the guards are removed.		N
	Movable guards (e.g. for changing the operating process or for cleaning purposes) shall be interlocked.		N
	For requirements relating to the interlocking systems of guards, see 5.2.1.		N
<b>5.3</b>	<b>Electrical hazards</b>		P
<b>5.3.1</b>	<b>General</b>		P
	The electrical equipment shall comply with EN 60204-1.		P
<b>5.3.2</b>	<b>Stopping function of switching devices</b>		P
	The stop function of switching devices shall be in accordance with Category 0, EN 60204-1:2006, 9.2.2.		P
<b>5.3.3</b>	<b>Protection against water ingress</b>		P
<b>5.3.3.1</b>	<b>IP degrees of protection</b>		P
	Electrical operating components shall comply with the following degrees of protection in accordance with EN 60529:		P
	a) IP X5 External electrical operating components:		P
	1) on the machine,		P
	2) on the control box on the machine,		P

	3) on the control box located in the process room;		P
	b) IP X3 Internal electrical operating components:		N
	1) in the machine with enclosed housing with the degree of protection IP X5 and open lower surface. Protection against direct and indirect impact of a water jet shall be ensured;		N
	c) IP X2 Internal electrical operating components:		N
	1) in a machine with completely enclosed housing with the degree of protection IP X5. Protection against condensate water shall be provided,		N
	2) in the control box enclosure;		N
	d) IP X0 Internal electrical operating components:		N
	1) in a machine with completely enclosed housing with the degree of protection IP X5. Protection against condensate water shall be provided, and the safety of fingers and the back of hand be ensured.		N
<b>5.3.3.2</b>	<b>Hoods</b>		P
	Band saw machines which are intended to be cleaned by means of pressurized water shall include measures to prevent ingress of water into the external electrical operating components. This can be achieved e.g. by the following measures:		P
	— the electrical operating components fitted to the band-saw shall be covered by hoods, and,		P
	— the Instruction handbook shall include advice to this effect for those operating components to be provided as part of the installation.		P
	Hoods covering the external operating components may be lifted for actuating ON- and OFF-switches. Hoods shall not, when closed, restrict the use of the OFF-switch (see Figure 11). When using membrane switches or similar systems, no hoods are needed if the membrane switch or similar systems are suitable for cleaning with pressurized water.		P
<b>5.3.4</b>	<b>ON- and OFF-switch</b>		P
	On band saw machines, ON- and OFF-switches shall be provided. The switches shall be arranged on the operator side of machines (see Figure 1 and Figure 3). The ON-switch shall be protected against unintentional switch-on (e.g. protective collar).		P
<b>5.3.5</b>	<b>Safety requirements related to electromagnetic phenomena</b>		P
	The machines shall have sufficient immunity from electromagnetic disturbances to enable them to operate safely as intended and not fail to danger when exposed to the levels and types of disturbances intended by the manufacturer.		P
	The manufacturer of the machines shall design, install and wire the equipment and sub-assemblies taking into account the instructions of the suppliers of these sub-assemblies.		P
<b>5.3.6</b>	<b>Wheel-mounted band saw machines</b>		P
	For wheel-mounted band saw machines, the manufacturer shall specify in the instruction handbook that:		P
	— the machine shall be switched off and the mains plug pulled		P

	before being moved,		
	— the electrical supply cable shall not be damaged when the machine is moved, and		P
	— the machine shall be held firmly at suitable locations e.g. by handles when being moved.		P
<b>5.4</b>	<b>Hazard from loss of stability</b>		P
	Band saw machines shall be designed not to slip, tilt, or roll over under all foreseeable operating conditions. Band saw machines for floor mounting may be wheel-mounted.		P
	When floor-type band saw machines are not fixed to the floor, sufficient inherent tilt stability e.g. by the design of the machine, the position of the centre of gravity (wheels and base position) shall be ensured. Wheelmounted machines shall be equipped with e.g. 2 support rollers (or 2 legs) and 2 pivot castors with locking devices to prevent turning and rolling.		P
	The manufacturer shall give in the instruction handbook information on mounting e.g. relating to the use of the locking device and to the surface quality of the floor.		P
	The machine shall not slip, tilt, or roll over when tested in accordance with Clause 6, Table 1, line 5.3.		P
<b>5.5</b>	<b>Noise hazard – Noise reduction at the design stage</b>		P
	When designing band saw machines for food processing, the information and technical measures to control noise at source given in EN ISO 11688-1 shall be taken into account.		P
	The most important causes for generation of airborne sound at these machines are		P
	— vibration of moving parts;		P
	— air current at saw blade;		P
	— condition of saw blade.		P
	The success of the applied noise reduction measures is assessed on the basis of the actual noise emission values (see Clause 6 and Annex A) in relation to other machines of the same family.		P
<b>5.6</b>	<b>Ergonomic requirements</b>		P
	The distance A (see Figures 1, 3 to 5) from the floor to the top surface of the feed table shall be between 800 mm and 1 050 mm.		P
	Attention shall be paid to the ergonomic requirement described in EN ISO 12100:2010, 6.2.8, as well as in EN 614-1 and EN 1005-1, EN 1005-2 and EN 1005-3. Any information for the user which is relevant for achieving the ergonomic objectives shall be contained in the instruction handbook.		P
<b>5.7</b>	<b>Hygiene and cleaning</b>		P
<b>5.7.1</b>	<b>General</b>		P
	The design of the machine shall be in accordance with EN 1672-2 and with the requirements laid down below as well as in accordance with Annex B.		P
<b>5.7.2</b>	<b>Food area</b>		P
	The following components are defined according to EN 1672-2 and regarded as food area (see Figure 12):		P
	— the saw blade;		P



	— the protective rail;		P
	— the fixed feed table and/or sliding feed table (upper surface);		N
	— the roller conveyor;		N
	— the product pusher;		P
	— the last slice device;		P
	— the slice thickness plate;		P
	— the machine casing, with respect to the path of the saw blade;		P
	— the bottom and top wheels;		P
	— the chip pan.		P
<b>5.7.3</b>	<b>Splash area</b>		P
	The following components are defined according to EN 1672-2 and regarded as splash area:		P
	— the fixed feed table and/or sliding feed table, lower surface;		P
	— the machine casing, outside and inside.		P
<b>5.7.4</b>	<b>Non-food area</b>		P
	The non-food area comprises all other surfaces.		P
<b>5.7.5</b>	<b>Surface conditions</b>		P
	The surface design shall comply with the requirements of EN 1672-2.		P
	The maximum surface roughness values shall comply with the requirements of Annex B.		P
<b>5.7.6</b>	<b>Cleaning</b>		P
	All surfaces in the food area shall be easy to clean and disinfect. They shall be designed such that cleaning liquids can run off freely.		P
	Information shall be included in the Instructions for use on the methods recommended for cleaning surfaces in the food areas, particularly for protective hoods, the product pusher, and the saw blade. Information shall also be given on general cleaning methods and the adequate removal of cleaning and disinfecting agents and of any cleaning materials that are unsuitable.		P
	NOTE Cleaning by pressurized water can contaminate the surroundings.		P
<b>6</b>	<b>Verification of safety requirements and/or measures</b>		P
	Verification of the requirements defined in Clause 5 and Clause 7 shall be made by means of inspection, calculation, or testing. These shall be applied to a machine in a fully commissioned condition but partial dismantling may be necessary for the purpose of some checks. Such partial dismantling shall not invalidate the result of the verification. The criteria for acceptance should follow the detailed requirements set out in Clause 5 and Clause 7 or in this clause.		P
<b>7</b>	<b>Information for use</b>		P
<b>7.1</b>	<b>General</b>		P
	The user information shall fulfil the requirements of EN ISO 12100:2010, 6.4. An instruction handbook shall be provided.		P
<b>7.2</b>	<b>Instruction handbook</b>		P
	The instruction handbook shall at least contain the following		P

	information:		
	a) information relating to transport, installation and storage:		P
	1) of the machine;		P
	2) of the saw blade;		P
	3) use of personal protective equipment (see 7.2 d);		P
	4) adequate space at the location;		P
	5) adequate light at the location;		P
	b) information relating to commissioning and dismantling:		P
	1) mounting and installation conditions, e.g. the surface quality of the floor (see 5.1 and 5.4);		P
	2) conditions of dismantling and disposing;		P
	c) information relating to the machine:		P
	1) description of the machine, guards and safety devices;		P
	2) description of hazards e.g. at cutting zones which could not be fully eliminated by safety devices, e.g. hazards at not protected saw-zones, generation of noise;		P
	3) description of adjustment of cutting thickness on portioning plate;		P
	4) description of use of sliding feed table and last slice device;		P
	5) description of use of product pusher and adjustable protective rail, of product size as well as warning on prohibited use: Sawing is not allowed without using the product pusher;		P
	6) description of electrical installation (see EN 60204-1:2006, Clause 17) and circuit diagram;		P
	7) declaration of noise emission values (according to Annex A);		P
	d) information relating to normal operating conditions:		P
	1) recommended saw blades and applications for each product (type of blades);		P
	2) description of the use of operating elements which will effect standstill of the machine and that after use the OFF-switch shall be switched immediately;		P
	3) description of the use of electrical supply cable and that before moving the machine it shall be switched of and the electrical plug shall be disconnected and that while moving the electrical supply cable shall not be damaged;		P
	4) information on attainment of ergonomic targets (see 5.6);		P
	5) description of use of product pusher, product guidance as well as product size and shape (e.g. < 50 mm length not allowed). Warning on prohibited use: Sawing is not allowed without using the product pusher;		P
	6) description of prohibited use, e.g. sawing of wood;		P
	7) indication of the need for regular verification of the interlocking devices, and for the user to determine the frequency of verification;		P
	8) recommendation of wearing personal protective equipment, e.g. hearing protection;		P
	8) recommendation of wearing personal protective equipment, e.g. hearing protection;		P
	9) recommendation of wearing gloves only in connection with		P

	scalloped saw band;		
	10) prohibition of wearing chain mail gloves;		P
	e) information relating to cleaning:		P
	1) description of the:		P
	i) cleaning method,		P
	ii) cleaning agent with reference to the safety data sheet of manufacturer,		P
	iii) disinfection method,		P
	iv) disinfection agent with reference to the safety data sheet of manufacturer,		P
	v) rinsing agent and application time to avoid toxic hazards,		P
	vi) agents not recommended for cleaning and disinfection;		P
	2) description of rules of action during cleaning and disinfection operations and wearing of personal protective equipment;		P
	3) description of use of hoods over external electrical operating components (e.g. ON/OFF-switch) when the machine is cleaned with pressurized water, and how the operating components underneath the hood shall be cleaned (see 5.3.3.2);		P
	4) description of removal and installation of movable guards for cleaning purposes (see 5.2.6);		P
	5) description of use of auxiliary devices, e.g. tensioning device, closed feed pipe;		P
	f) information relating to maintenance:		P
	1) description of installation and removal of saw blade and saw blade stripper including use of personal protective equipment;		P
	2) description of execution and frequency of inspections and maintenance actions, taking account of rules of action;		P
	3) description of lubricants used and of lubricating points;		P
	4) drawings, used for these tasks;		P
	5) the specifications of the spare parts to be used, when these affect the health and safety of operators;		P
	6) circuit diagram;		P
	g) the instruction handbook shall contain the information that the operator shall be trained and specifies the elements of training.		P
<b>7.3</b>	<b>Marking</b>		P
	Band saw machines shall be marked permanently and legibly with at least the following:		P
	— the business name and full address of the manufacturer and, where applicable, his authorized representative;		P
	— designation of the machinery;		P
	— designation of series or type;		P
	— serial number;		P
	— mandatory marking <sup>1)</sup> ;		P
	— the year of construction, that is the year in which the manufacturing process is completed;		P
	— rating information, including supply voltage and frequency, power rating.		P

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<b>5.</b>	<b>Safety requirements and protective measures</b>		P
<b>5.1</b>	<b>General</b>		P
	This clause indicates measures that can be applied to food processing machines to eliminate or mitigate the hazards described in Clause 4 of this document. It also indicates type-B- and type-C- standards (as defined by EN ISO 12100:2010) which contain relevant safety requirements.		P
	Where a food processing machine has significant hazards that are not described in Clause 4, the manufacturer shall identify appropriate methods of eliminating or minimizing the risks from these hazards by referring to European Standards that are relevant to that hazard.		P
<b>5.2</b>	<b>Requirements to eliminate mechanical hazards</b>		P
<b>5.2.1</b>	<b>Safeguarding of moving parts</b>		P
<b>5.2.1.1</b>	<b>General</b>		P
	When selecting the most appropriate safeguarding method for each part of a food processing machine, preference shall be given to eliminating mechanical hazards by design, e.g. by limiting the force, power or movement of moving parts. See 5.2.1.2.		P
	Where hazards cannot be eliminated by design, mechanical hazards shall wherever possible be safeguarded using guards that comply with EN 953:1997+A1:2009. Fixed guards, i.e. guards that are securely held in place with fixings that can only be undone using tools shall be used for parts of machines where access is infrequent. See 5.2.1.3.		P
	The use of protective devices on food processing machines shall be limited to situations where fixed and moveable guards cannot be used for technical reasons.		P
<b>5.2.1.2</b>	<b>Safety by design</b>		P
	Moving parts can be considered to be safe by design provided the force exerted by the moving parts does not exceed 75 N, the pressure they exert against an object is less than 25 N/cm <sup>2</sup> and their energy is less than 4 J. If the hazardous movement is automatically reversed within 1 s when resistance is detected, the movement can be considered as safe provided the force does not exceed 150 N, the pressure does not exceed 50 N/cm <sup>2</sup> and the energy is less than 10 J.		P
	Crushing hazards caused by moving parts can also be made safe by design by ensuring sufficient distance between moving and fixed parts and between one moving part and another using the dimensions indicated in EN 349:1993+A1:2008.		P
<b>5.2.1.3</b>	<b>Fixed and interlocked guards</b>		P
	Moving parts which cannot be made safe by design shall be safeguarded by fixed or interlocked enclosing guards complying with EN 953:1997+A1:2009 and dimensioned and positioned using EN ISO 13857:2008. Where distance guards are used they shall		P

	be dimensioned and positioned in accordance with EN ISO 13857:2008, Table 2, but shall be at least 1 600 mm high. Where it is foreseeable that someone will try to put their feet into a machine, e.g. because it is next to an access platform, guards shall be dimensioned and positioned in accordance with Table 7 and all relevant tables in EN ISO 13857:2008.		
	As a general rule the fixings for fixed guards shall remain attached to either the guard or the machine when the guard is removed, however it is acceptable to use a conventional fixing method where the guard is only removed very infrequently or hygiene considerations make the use of captive fixings unacceptable.		P
<b>5.2.1.4</b>	<b>Openings in guards</b>		P
	Openings in guards shall be positioned or dimensioned to prevent access to danger zones within the machine when standing on the floor or access level and reaching into the opening.		P
	The minimum safety distance to the nearest danger zone through the opening shall comply with EN ISO 13857:2008, Table 3, Table 5, Table 6 and Table 7.		P
	Where the width of the opening is greater than 400 mm or the height is greater than 120 mm the safeguarding methods indicated in Annex B shall be used.		N
<b>5.2.1.5</b>	<b>Interlocking devices associated with guards</b>		P
	Moveable guards shall be interlocked with devices that comply with EN ISO 14119:2013, 4.2 and 4.3. The requirements of EN ISO 14119:2013, Clauses 5, 7 and 8 shall be satisfied.		P
	EN ISO 13855:2010 shall be used to determine if guard-locking devices complying with EN ISO 14119:2013, 4.3 and 5.7, need to be fitted to guard doors to prevent access to moving parts while they are slowing down.		P
<b>5.2.2</b>	<b>Safety requirements for hygienic design features</b>		P
<b>5.2.2.1</b>	<b>Quick release fixings</b>		P
	Where quick release fixings, which can be undone without the use of tools, are used to secure parts of machines or guards that prevent access to danger zones, an interlocking device complying with 5.2.1.5 shall be fitted which ensures that no hazardous movement can occur when the fixings are removed.		P
<b>5.2.2.2</b>	<b>Guarding under machines</b>		P
	Where the distance between the bottom of the machine frame or guards and the floor is greater than 50 mm and less than 120 mm it shall be assumed that someone can get the full length of their arm under the machine and so the distance from the edge of the frame or guard to the nearest danger zones shall be at least 850 mm. See Figure 2.		P
	Where the distance between the bottom of the machine frame or guards and the floor is greater than 120 mm and less than 200 mm it shall be assumed that someone can get the full length of their arm under the machine and part of their shoulder and so the		P

	distance from the edge of the frame or guard to the nearest danger zones shall be at least 1 000 mm.		
	Where the distance between the bottom of the machine frame or guards and the floor is greater than 200 mm, it shall be assumed that someone can crawl under the machine and so the machine shall be fitted with guards to prevent access from danger zones from underneath the machine.		P
<b>5.2.2.3</b>	<b>Spillage trays</b>		P
	Where the removal of spillage trays gives access to danger zones and the trays only need to be removed while the machine is stopped the tray shall either:		P
a)	be secured with fixings, e.g. locks, that can only be undone with tools and remain attached to the machine or the tray, or		P
b)	be fitted with an interlocking device complying with 5.2.1.5 which ensures that the machine cannot operate unless the tray is in place.		P
	If it is necessary to remove the tray while the machine is in operation access to the danger zone shall be prevented by either:		P
c)	fitted with a fixed wire mesh guard above the tray positioned and dimensioned according to EN ISO 13857:2008, Table 4, or		P
d)	fitted with a fixed wire mesh guard below the tray as illustrated in Figure 3. Ensuring that the dimensions and position of the mesh and the slot revealed when the tray is removed shall comply with EN ISO 13857:2008, Table 4, or		P
e)	fitted with mechanical interlocking devices which prevent the tray from being removed until a guard is inserted above the tray and prevent the guard from being removed until the tray is put back in place, or		P
f)	an alternative method which risk assessment suggests gives an equivalent level of safety.		P
<b>5.2.3</b>	<b>Safety requirements for high pressure fluids</b>		N
	All pneumatic components and piping shall conform to the requirements of EN ISO 4414:2010. All hydraulic components, systems and piping shall conform to the requirements of EN ISO 4413:2010.		N
	Where safety functions are controlled through hydraulic or pneumatic systems, these circuits shall comply with the requirements of 5.3.1.4 and 5.3.1.7.		N
	Unexpected start-up shall be prevented using the measures described in EN 1037:1995+A1:2008, and a separate means of isolation shall be provided for each type of energy.		N
	The design shall ensure that hydraulic oil or pneumatic lubricating oil cannot come into contact with the product.		N
	Where high pressure water is used as a cutting medium interlocked guards complying with 5.2.1.3 shall be provided that prevent access to the high pressure water and are interlocked in such a way that the hazardous flow of water is stopped immediately the guards are opened.		N
<b>5.2.4</b>	<b>Stored energy</b>		N

	Where a food processing machine contains stored energy, e.g. compressed air or pressurized steam, the machine shall be designed in such a way that this energy cannot be released accidentally, e.g. using a guard locking device linked to a pressure sensor and a means shall be provided to release this stored energy safely.		N
<b>5.2.5</b>	<b>Requirements to prevent slip, trip and falling hazards</b>		P
<b>5.2.5.1</b>	<b>Design to avoid slipping</b>		P
	The design of the machine shall ensure that liquids, steam or solids that could spill onto the floor or working platforms around the machine are contained, e.g. in spillage trays. The design of work platforms and steps that are likely to become covered with water or other liquids during operation or cleaning shall be provided with an enhanced slip resistant surface as required by EN ISO 14122-2:2001, 4.1.2 b), e.g. machine-serrated open bar grating floors, or top surface resin bonded abrasive grit floors, should be used in preference to plate floors with a coefficient of friction of less than 0,6.		P
<b>5.2.5.2</b>	<b>Design to avoid tripping</b>		P
	The design of the machine should avoid assemblies at low level that are likely to cause a trip accident and the instructions for use shall stress the importance of routing cables and pipe work so that it does not cause a tripping hazard.		P
<b>5.2.5.3</b>	<b>High level access</b>		P
<b>5.2.5.3.1</b>	<b>Design of means of access</b>		P
	Where access is required to operate, adjust, clean, disinfect, inspect, or maintain a machine in a position which cannot be reached from the floor, the manufacturer shall design or specify a safe means of access to these areas. The manufacturer shall follow the hierarchy in EN ISO 14122-1:2001 when selecting or designing this means of access.		P
<b>5.2.5.3.2</b>	<b>Provision of means of access</b>		P
	When high level access is required or expected for operation or cleaning, a permanent or moveable means of access shall be provided by the manufacturer with the machine.		P
	When high level access is required for maintenance the manufacturer is not required to provide the means of access but shall describe the temporary means of access to be used to carry out these tasks in the instruction handbook.		P
<b>5.2.5.3.3</b>	<b>Construction of means of access</b>		P
	Permanent working platforms shall comply with EN ISO 14122-2:2001.		P
	Permanent stairs which are used once a week or more often shall comply with EN ISO 14122-3:2001.		N
	Step ladders and fixed ladders shall only be used where the criteria for their use set out in EN ISO 14122-1:2001 is met. Step ladders shall comply with EN ISO 14122-3:2001 and fixed ladders shall comply with EN ISO 14122-4:2004.		N
	Moveable platforms with stairs are an acceptable alternative to a		N

	permanent means of access for access once a week or more often provided they meet the requirements for EN ISO 14122-2:2001 and EN ISO 14122-3:2001.		
<b>5.2.5.3.4</b>	<b>Distance to danger zones</b>		P
	It shall not be possible for the operator to reach any danger zone on the machine when standing on the permanent means of access. The safety distances from the means of access to the nearest danger zone shall comply with EN ISO 13857:2008, Table 2.		P
	Where a moveable means of access is provided for frequent access, the design of the machine's guards shall ensure that if is not possible to reach a danger zone from this moveable means of access wherever it is positioned around the machine.		N
<b>5.2.6</b>	<b>Stability of machines</b>		P
<b>5.2.6.1</b>	<b>Stability during operation</b>		P
	The machine shall be designed and constructed so that it is stable during normal use and foreseeable abnormal situations.		P
	The manufacturer shall state in the instruction manual if the machine shall be anchored to the floor or to another machine before use and give detailed information about the methods and means of anchorage.		P
	On machines fitted with wheels, at least two wheels shall be fitted with locking devices to ensure that the machine does not move unexpectedly when it is in use.		P
	If it is foreseeable that someone will stand on the machine, the manufacturer shall design the machine or its fixings to ensure stability in this situation.		P
<b>5.2.6.2</b>	<b>Stability while being moved</b>		P
	The manufacturer shall provide information in the instruction manual on how to move the machine safely. See 7.3.		P
	Machines fitted with wheels shall be designed so that they are stable when they are placed on a 10° slope in any orientation.		P
<b>5.3</b>	<b>Requirements to prevent electrical hazards</b>		P
<b>5.3.1</b>	<b>Electrical equipment</b>		P
<b>5.3.1.1</b>	<b>General</b>		P
	Electrical equipment shall comply with EN 60204-1:2006. In the places where EN 60204-1:2006 provides various options, the options stated below shall be used.		P
<b>5.3.1.2</b>	<b>Supply disconnecting device</b>		P
	The machine shall be equipped with a readily identifiable and accessible supply disconnection device. This device shall be selected from those listed in EN 60204-1:2006, 5.3.2, and comply with 5.3.3 and 5.3.4 of that standard. At least one such device shall be attached to the machine. The actuator of the supply disconnection device shall conform to EN 61310-3:2008.		P
<b>5.3.1.3</b>	<b>Excepted circuits</b>		P
	Some circuits, e.g. machine lighting circuits, do not need to be disconnected by the supply disconnection device. Circuits that do not have to be disconnected are listed in EN 60204-1:2006, 5.3.5.		P



	Those circuits that are not disconnected by the main supply disconnecting device shall each have their own supply disconnecting device, and the notice and warning requirements of EN 60204-1:2006, 5.3.5, shall be implemented.		
<b>5.3.1.4</b>	<b>Prevention of unexpected start up</b>		P
	Devices to prevent unexpected start up shall be selected from EN 60204-1:2006, 5.4, and shall be designed so that they can be locked. The design of the controls shall comply with EN 1037:1995+A1:2008.		
	The control system shall be designed so that the machine does not start unexpectedly, e.g. under the following conditions:		P
a)	as a result of a signal generated by a sensor (except when in automatic mode);		P
b)	by closing an interlocked guard (unless it is a control guard);		P
c)	by restoring the power supply after an interruption.		P
<b>5.3.1.5</b>	<b>Protection against electric shock</b>		P
	Electric shock by direct contact shall be prevented by choosing from the methods described in EN 60204-1:2006, 6.2, and electric shock by indirect contact shall be prevented by choosing from the methods describe in EN 60204-1:2006, 6.3.		P
<b>5.3.1.6</b>	<b>Degree of protection</b>		P
	The protection level for electrical enclosures, as defined by EN 60529:1991, shall be selected for the machine and its environment, in accordance with EN 60204-1:2006, 11.3, and Table 1 and Table 2 of this standard.		P
	The manufacturer shall state in the instructions for use any restrictions on cleaning techniques, e.g. "the electrical enclosures are protected to IP65 and so the machine should only be cleaned using low pressure water".		N
<b>5.3.1.7</b>	<b>Emergency stop</b>		P
	Where food processing machines are provided with an emergency stop device it shall comply with EN ISO 13850:2008 and the emergency stop function shall comply with EN 60204-1:2006, 9.2.5.4.2.		P
5.3.1.8	Cables in wire trays		P
	Where open wire trays are used to support cables, sufficient mechanical protection shall be provided for the cables to ensure that they cannot be damaged or pulled from glands during normal operation, cleaning and maintenance activities.		P
<b>5.3.2</b>	<b>Electrostatic phenomena</b>		P
	Where there is a risk of a build-up of static electricity on a food processing machine, the manufacturer shall provide the necessary earth bonding or static elimination equipment to ensure that no hazardous build-ups occur.		P
<b>5.4</b>	<b>Thermal hazards</b>		P
	As a general rule the temperature of touchable surfaces on food processing machines shall not exceed the burn thresholds defined in EN ISO 13732-1:2008 for hot surfaces and EN ISO		P

	13732-3:2008 for cold surfaces.		
	If this is technically impossible the manufacturer shall eliminate the burning risk by insulation, or shall prevent access, for example by fitting a distance guard (see Figure 4). If these measures are not sufficient a hot or cold surface warning pictogram as illustrated in Figure 12 — Warning pictogram “Warning, hot surface” and Figure 13 — Warning pictogram “Warning, cold surface” shall be fitted either on or immediately adjacent to the hot or cold surface.		P
	Where the operation of the food processing machine is likely to generate a hot or cold environment in the area where the machine is being operated, the manufacturer shall provide information in the instructions for use on the steps that the user shall take to prevent health damaging effects to operators and maintenance personnel, e.g. the provision of ventilation, air conditioning or personal protection equipment.		P
<b>5.5</b>	<b>Noise reduction</b>		P
	Noise reduction of food depositors shall be an integral part of the design process and shall be achieved particularly by applying measures to control noise at source.		P
a)	Noise can be reduced or eliminated at source using measures that include the following:		P
b)	drive mechanisms can be fitted with acoustic attenuation materials;		P
c)	air exhausts should be fitted with silencers.		P
	Additional design measures can be found in EN ISO 11688-1:2009.		P
	This list is not exhaustive, alternative technical measures for noise reduction with identical or greater efficiency can be used.		P
<b>5.6</b>	<b>Vibration</b>		P
	Where food processing machines contain mechanisms that vibrate, the manufacturer shall ensure that hazardous vibration is not transmitted to people operating the machine, e.g. by using anti-vibration mountings. See EN 1299:1997+A1:2008 for more information on reducing vibration.		P
<b>5.6</b>	<b>Vibration</b>		P
	Where food processing machines contain mechanisms that vibrate, the manufacturer shall ensure that hazardous vibration is not transmitted to people operating the machine, e.g. by using anti-vibration mountings. See EN 1299:1997+A1:2008 for more information on reducing vibration.		P
<b>5.7</b>	<b>Radiation</b>		P
	Where machines contain radiation sources or equipment that generates radiation, the manufacturer shall ensure that undesirable radiation emissions from the machinery are eliminated or be reduced to levels that do not have adverse effects on persons. The following risk reduction methods shall be used:		P

a)	low frequency, radio frequency and micro-waves, e.g. contained using Faraday cages;		P
b)	infrared, visible light and ultraviolet light, e.g. contained using light baffles;		P
c)	X- and Gamma rays, e.g. contained using the methods described in EN 12198-3:2002+A1:2008;		P
d)	alpha- and beta-particles, electron or ion beams, neutrons, e.g. contained using the methods described in EN 12198-3:2002+A1:2008;		P
e)	lasers, e.g. contained using the methods described in EN ISO 11553-1, EN ISO 11553-2 and EN ISO 11553-3.		P
<b>5.8</b>	<b>Food products, materials and substances</b>		P
<b>5.8.1</b>	<b>Food products</b>		P
	Where the manufacturer knows that the food products that will be processed in the food processing machine, the manufacturer shall design and equip the machine in such a manner that operators and maintenance personnel are protected from any hazards presented by these food products.		P
	Where the manufacturer does not know the food products that will be processed in the food processing machine, the manufacturer shall state in the instructions for use any assumptions that have been made about the intended use of the machine, e.g. "This machine has been designed on the assumption that it will only be used to process non-hazardous food products".		P
a)	Inhalation of harmful substances – When choosing methods of reducing hazards from hazardous food products and gases like ammonia, reference shall be made to EN 626-1:1994+A1:2008.		N
b)	Suffocation and asphyxiation – On food processing machines where there is a risk of suffocation if people enter the machine, e.g. to clean or carry out maintenance, the manufacturer shall design a safe system for carrying out these tasks which is described in the information for use and supply any means of isolation, air quality measurement or ventilation necessary to control the atmosphere within the machine.		N
	Where a food processing machine emits gases, e.g. nitrogen or carbon dioxide, that are likely to reduce oxygen levels around the machine, the manufacturer shall provide information on how safe levels of oxygen can be maintained to prevent suffocation of operators working near the machine, e.g. adequate ventilation and monitoring of oxygen levels.		N
	Where it is necessary for someone to enter a confined space within a food processing machine, the manufacturer shall provide readily identifiable and accessible isolating valves which can be locked in the closed position for each feed point to the enclosed space.		N
c)	Impact – The manufacturer shall ensure that exposed persons cannot be hit by food products entering, discharging, or being ejected from the machine.		N
d)	Burns and scalds – The manufacturer shall ensure that the		N

	design of the food processing machine protects exposed persons from burns and scalds from food products. See 5.4.		
e)	Microbiological contamination – When choosing methods of reducing hazards from hazardous food products reference shall be made to EN 626-1:1994+A1:2008.		N
<b>5.8.2</b>	<b>Cleaning media</b>		P
	When selecting the method for cleaning the machine, the manufacturer shall give preference to cleaning methods that minimize the hazards to the operator and minimize the risk of contaminating the product, i.e. methods that do not use hazardous chemicals.		P
	If the cleaning method adopted recommends the use of hazardous chemicals for cleaning, the manufacturer shall design the machine and the operating procedures to minimize the risk to operators by providing:		P
-	an automated handling, dilution, use and recovery system for the chemical (in-place cleaning system);		P
-	by providing detailed instructions on the correct method of handling the chemical and cleaning the machine and the appropriate personal protection equipment in the instructions for use.		P
	Where the manufacturer recommends the use of steam or pressurized water for cleaning, the manufacturer shall ensure that electrical equipment on the machine has the appropriate degree of protection. See 5.3.1.6.		N
	Where an automated clean in place (CIP) or sterilize in place (SIP) is provided which uses a hazardous cleaning medium, the manufacturer shall equip the machine with:		P
-	guard-locking devices complying with EN ISO 14119:2013 which prevent accidental opening of lids or guards and exposure to the cleaning media during the cleaning or sterilizing cycle;		P
-	a visual warning device which operates during the cleaning or sterilizing cycle.		N
5.8.3	Requirements for machines used in potentially explosive atmospheres		N
	Where food processing machine are to be used in a potentially explosive atmosphere the manufacturer shall comply with the requirements of the ATEX-Directive 94/9/EC.		N
<b>5.9</b>	<b>Ergonomic design principles</b>		P
<b>5.9.1</b>	<b>General</b>		P
	The manufacturer shall ensure that the food processing machine is designed to avoid ergonomic hazards in the following ways.		P
<b>5.9.2</b>	<b>Operating the machine</b>		P
	Controls and control panels shall be positioned according to the requirements of EN 614-1. The indicators and actuators shall comply with EN 894-1:1997+A1:2008, EN 894-2:1997+A1:2008, EN 894-3:2000+A1:2008, EN 61310-1:2008 and EN 61310-3:2008. Indication lights fitted to the machine shall comply with the requirements of EN 60204-1:2006, 10.3.2 and 10.3.3.		P

<b>5.9.3</b>	<b>Loading product into the feed hopper</b>		P
	On machines where the hopper cannot be loaded conveniently from floor level, e.g. if the height of the hopper is 1 400 mm or greater, the manufacturer shall either provide a mechanism to load product into the hopper or a permanent means of access, e.g. stairs and a platform, complying with the requirements of EN ISO 14122-1:2001, EN ISO 14122-2:2001 and EN ISO 14122-3:2001.		P
<b>5.9.4</b>	<b>Cleaning the machine</b>		P
	The parts of the machine, which have to be reached for cleaning shall be easily accessible. This may involve providing additional interlocked guards, access platforms designed for cleaning work or designing the machine so it can be cycled to a position where cleaning can be carried out without the risk of injury.		P
<b>5.9.5</b>	<b>Maintenance</b>		P
	The design of the machine shall minimize the risk of physical strain when carrying out maintenance. This may require the provision of lifting beams over heavy drives or gearboxes or the provision of mechanical handling equipment to minimize risks from ergonomic hazards.		P
<b>5.9.6</b>	<b>Moving the machine</b>		P
	The manufacturer shall provide instructions on how to move the machine safely in the instruction handbook. Where machines are equipped with wheels the manufacturer shall ensure that the machine can be moved without the need for excessive effort.		P
<b>5.10</b>	<b>Controls</b>		P
<b>5.10.1</b>	<b>General</b>		P
	The controls on a food processing machine shall be designed so that they are robust, easily accessible and their function is easily identifiable.		P
	Where technically feasible, the controls shall be positioned so that the operator has a clear view of the interior of the machine from the control position.		P
<b>5.10.2</b>	<b>Stop Function</b>		P
	Each workstation of a food processing machine shall be equipped with a stop button. On semiautomatic machines this stop button shall be within easy reach of the operator when the operator is in the operating position.		P
<b>5.10.3</b>	<b>Emergency stop devices on large machines</b>		P
	Where the perimeter of a standalone machine is greater than 10 m the machine shall be equipped with two or more emergency stop devices and the devices shall be positioned so that they are no further than 10 m apart.		P
	Where the machine is typically included in a line of machines, emergency stop devices shall be positioned on both sides of the machine or in a position where it can be accessed from both sides of the machine.		P
<b>5.10.4</b>	<b>Means of isolation of energy supplies</b>		P
	Food processing machines shall be equipped with a readily		P

	identifiable and accessible means of isolation for each type of energy supplied to the machine which can be locked in the off position.		
	Compressed air isolation valves shall be clearly labelled to indicate their purpose and the method of operation of the valve and shall have the facility to release stored energy.		P
	Electricity isolation devices shall comply with 5.3.1.2.		P
	If the electrical isolation device does not isolate all energy sources, this fact shall be marked on the isolation device and described in the instruction handbook.		P
<b>5.11</b>	<b>Requirements to prevent failures</b>		P
	The manufacturer shall design the food processing machine so that hazards do not arise following component or system failures in the following ways:		P
a)	Failure of mechanical components – components shall be robust and suitable for their intended use.		P
b)	Failure of energy supplies – no hazard shall arise following a failure of the power supply.		P
c)	Failure of control circuits – no hazard shall arise following a control circuit failure and the design of the food processing machine shall ensure that it is possible to stop the machine safely following a control system failure.		P
d)	Failure of electronic drive systems – Where hazardous movement of machinery is controlled by servo, rectifier, inverter or similar electronic drive systems, the design of the safety related parts of the control system shall prevent unexpected start up during short term interventions, e.g. the removal of misshaped products during normal operation.		P
	Where the safety related pulse blocking, monitoring or control functions are achieved with electrical or electronic control systems, they shall comply with performance level “d” of EN ISO 13849-1:2008.		N
e)	Unexpected ejection of fluids – the food processing machine shall be designed to ensure that liquids and gases, including, compressed air, steam, the product and hydraulic fluid cannot escape unexpectedly.		N
f)	Errors of fitting – the food processing machine shall be designed so that hazards cannot arise if parts that have to be removed and replaced for cleaning or product changing are fitted incorrectly.		P
g)	Over-run – food processing machines shall be designed so that the over-run following a stop command is less than the time it takes for an operator to reach danger zones. Where this requirement is achieved by the use of a brake, the manufacturer shall provide information in the instruction handbook on the frequency and method of adjusting this brake to maintain a safe operation.		P
h)	Failure of safety-related components – unless stated otherwise in this European Standard or indicated by risk assessment, the following requirements shall apply:		P

1)	safety functions incorporating electrical and electronic components shall comply with at least performance level “d” of EN ISO 13849-1:2008;		P
2)	safety functions incorporating hydraulic and pneumatic components shall comply with at least performance level “c” of EN ISO 13849-1:2008.		P
i)	Hydraulic and pneumatic two-hand controls shall comply with type III A, and electric/electronic twohand controls shall comply with type III B of EN 574:1996+A1:2008 and type III of EN 60204-1:2006.		N
j)	Failure of energy supply disconnection devices – the manufacturer shall use isolating switches, plugs and valves that are specifically designed for the purpose of isolating energy supplies.		N
k)	Failure of starting or stopping devices – the normal stops and emergency stops shall be stops of category 0 or 1 as defined in EN 60204-1:2006, 9.2.5.3, or their equivalent where the controls are pneumatic or hydraulic.		P
	Workstations of food processing machines shall be equipped with a normal stop device in accordance with the requirements above, which can be accessed easily from the operating position and can stop all of the moving parts of the machine.		P
l)	Failure of information or warning devices – Where information or warning devices have a safety critical function, the manufacturer shall provide a method of monitoring these devices that will alert the user if a failure has occurred.		P
m)	Failure of emergency devices – Food processing machines shall be provided with an emergency stop button located on each control station. The emergency stop function shall comply with EN 60204-1:2006, 9.2.5.3. The emergency stop device shall comply with EN ISO 13850:2008.		P
n)	Failure of guards and guard fixings – the manufacturer shall design guards and guard fixings so that when used as intended they will last the lifetime of the machine. The manufacturer shall include details on how to maintain guards and guard fixings in the instruction handbook.		P
<b>5.12</b>	<b>Requirements to prevent hazards due to missing or wrongly adjusted guards and protective devices</b>		P
	The manufacturer shall comply with the following requirements to prevent hazards from missing or wrongly adjusted guards or protective devices:		P
a)	Guards – where there is a risk of guards being removed an left off following routine cleaning and product changing, these guards shall be fitted with interlocks complying with 5.2.1.5 that prevent the machine from operating if the guard is missing.		P
b)	Protective devices – electro-sensitive protective equipment (ESPE) shall conform to EN 61496-1:2013, type 4, and shall be positioned in accordance with EN ISO 13855:2010, to ensure that any hazardous		P

	movement has been stopped before the operator reaches the danger zone.		
c)	Safety signs – warning symbols complying with EN ISO 7010:2012 shall be used in preference to warning notices. The manufacturer shall select materials of construction and fixing methods for safety signs that will be compatible with the cleaning methods of the food processing machine. The position and purpose of all safety signs fitted on the machine shall be noted in the instruction handbook.		P
d)	Feeding and discharge equipment – where the removal without tools of feeding or discharging equipment e.g. conveyors, exposes danger zones on the food processing machine, the feeding or discharging equipment shall be interlocked with the food processing machine in such a way that when the feeding or discharging equipment is removed, the food processing machine cannot operate. The interlocking devices used shall comply with 5.2.1.5.		N
e)	Essential equipment for safe adjustment and maintenance – where special tools are required for the safe adjustment of a food processing machine, these shall be supplied with the machine by the manufacturer.		P
<b>5.13</b>	<b>Requirements for machines and processes that are linked together</b>		P
	Where food processing machines operate in continuous production and cannot be stopped immediately without creating additional hazards either on the machine that has been stopped or at some other point in the food processing line, the manufacturer shall design the machine or system in such a way that the machine or system can be brought safely into a mode where the significant hazards of the machine are eliminated in as short a time as is reasonably practicable.		P
<b>5.14</b>	<b>Requirements for common mechanisms on food processing machines</b>		P
<b>5.14.1</b>	<b>Safety requirements for feed hoppers</b>		P
<b>5.14.1.1</b>	<b>General</b>		P
	The hazards at feed hoppers can be safeguarded in a variety of ways, six of which are described in this document, however some methods of safeguarding are only suitable in specific situations, e.g. when the hopper is fed automatically and some methods of safeguarding give a better level of protection than others.		P
	Moreover safeguarding solutions which reduce the risk from the mechanical hazard, e.g. increasing the height of the hopper, may increase the ergonomic risks when loading product into the hopper and measures introduced to reduce the ergonomic risk, e.g. providing stairs or a platform may increase the risk of slipping and falling and from mechanical hazards.		P
	The method chosen to eliminate the mechanical hazards shall take into account the anticipated activities associated with the hopper and the other risks that may result from these activities,		P



	e.g. ergonomic, slip and fall hazards.		
	Table 3 can be used to compare the relative merits of different safeguarding methods.		P
<b>5.14.1.2</b>	<b>Safeguarding moving parts in feed hoppers</b>		P
<b>5.14.1.2.1</b>	<b>Solid interlocked guard</b>		P
	Where the top of the hopper is safeguarded with a solid interlocked guard complying with 5.2.1.3 the hopper can be of any height, regardless of the height of the danger zone in the hopper. However, if there are any openings in the lid the distance of these openings from the nearest danger zone shall comply with EN ISO 13857:2008, Table 4. See Figure 5.		P
	The guard shall be interlocked with a device complying with EN ISO 14119:2013.		P
<b>5.14.1.2.2</b>	<b>Interlocked guard with openings</b>		P
	Where the top of the hopper is safeguarded with an interlocked guard complying with 5.2.1.3 which contains openings up to 120 mm wide, the distance from the opening to the nearest danger zone shall comply with of EN ISO 13857:2008, Table 4. Where the height of the hopper from the nearest access position is less than 600 mm there is a risk that someone may try to put their legs through the openings and so the reach distance from the opening to the nearest danger zone shall be determined using EN ISO 13857:2008, Table 4 and Table 7. See Figure 6.		P
	The guard shall be interlocked with a device complying with EN ISO 14119:2013.		P
<b>5.14.1.2.3</b>	<b>Fixed guard</b>		N
	Where the top of the hopper is safeguarded with a fixed guard complying with 5.2.1.3 which comprises bars set up to 120 mm wide, the distance from the opening to the nearest danger zone shall comply with EN ISO 13857:2008, Table 4. Where the height of the hopper from the nearest access position is less than 600 mm there is a risk that someone may try to put their legs through the bars and so the reach distance from the opening to the nearest danger zone shall be determined using EN ISO 13857:2008, Table 4, and – if there is a risk of someone standing in the hopper – EN ISO 13857:2008, Table 7. See Figure 7.		N
<b>5.14.1.2.4</b>	<b>Interlocked stairs and platform</b>		N
	Guarding by distance in conjunction with an interlocked set of steps and platform is suitable for use in a situation where the hopper has to be fed manually, but because of the risk of slipping and falling on the stairs is less desirable than 1 or 2. b shall be > 1 600 mm, and b and c shall be determined on the basis of the height of the danger zone a, using EN ISO 13857:2008, Table 2. The design of the stairs shall comply with EN ISO 14122-3:2001 and the platform and handrails to EN ISO 14122-2:2001. The stairs and platform shall be interlocked with suitable devices, e.g. complying with EN ISO 14119:2013. See Figure 8.		N
<b>5.14.1.2.5</b>	<b>Swan neck hopper</b>		N

	The swan-neck hopper is a variation on guarding by distance where the horizontal distance from the danger zone is increased by a horizontal chute and access into the hopper is restricted by limiting the height of the chute. b shall be > 1 600 mm, and b and c shall be determined on the basis of the height of the danger zone a, using EN ISO 13857:2008, Table 1. d shall be < 400 mm. See Figure 9.		N
<b>5.14.1.2.6</b>	<b>Hopper fitted with ESPE</b>		N
	Electro-sensitive protection equipment (ESPE) can be used as a protective device for a feed hopper provided it is positioned sufficiently far from the danger zone so that the moving parts have time to stop before the danger zone is reached. In general this will mean that the drives of the moving parts will need to be braked.		N
	The electro-sensitive protection equipment shall comply with EN 61496-1:2013. D4 shall be determined on the basis of the stopping time of the machine using EN ISO 13855:2010. See Figure 10.		N
<b>5.14.2</b>	<b>Cutting devices</b>		P
<b>5.14.2.1</b>	<b>General</b>		P
	Knives and cutting devices on food processing machines shall not only be safeguarded while they are in motion, according to 5.2.1.3, but shall also be designed in such a way that it is possible to install, remove and clean the device safely.		P
	Methods of achieving this objective include the following:		P
-	positioning the cutting device so that unintentional contact with the knife-edge is avoided during installation and removal, or;		P
-	equipping the cutting device with a detachable knife-edge guard.		P
	Cutting-edge guards shall, if detachable, be easy to attach and remove and sufficiently robust to withstand being hit by an operator's hand or arm.		P
	Note: The force of a hand or arm can be assumed to be 200 N when the person only is able to reach into the cutting device and 800 N when the knife is positioned so that the operator can lean over the knife.		P
<b>5.14.2.2</b>	<b>Requirements to avoid injury when installing or removing the cutting device</b>		P
	The cutting device shall be designed so that it can be held and moved without the risk of contact with the knife-edge. This can be achieved by:		P
-	shaping the cutting device so that it can be gripped firmly on the side opposite to the cutting-edge, or		P
-	providing a loose holding device which can hold the cutting device, or		P
-	providing a cutting device holder that can be fastened to the device with bolts, a magnet or a clamping mechanism.		P
	Handles and grips designed for holding the cutting device shall be suitable for supporting the weight and shape of the knife and be designed so the knife can be held with the knife-edge directed		P

	away from the person holding the knife.		
<b>5.14.2.3</b>	<b>Requirements to avoid injury when carrying or storing the cutting device</b>		P
	Every machine shall be provided with a cutting device carrier for storing and transporting the cutting device. The cutting device carrier shall protect persons against contact with the cutting-edge and prevent damage to the knife-edge during transport and storing.		P
	Long band cutting devices can be carried in a clip with the cutting edge turned away from the person carrying the device. The manufacturer shall provide the clip or clips for carrying the blade with the machine.		P
	Short band cutting devices shall be equipped with a cutting device carrier.		P
<b>5.14.3</b>	<b>Conveyors</b>		P
	Conveyors shall comply with the relevant safety requirements of EN 619:2002+A1:2010 or EN 620:2002+A1:2010. Where fixed or interlocked guards are used to safeguard danger zones on conveyors they shall comply with 5.2.1.3.		P

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5	Hygiene requirements		P
5.1	Hygiene risk assessment		P
5.1.1	<b>General</b>		P
	The hazards shall be eliminated or the associated risks reduced by ensuring machinery is properly designed, constructed and capable of being properly installed, operated, cleaned and maintained.	Food grade stainless steel 304	P
	The hygiene requirements of the different areas of the equipment depend upon the functions of the area, the type of food to be processed and the nature of hazards to the food.		P
	In applying the design and construction criteria the primary objective shall be to eliminate or reduce the risks to an acceptable level (see Figure 1).		P
	The hygiene risk assessment follows the methodology described in EN 1050.		P
5.1.2	Determination of the limits of the machine		P
	Risk assessment shall take into account:		P
	- the phases of machine life;		P
	- the limits of the machine (see 5.2 of EN ISO 12100-1:2003) including the intended use (both the correct use and operation of the machinery as well as the consequences of reasonably foreseeable misuse or malfunction) in accordance with 3.22 of EN ISO 12100-1:2003, for example: will the machine be used for one specific purpose only, for which hazards are readily identifiable, or could the machine be used for a wide range of food products in many industries (e.g. a pump)?;		P
	- the full range of foreseeable uses of the machinery (e.g. industrial, non-industrial and domestic) by persons identified by sex, age, dominant hand usage, or limiting physical abilities (e.g. visual or hearing impairment, size, strength);		P
	- the anticipated level of training, experience or ability of the foreseeable users.		P
5.1.3	Hygiene risk estimation		P
	The estimation of the hygiene risk by the manufacturer shall be related to the three significant hazards defined in Clause 4 and restricted to the hazards caused by the intended use of the machine, as defined in 3.22 of EN ISO 12100-1:2003:		P
	- <input type="checkbox"/> estimate the severity of the possible harm from the considered hazard;		P
	- estimate the probability of the occurrence of that harm from the considered hazard: see example below. EXAMPLE		P
	When all hygienic hazards are identified, they can be scored, one by one, with the help of the Figure 2.		P
	The questions to raise are:		P
	1 – Does the hazard have a low, medium or high impact if it occurs?		P

	2 – Is the probability of occurrence that the hazard occurs low, medium or high?		P
5.1.4	Hygiene risk evaluation		P
	After hygiene risk estimation, hygiene risk evaluation shall be carried out to determine if hygiene risk reduction is required or whether food safety has been achieved by reducing risks to an acceptable level. If hygiene risk reduction is required, then appropriate food safety measures shall be selected and applied, and the procedure repeated (see Figure 1). During this iterative process, it is important for the designer to check whether additional hazards are created when new food safety measures are applied. If additional hazards are identified, they shall be added to the list of identified hazards.	Food grade stainless steel 304	P
	The achievement of the hygiene risk reduction objectives and a favourable outcome of risk comparison give confirmation that the machinery is safe.		P
5.1.5	Hygiene risk reduction		P
	Achievement of the following conditions shall indicate the satisfactory hygiene risk reduction process:		P
	<input type="checkbox"/> <input type="checkbox"/> the hazard has been eliminated or the hygiene risk reduced by:		P
	a) design or by the substitution of less hazardous materials and substances;		P
	b) safeguarding the hygienic conditions;		P
	<input type="checkbox"/> <input type="checkbox"/> the information on the intended use of the machinery is sufficiently clear (see Clause 7) when:		P
	a) the operating procedures for the use of the machinery are consistent with the ability of personnel who use the machinery or other persons who can introduce hazards to the food;		P
	b) the recommended hygienic working practices for the use of the machinery and the related training requirements have been adequately described;		P
	c) the user is sufficiently informed about hazards occurring during the different phases of the life of the machinery;		P
	d) the use of personal protective equipment is recommended, the need for such equipment and the training requirements for its use have been adequately described.		P
<b>5.2</b>	<b>Materials of construction</b>		P
<b>5.2.1</b>	<b>General requirements</b>	Food grade stainless steel 304	P
	Materials shall be suitable for intended use.		P
	Surfaces of materials and coatings shall be durable, cleanable and where required capable of being disinfected, without breaks, resistant to cracking, chipping, flaking and abrasion and prevent penetration of unwanted matter under intended use.		P
5.2.2	Food area		P
	In addition to the general requirements (see 5.2.1), under intended conditions of use, the materials shall be:		P

	- corrosion resistant;		P
	- non toxic;		P
	- non absorbent (except when technically or functionally unavoidable).		P
	The materials shall:		P
	- not transfer undesirable odours, colours or taint to the food;		P
	- not contribute either to the contamination of food or have any adverse influence on the food.		P
5.3	Design		P
5.3.1	<b>Food area</b>		P
5.3.1.1	<b>Surfaces</b>		P
	Surface finish shall be suitable for intended use.		P
	Surfaces shall be cleanable and where required capable of being disinfected. For this purpose they shall be smooth, continuous or sealed.		P
	The surface design and finish shall be such that the product is prevented as far as possible from becoming accidentally separated from the food area and from returning to it, if that return would cause a hazard to the processed food.		P
	Surfaces shall have a finish so that no particle of product becomes trapped in small crevices, thus becoming difficult to dislodge and so introduce a contamination hazard.		P
	These above requirements also apply to dismountable parts, which are removable for cleaning.		P
	Guidance for measurement of surface finish (roughness specification Rz and/or Ra) can be found in EN ISO 4288. Additional requirements for surface finish can be found in some machinery specific type C standards.		P
5.3.1.2	Joints		P
5.3.1.2.1	Permanent joints		P
	Joints shall be sealed and hygienic. Recesses, gaps, crevices, protruding ledges, inside shoulders and dead spaces shall be avoided (see Figures A.3, A.4 and A.5). If technically impossible, adequate solutions (e.g. cleaning, disinfection, instructions, etc.) shall be given.		P
5.3.1.2.2	Dismountable joints		P
	Dismountable joints shall present a true and hygienic fit (see Figures A.6, A.7, A.8 and A.9).		P
5.3.1.3	Fasteners		P
	Fasteners such as screws, bolts, rivets and so on, shall be avoided. If technically impossible adequate solutions (e.g. cleaning, disinfection, instructions, etc.) shall be given (see Figure A.10).		
5.3.1.4	Drainage		P
	It shall be ensured that the machinery is preferably self draining, or that the residual liquid can be removed by other means (see Figures A.11, A.12 and A.13).		P
5.3.1.5	Internal angles and corners		P
	Internal angles and corners shall be so constructed that they are		P

	effectively cleanable and where required capable of being disinfected (see Figure A.14).		
	Internal angles and corners shall comply with technical requirements which are given in machinery specific C standards.		P
5.3.1.6	Dead spaces		P
	Dead spaces shall be avoided unless technically impossible in the design, construction and installation of the machinery (see Figures A.15 and A.16).		P
	Dead spaces, which are unavoidable, shall be constructed in such a way that they are drainable/cleanable and capable of being disinfected, where required.		P
5.3.1.7	Bearings and shaft entry points		P
	Bearings shall be either located outside of the food area except where this is technically unavoidable, or designed for and lubricated with food grade lubricant, cleanable and where required capable of being disinfected (see Figures A.17 and A.18).		P
	Shaft seals and moving shafts in the food area shall be self (or product)-lubricated or should be designed for and lubricated with food grade lubricant, cleanable and, where required, capable of being disinfected.		P
	NOTE Requirements for equipment used in aseptic processing may be found in specific C standards.		P
5.3.1.8	Instrumentation and sampling devices		P
	Instrumentation and sampling devices shall comply with the relevant sections of this Clause 5 (see Figures A.19, A.20 and A.21).		P
5.3.1.9	Panels, covers, doors		P
	These parts shall be so designed that they avoid any adverse influence (e.g. entry and/or accumulation of any soil) and shall be cleanable and, where required, capable of being disinfected.		P
5.3.1.10	Control devices		P
	If there is no manual contact with the food, these items or areas of machinery which are handled for control reasons by the operator, shall be considered as non food areas. In case of manual contact with the food, where cross contamination can occur these areas or items shall be covered by the definition of a food area (see 3.4.1).		P
5.3.2	Splash area		P
	The splash area shall be designed and constructed following the same principles for the food area.		P
	As the food does not return to the food area, the technical design criteria may be less stringent than in the food area in areas such as the following provided that there is no adverse effect on the food:		P
	- technical requirements for surface finish may allow for higher Rz and/or Ra values;		P
	- internal angles and corners may be of smaller radius, provided they are still cleanable and, where required, capable of being disinfected;		P

	- bearings, seals, moving shafts, etc., located in a splash area, may be lubricated by non-food grade lubricants, provided there is no adverse influence on the food.		P
	Regarding fasteners see the Figure A.22.		P
5.3.3	Non food area		P
	In addition to the general requirements (see 5.2.1) exposed surfaces used in the non-food area shall be made of corrosion resistant material or material that is treated (coated or painted) so as to be corrosion resistant. These surfaces shall be cleanable and, where required, capable of being disinfected and shall not contaminate or have any adverse influence on the food.		P
	Equipment shall be designed and constructed in such a manner to prevent the retention of moisture, ingress and harbourage of vermin and accumulation of soils, and to facilitate inspection, servicing, maintenance, cleaning and, where required, disinfection. Tubular framing shall be totally closed or effectively sealed.		P
5.3.4	Services		P
	Services, pipes, connections and related devices forming an integral part of the machinery shall meet the requirements of 5.3.1, 5.3.2 and 5.3.3, according to the area where they are situated, and not introduce any hazard as defined in Clause 4.		P
6	Verification of hygiene requirements and/or measures		P
	Verification of compliance with hygienic requirements shall be undertaken using one or more of the verification methods given in Table 1.		P
7	Information for use		P
7.1	General		P
	The intended use of the food machinery and its limits shall be specified in the information for use provided by the manufacturer.		P
	In relation to risks that cannot be eliminated, users shall be informed of any measures that they shall comply with, including the need for any particular training.		P
	Information for use shall meet the requirements of Clause 6 of EN ISO 12100-2:2003.		P
	Instruction handbook		P
7.2	General		P
7.2.1	An instruction handbook shall be provided by the manufacturer and meet the requirements and advice of 6.5 of EN ISO 12100-2:2003. It shall include specific additional information related to the following points:		P
7.2.2	Information relating to installation		P
	In particular:		P
	- space needed for use and maintenance, for example measures to be taken when installing machinery. Care shall be taken to ensure that there is adequate access for servicing machinery and cleaning service systems and their adjacent areas so that the required level of hygiene can be maintained;		P
	- permissible environmental operating conditions and in		P



	addition, where required, measures to be taken so that the food is not adversely influenced by for example air currents, dust or liquids derived from leakage, condensation or aerosols		
7.2.3	Information relating to the machine itself		P
	Specific instructions for the intended use (see 5.1.5) shall be included.		P
7.2.4	Information relating to cleaning and disinfection		P
	The instruction handbook shall indicate the recommended cleaning and disinfecting agents and instructions for dismantling (if necessary), cleaning, disinfection, rinsing and inspection for cleanliness.		P
	The method and frequency of cleaning various surfaces including dismantable parts is dependant on the food product processed and the associated relevant hazard.		P
7.2.5	Information relating to maintenance		P
	A scheme shall comprise a system of measures to ensure required level of hygiene is maintained for food machinery within specified intervals.		P
	If food grade lubricants are required they shall be specified.		P
7.3	Marking		P
	No specific marking within the scope of this document is necessary.		P

EN ISO 12100 test report

**Summary of test results (information/comments):**

Machine risk Evaluation

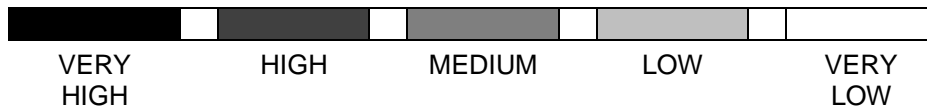
Machine risk Evaluation accord EN ISO12100:2010

The risk assessment of the subject product has been conducted and found the risk is at a “very low” level. Operators and maintenance personnel trainings shall be effectively implemented so the residual risk associated with the machinery can be maintained at a “very low” level.

Risk rank categories can be divided into “VERY HIGH, HIGH, MEDIUM, LOW, VERY LOW”.

RISK RANKING MATRIX	LIKELIHOOD				
	Frequent A	Likely B	Possible C	Rare D	Unlikely E
Catastrophic 1					
Severe 2					
Moderate 3					
Minor 4					

Overall Risk Ranking Categories:



1.	<b>Mechanical Hazards due to:</b>					See below
	-Acceleration, deceleration (kinetic energy)	Machine part or workpieces	Minor	Unlikely	Very low	No hazard
	-Angular parts	Machine part or workpieces	Minor	Unlikely	Very low	No sharp hazard
	-Approach of a moving element to a fixed part	Machine part or workpieces	Minor	Unlikely	Very low	Can not approach
	-Cutting parts	N/A				
	-Elastic elements	N/A				
	-Falling objects	Machine part or workpieces	Minor	Unlikely	Very low	No such elements
	-Gravity (stored energy)	Machine part or workpieces	Minor	Unlikely	Very low	No such elements
	-Height from the ground	Total machine	Minor	Unlikely	Very low	Horizontal equipment
	-High pressure	N/A				
	- Machinery mobility	Whole machine	Minor	Unlikely	Very low	No hazard
	-Moving elements	up and down	Severe	Unlikely	Very low	So the risk class is changed low into very low.
	-Rotating elements	Rotating	Minor	Unlikely	Very low	No such elements
	-Rough, slippery surface	Whole machine	Minor	Unlikely	Very low	No rough surface
	- Sharp edges	Machine part or workpieces	Minor	Unlikely	Very low	No sharp hazard
	-Stability	Whole machine	Moderate	Unlikely	Very low	Standed on floor and horizontal construction ensured Stability
	- Vacuum	N/A				
2.	<b>Electrical hazards due to:</b>					See below

	- Arc	Live parts	Severe	Unlikely	Very low	Live parts protected by Enclosure It can income power supply until close enclose and door for electric control cabinet
	- Electromagnetic phenomena	N/A				
	-Electrostatic phenomena	Outside surface	Minor	Unlikely	Very low	Protected by earthing protective circuits
	- Live parts	Live parts	Severe	Unlikely	Very low	Live parts protected by Enclosure It can income power supply until close enclose and door for electric control cabinet
	-Not enough distance to live parts under high voltage	Live parts	Severe	Unlikely	Very low	Live parts protected by Enclosure It can income power supply until close enclose and door for electric control cabinet
	-Overload	Live parts	Severe	Unlikely	Very low	Live parts protected by Enclosure It can income power supply until close enclose and door for electric control cabinet

	-Parts which have become live under fault conditions	Live parts	Severe	Unlikely	Very low	Live parts protected by Enclosure It can income power supply until close enclose and door for electric control cabinet
	- Short-circuit	Live parts	Severe	Unlikely	Very low	Live parts protected by Enclosure It can income power supply until close enclose and door for electric control cabinet
	- Thermal radiation	Inside machine	Moderate	Unlikely	Very low	No molten and chemical object projected. Machine have protection of short-circuits breaker, overloads, etc.
<b>3.</b>	<b>Thermal hazards resulting in:</b>					See below
	- Explosion	N/A				
	- Flame	N/A				
	-Objects or materials with a high or low temperature	N/A				
	-Radiation from heat sources	surface	Moderate	no similar hazard happene d from all users	Very low	Surface labeled heating warning sign.
<b>4.</b>	<b>Hazard generated by noise, resulting in:</b>					See below
	-Cavitation phenomena	Whole machine	Minor	Unlikely	Very low	No cavitation phenomena

	- Exhausting system	Whole machine	Minor	Unlikely	Very low	No infective <85dB
	-Gas leaking at high speed	Whole machine	Minor	Unlikely	Very low	No gas leaking at high speed
	-Manufacturing process (stamping, cutting, etc.)	Whole machine	Minor	Unlikely	Very low	No hazard
	-Moving parts	Whole machine	Minor	Unlikely	Very low	No infective <85dB
	-Scraping surfaces	Whole machine	Minor	Unlikely	Very low	No scraping surfaces
	-Unbalanced rotating parts	Whole machine	Minor	Unlikely	Very low	No unbalanced rotating part
	-Whistling pneumatics	Whole machine	Minor	Unlikely	Very low	No whistling pneumatics
	-Worn parts	Whole machine	Minor	Unlikely	Very low	No worn parts
<b>5.</b>	<b>Hazards generated by vibration</b>					See below
	- Cavitations phenomena	Whole machine	Minor	Unlikely	Very low	No cavitations phenomena
	- Misalignment of moving parts	Whole machine	Minor	Unlikely	Very low	No misalignment of moving parts
	- Mobile equipment	Whole machine	Minor	Unlikely	Very low	No hazard
	-Scraping surfaces	Whole machine	Minor	Unlikely	Very low	No scraping surfaces
	- Unbalanced rotating parts	Whole machine	Minor	Unlikely	Very low	No unbalanced rotating part
	- Vibrating equipment	Whole machine	Minor	Unlikely	Very low	No vibrating equipment
	- Worn parts	Whole machine	Minor	Unlikely	Very low	No worn parts
<b>6</b>	<b>Hazard generated by radiation</b>					See below
	-Ionizing radiation source	N/A				
	-Low frequency electromagnetic radiation	N/A				

	-Optical radiation (infrared, visible and ultraviolet), including laser	N/A				
	- Radio frequency electromagnetic radiation	N/A				
<b>7.</b>	<b>Hazards generated by materials and substances (and their constituent elements) processed or used by the machinery</b>					
	- Aerosol	N/A				
	- Biological and microbiological (viral or bacterial) agent	N/A				
	- Combustible	Material	Severe	Unlikely	Very low	No possible for fire or explosion Flammable warning marked . So the risk class is changed low into very low.
	- Dust	N/A				
	- Explosive	N/A				
	- Fibre	N/A				
	- Flammable	N/A				
	-Fluid	N/A				
	- Fume	N/A				
	- Gas	Whole machine	Minor	Unlikely	Very low	User provide emission and recycle setting for gases No harmful fluids, gases, mists, fumes
	- Mist	N/A				
	- Oxidize	N/A				

8.	<b>Hazards generated by neglecting ergonomic principals in machinery design as, e.g. hazards from:</b>					See below
	- Access	Whole machine	Minor	Unlikely	Very low	Simple and easy operation procedures, not needing excessive effort
	-Design or location of indicators and visual displays units	Visual display	Minor	Unlikely	Very low	Normally visual height of man body
	- Design, location or identification of control devices	Control panel	Minor	Unlikely	Very low	Adequate identification of machine provided Clearly, visibly, enduringly control sign used
	-Effort	Whole machine	Minor	Unlikely	Very low	No necessary
	- Flicker, dazzling, shadow, stroboscopic effect	Lighting	Minor	Unlikely	Very low	User provided lighting
	- Local lighting	Lighting	Minor	Unlikely	Very low	User provided lighting
	-Mental overload/underload	N/A	Minor	Unlikely	Very low	No necessary
	- Posture	Whole machine	Minor	Unlikely	Very low	Simple and easy operation procedures, not needing excessive effort
	- Repetitive activity	Whole machine	Minor	Unlikely	Very low	No repetitive activity
	- Visibility	Whole machine	Minor	Unlikely	Very low	Easy visibility
9.	<b>Hazards associated with environment in which the machine is used</b>					See below



	- Dust and fog	Whole machine	Minor	Unlikely	Very low	No dust and fog
	- Electromagnetic disturbance	Whole machine	Minor	Unlikely	Very low	No electromagnetic disturbance
	-Lightning	Whole machine	Minor	Unlikely	Very low	Enough lighting
	- Moisture	Whole machine	Minor	Unlikely	Very low	No moisture
	- Pollution	Whole machine	Minor	Unlikely	Very low	No pollution
	- Snow	Whole machine	Minor	Unlikely	Very low	No snow
	-Temperature	Whole machine	Minor	Unlikely	Very low	No high temperature
	- Water	Whole machine	Minor	Unlikely	Very low	No hazard
	- Wind	Whole machine	Minor	Unlikely	Very low	No wind
	- Lack of oxygen	Whole machine	Minor	Unlikely	Very low	No lack of oxygen
<b>10.</b>	<b>Combination of hazards</b>					See below
	E.g. repetitive activity + effort + high environmental temperature	Whole machine	Minor	Unlikely	Very low	No hazard
<b>11.</b>	Unexpected start-up, unexpected overrun/ overspeed (or any similar malfunction) from:					See below
	-Failure/disorder of the control system	Controller	Minor	Unlikely	Very low	No hazard to person
	-Restoration of energy supply after an interruption	Controller	Minor	Unlikely	Very low	Only press down switch to start machine.
	-External influences on electrical equipment	Controller	Minor	Unlikely	Very low	Only press down switch to start machine.e.

	-Other external influences (gravity, wind, etc.)	Whole Machine	Minor	Unlikely	Very low	Indoor used machine
	-Errors in the software	Software	Minor	Unlikely	Very low	No hazard
	-Errors made by the operator (due to mismatch of machinery with human characteristics and abilities, see 8.6)	Whole Machine	Minor	Unlikely	Very low	No hazard to person
12.	Impossibility of stopping the machine in the best possible conditions	N/A	Minor	Unlikely	Very low	Only press down switch to start machine.
13.	Variations in the rotational speed of tools	Rotating parts	Minor	Unlikely	Very low	No sword and similar devices provided
14.	Failure of the power supply	Controller	Minor	Unlikely	Very low	Protected by circuit breaker, and pressing switch to start machine.
15.	Failure of the control circuit	Controller	Minor	Unlikely	Very low	Protected by circuit breaker, and pressing switch to start machine.
16.	Errors of fitting	Whole machine	Moderate	Unlikely	Very low	Assembly by manufacturer and also marking provided. After errors of fitting, the equipment can't start.
17.	Break-up during operation	Whole machine	Moderate	Unlikely	Very low	No hazard, Protected by metal enclosure.
18.	Falling or ejected objects or fluids	Whole machine	Minor	Unlikely	Very low	No objects or fluids falling or ejected
19.	Slip, trip and fall of persons (related to machinery)	Whole machine	Minor	Unlikely	Very low	Not permitting person to stand or move on machine

Additional hazards, hazardous situations and hazardous events due to mobility						
20.	Relating to the travelling function	N/A				Not for traveling function
20.1	Movement when starting the engine	N/A				
20.2	Movement without a driver at the driving position	N/A				
20.3	Movement without all parts in a safe position	N/A				
20.4	Excessive speed of pedestrian controlled machinery	N/A				
20.5	Excessive oscillations when moving	N/A				
20.6	Insufficient ability of machinery to be slowed down, stopped and immobilized	N/A				
21	Linked to the work position (including driving station) on the machine	N/A				
21.1	Fall of persons during access to (or at/from) the work position	N/A				
21.2	Exhaust gases/lack of oxygen at the work position	N/A				
21.3	Fire (flammability of the cab, lack of extinguishing means)	N/A				
21.4	Mechanical hazards at the work position:	N/A				
	a. contact with the wheels;	N/A				
	b. rollover;	N/A				

	c. fall of objects, penetration by objects;	N/A				
	d. break-up of parts rotating at high speed;	N/A				
	e. contact of persons with machine parts or tools (pedestrian controlled machines).	N/A				
21.5	Insufficient visibility from the work positions	N/A				
21.6	Inadequate lighting	N/A				
21.7	Inadequate seating	N/A				
21.8	Noise at the work position	N/A				
21.9	Vibration at the work position	N/A				
21.10	Insufficient means for evacuation/emergency exit	N/A				
22	Due to the control system	N/A				
22.1	Inadequate location of manual controls	N/A				
22.2	Inadequate design of manual controls and their mode of operation	N/A				
23	From handling the machine (lack of stability)	N/A				
24	Due to the power source and to the transmission of power	N/A				
24.1	Hazards from the engine and the batteries	N/A				
24.2	Hazards from transmission of power between machines	N/A				

24.3	Hazards from coupling and towing	N/A				
25	From/to third persons	N/A				
25.1	Unauthorized start-up/use	N/A				
25.2	Drift of a part away from its stopping position	N/A				
25.3	Lack or inadequacy of visual or acoustic warning means	N/A				
<b>26</b>	<b>Insufficient instructions for the driver/operator</b>	N/A				
<b>Additional hazards, hazardous situations and hazardous events due to lifting</b>						
27	Mechanical hazards and hazardous events	N/A				Not for lifting work
27.1	from load falls, collisions, machine tipping caused by:	N/A				
27.1.1	lack of stability	N/A				
27.1.2	uncontrolled loading - overloading - overturning moments exceeded	N/A				
27.1.3	uncontrolled amplitude of movements	N/A				
27.1.4	unexpected/unintended movement of loads	N/A				
27.1.5	inadequate holding devices/accessories	N/A				
27.1.6	collision of more than one machine	N/A				
27.2	from access of persons to load support	N/A				
27.3	from derailment	N/A				

27.4	from insufficient mechanical strength of parts	N/A				
27.5	from inadequate design of pulleys, drums	N/A				
27.6	from inadequate selection of chains, ropes, lifting and accessories and their inadequate integration into the machine	N/A				
27.7	from lowering of the load under the control of friction brake	N/A				
27.8	from abnormal conditions of assembly/testing/use/maintenance	N/A				
27.9	from the effect of load on persons (impact by load or counterweight)	N/A				
28	Electrical hazards	N/A				
28.1	from lightning	N/A				
29	Hazards generated by neglecting ergonomic principles	N/A				
29.1	insufficient visibility from the driving position	N/A				
<b>Additional hazards, hazardous situations and hazardous events due to underground work</b>						
30	Mechanical hazards and hazardous events due to:	N/A				Not for underground work
30.1	Lack of stability of powered roof supports	N/A				

30.2	Failing accelerator or break control of machinery running on rails	N/A				
30.3	Failing or lack of deadman's control of machinery running on rails	N/A				
31	Restricted movement of persons	N/A				
32	Fire and explosion	N/A				
33	Emission of dust, gases etc.	N/A				
<b>Additional hazards, hazardous situations and hazardous events due to lifting or moving of persons</b>						
34	Mechanical hazards and hazardous events due to:	N/A				Not for lifting or moving of persons
34.1	Inadequate mechanical strength - inadequate working coefficients	N/A				
34.2	Failing of loading control	N/A				
34.3	Failing of controls in person carrier (function, priority)	N/A				
34.4	Overspeed of person carrier	N/A				
35	Falling of person from person carrier	N/A				
36	Falling or overturning of person carrier	N/A				
37	Human error, human behaviour	N/A				

## Annex : Technical Information

### A1. Picture of machine



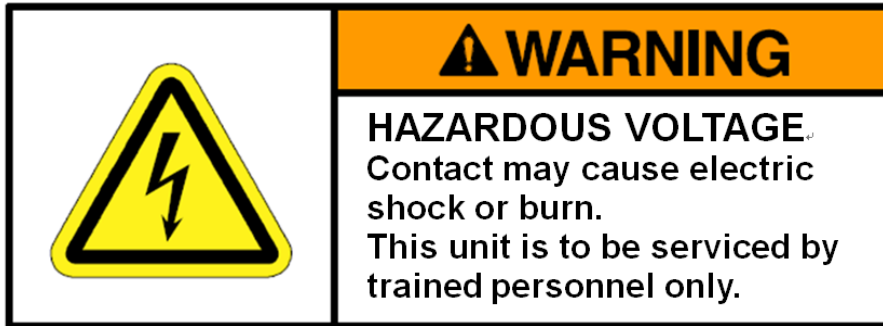








A2. Warning Label



A3. Nameplate

<b>KENTMASTER</b>	<b>Bone Saw</b>	
Model No.: KENT440F	Rated Power: 2.2KW	<b>CE</b>
Voltage/Frequency/Phase No.: 380V~, 50HZ, 3PH		
Serial No.: /	Date for manufactured: /	
		<b>Made in China</b>
Tel: +86-10-89496968	Fax: +86-10-89456208	
<b>Manufacturer Name: Kentmaster Meat Equipment (Beijing) Co., Ltd.</b>		
<b>Manufacturer Address: Room 117, Building 6, No. 28, Linhe Avenue, Linhe Industrial Zone, Shunyi, Beijing, China</b>		