MD TEST REPORT

EN ISO 12100:2010

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

EN 201:2009

Plastics and rubber machines — Injection moulding machines —Safety requirements

EN 60204-1: 2018

Safety of machinery - Electrical equipment of machines - Part 1: General requirements

EN 61000-6-2:2005

Electromagnetic compatibility (EMC) - Part 6-2: GenEngine standards - Immunity for industrial environments

EN 61000-6-4:2007+A1:2011

Electromagnetic compatibility (EMC) - Part 6-4: GenEngine standards - Emission standard for industrial environments

For

ZHEN HUA PRECISION MACHINERY CO., LTD.

DONGPING INDUSTRIAL ZONE, QISHI TOWN,DONGGUANG CITY, GUANGDONG PROVINCE, CHINA.

Series model:

ZH-88、ZH-128、ZH-168、ZH-218、ZH-268、ZH-280、ZH-338、ZH-400、ZH-500、ZH-650、ZH-750、ZH-950、ZH-1080、ZH-1250、ZH-1600、ZH-90II、ZH-130II、ZH-170II、ZH-220II、ZH-280II、ZH-350II、ZH-450II、ZH-550II、ZH-650II、ZH-V55S-LSR、ZH-V55SD-LSR、ZH-V55R2-LSR、ZH-V85S-LSR、ZH-V85SD-LSR、ZH-V85R2-LSR、ZH-V120S-LSR、ZH-V120SD-LSR、ZH-V120R2-LSR、ZH-V160S-LSR、ZH-V160SD-LSR、ZH-V160R2-LSR、268、ZH-338-IB

September 10, 2019

This Report Concerns: ☒ Original Report	**Equipment Type:** Injection molding machine
Test Engineer:	Eric/
Report Number:	TH19JR-1919S
Test Date:	September 04– 10, 2019
Reviewed By:	Prince/
Approved By:	Prince/
Prepared By:	**Shenzhen Tian Hai Test Technology Co.,Ltd.** 4F, A3 BLDG, The Silicon Valley Power intelligent terminal industrial park, Guan Lan street, Longhua district, Shenzhen Tel : 86-755-86615100 Fax: 86-755-86615105

Note: This test report is limited to the above client company and the product model only.
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TEST REPORT

EN ISO 12100:2010

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

EN 201:2009

Plastics and rubber machines — Injection moulding machines —Safety requirements

EN 60204-1: 2018

Safety of machinery–Electrical equipment of machines Part 1: General requirements

EN 61000-6-2:2005

Electromagnetic compatibility (EMC) - Part 6-2: GenEngine standards - Immunity for industrial environments

EN 61000-6-4:2007+A1:2011

Electromagnetic compatibility (EMC) - Part 6-4: GenEngine standards - Emission standard for industrial environments

Report		
Report reference No.	:	TH19JR-1919S
Tested by (+signature)	:	Eric
Reviewed by (+signature)	:	Prince
Approved by (+signature)	:	Prince
Date of issue	:	September 10, 2019
Testing laboratory		
Name	:	**Shenzhen Tian Hai Test Technology Co.,Ltd.**
Address	:	4F, A3 BLDG, The Silicon Valley Power intelligent terminal industrial park, Guan Lan street, Longhua district, Shenzhen
Test location	:	Same as above
Client		
Applicant Name	:	**ZHEN HUA PRECISION MACHINERY CO., LTD.**
Address	:	DONGPING INDUSTRIAL ZONE, QISHI TOWN,DONGGUANG CITY, GUANGDONG PROVINCE, CHINA.
Manufacturer	:	**ZHEN HUA PRECISION MACHINERY CO., LTD.**
Address	:	DONGPING INDUSTRIAL ZONE, QISHI TOWN,DONGGUANG CITY, GUANGDONG PROVINCE, CHINA.
Test specification		
Standards	:	EN ISO 12100:2010;EN201:2009;EN 60204-1: 2018 EN 61000-6-2:2005&EN 61000-6-4:2007+A1:2011
Non-standard test method	:	N.A.
Test item		
Description	:	**Injection molding machine**
Trademark	:	zhenhua
Rating	:	Input: 380V AC, 50Hz, 25A, 18kW

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Model and or type reference	:	ZH-88、ZH-128、ZH-168、ZH-218、ZH-268、ZH-280、ZH-338、ZH-400、ZH-500、ZH-650、ZH-750、ZH-950、ZH-1080、ZH-1250、ZH-1600、ZH-90II、ZH-130II、ZH-170II、ZH-220II、ZH-280II、ZH-350II、ZH-450II、ZH-550II、ZH-650II、ZH-V55S-LSR、ZH-V55SD-LSR、ZH-V55R2-LSR、ZH-V85S-LSR、ZH-V85SD-LSR、ZH-V85R2-LSR、ZH-V120S-LSR、ZH-V120SD-LSR、ZH-V120R2-LSR、ZH-V160S-LSR、ZH-V160SD-LSR、ZH-V160R2-LSR、268、ZH-338-IB

Test case verdicts

Test case does not apply to the test object	:	N (Not apply)
Test item does meet the requirement	:	P(Pass)
Test item does not meet the requirement	:	F(Fail)

General remarks:

""See remark #)""refers to a remark appended to the report.
""See appended table)""refers to a table appended to the report.
Throughout this report a comma is used as the decimal separator.
The test results presented in this report relate only to the object tested.
This report shall not be reproduced except in full without the written approval of the testing laboratory.

Attachment include:
Appendix for photo
Remarks:
Copy of the marking plate

Injection molding machine
Model:
Input: 380V AC, 50Hz, 25A, 18kW

CE

ZHEN HUA PRECISION MACHINERY CO., LTD.
DONGPING INDUSTRIAL ZONE, QISHI TOWN,DONGGUANG CITY, GUANGDONG PROVINCE, CHINA.

Note：
This test report document is revised on request in the Machine Directive Test Report dated 11.12.2019 and the revised TH19LR-2316S, which is valid in conjunction with the test report TH19JR-1919S and dated 21.10.2019.

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EN ISO 12100			
Clause	**Requirement Test**	**Result**	**Verdict**
5	**Risk assessment**		P
	Risk analysis provides information required for the risk evaluation, which in turn allows judgments to be made about whether or not risk reduction is required	Complied	P
	These judgments shall be supported by a qualitative or, where appropriate, quantitative estimate of the risk associated with the hazards present on the machinery.	Complied	P
	The risk assessment shall be documented according to Clause 7	Complied	P
5.2	Information for risk assessment		P
	a) Related to machinery description:		P
	b) Related to regulations, standards and other applicable documents:		P
	c) Related to experience of use:		P
	d) Relevant ergonomic principles.		P
5.3	Determination of limits of machinery		P
5.3.1	General		P
	the characteristics and performances of the machine or a series of machines in an integrated process, and the related people, environment and products, should be identified in terms of the limits of machinery as given in 5.3.2 to 5.3.5.	Complied	P
5.3.2	Use limits		P
	a) the different machine operating modes and different intervention procedures for the users, including interventions required by malfunctions of the machine;	Complied	P
	b) the use of the machinery (for example, industrial, non-industrial and domestic) by persons identified by sex, age, dominant hand usage, or limiting physical abilities	Complied	P
	c) the anticipated levels of training, experience or ability of users including	Complied	P
	d)exposure of other persons to the hazards associated with the machinery where it can be reasonably foreseen	Complied	P
5.3.3	Space limits		P
	a) the range of movement	Complied	P
	b) space requirements for persons interacting with the machine, such as during operation and maintenance,	Complied	P
	c) human interaction such as the operator–machine interface,	Complied	P
	d) the machine–power supply interface.	Complied	P
5.3.4	Time limits		P
	a) the life limit of the machinery and/or of some of its components (tooling, parts that can wear,electromechanical components, etc.), taking into account its intended use and reasonably foreseeable misuse	Complied	P
	b) recommended service intervals.		P
5.3.5	Other limits		P
	a) properties of the material(s) to be processed	Complied	P
	b) housekeeping — the level of cleanliness required		N
	c) environmental — the recommended minimum and maximum temperatures, whether the machine can be operated indoors or outdoors, in dry or wet weather, in direct sunlight, tolerance to dust and wet, etc.	Complied	P
5.4	Hazard identification		P
	a) Human interaction during the whole life cycle of the machine	Complied	P
	b) Possible states of the machine	Complied	P

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EN ISO 12100			
Clause	**Requirement Test**	**Result**	**Verdict**
	c) Unintended behaviour of the operator or reasonably foreseeable misuse of the machine	Complied	P
5.5	Risk estimation		P
5.5.1	General		P
	After hazard identification, risk estimation shall be carried out for each hazardous situation by determining the elements of risk given in 5.5.2. When determining these elements, it is necessary to take into account the aspects given in 5.5.3.	Complied	P
5.5.2	Elements of risk		P
	a) the severity of harm;	Complied	P
	b) the probability of occurrence of that harm, which is a function of	Complied	P
5.5.2.2	Severity of harm		P
	a) the severity of injuries or damage to health, for example,	Complied	P
	b) the extent of harm,	Complied	P
5.5.2.3	Probability of occurrence of harm		P
5.5.2.3.1	Exposure of persons to the hazard		P
	a)the need for access to the hazard zone	Complied	P
	b) the nature of access	Complied	P
	c) the time spent in the hazard zone,	Complied	P
	d) the number of persons requiring access	Complied	P
	e) the frequency of access.	Complied	P
5.5.2.3.2	Occurrence of a hazardous event		P
	a) reliability and other statistical data,	Complied	P
	b) accident history,	Complied	P
	c) history of damage to health,	Complied	P
	d) comparison of risks (see 5.6.3).	Complied	P
5.5.2.3.3	Possibility of avoiding or limiting harm		P
	a) different persons who can be exposed to the hazard(s)	Complied	P
	b) how quickly the hazardous situation could lead to harm	Complied	P
	c) any awareness of risk,	Complied	P
	d) the human ability to avoid or limit harm	Complied	P
	e) practical experience and knowledge	Complied	P
5.5.3	Aspects to be considered during risk estimation		P
5.5.3.1	Persons exposed		P
	Risk estimation shall take into account all persons (operators and others) for whom exposure to the hazard is reasonably foreseeable.	Complied	P
5.5.3.2	Type, frequency and duration of exposure		P
	The risk estimation shall also take into account tasks, for which it is necessary to suspend protective measures.	Complied	P
5.5.3.3	Relationship between exposure and effects		P
	The relationship between an exposure to a hazard and its effects shall be taken into account for each hazardous situation considered.	Complied	P
5.5.3.4	Human factors		P
	Human factors can affect risk and shall be taken into account in the risk estimation,	Complied	P
5.5.3.5	Suitability of protective measures		P
	a) identify the circumstances which can result in harm,	Complied	P
	b) whenever appropriate, be carried out using quantitative methods to compare alternative protective measures (see ISO/TR 14121-2),	Complied	P

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Clause	**Requirement Test**	**Result**	**Verdict**
	c) provide information that can assist with the selection of appropriate protective measures.	Complied	P
5.5.3.6	Possibility of defeating or circumventing protective measures		P
	Risk estimation shall take account of the possibility of defeating or circumventing protective measures. It shall also take account of the incentive to defeat or circumvent protective measures	Complied	P
5.5.3.7	Ability to maintain protective measures		P
	Risk estimation shall consider whether the protective measures can be maintained in the condition necessary to provide the required level of protection.	Complied	P
5.5.3.8	Information for use		P
	Risk estimation shall take into account the information for use, as available. See also 6.4.	Complied	P
5.6	Risk evaluation		P
5.6.1	General		P
	Achieving the objectives of risk reduction and a favourable outcome of risk comparison applied when practicable gives confidence that risk has been adequately reduced.	Complied	P
5.6.2	Adequate risk reduction		P
	Application of the three-step method described in 6.1 is essential in achieving adequate risk reduction.	Complied	P
5.6.3	Comparison of risks	Complied	P
6	**Risk reduction**		P
6.1	General		P
	All protective measures intended for reaching this objective shall referred to as the three-step method (see also Figures 1 and 2).	Complied	P
6.2	Inherently safe design measures		P
6.2.1	General		P
	Inherently safe design measures are achieved by avoiding hazards or reducing risks by a suitable choice of design features for the machine itself and/or interaction between the exposed persons and the machine.	Complied	P
6.2.2	Consideration of geometrical factors and physical aspects		P
6.2.2.1	Geometrical factors		P
	a) The form of machinery is designed to maximize direct visibility of the working areas and hazard zones from the control position — reducing blind spots,	Complied	P
	b) The form and the relative location of the mechanical components parts	Complied	P
	c) Avoiding sharp edges and corners, protruding parts	Complied	P
	d) The form of the machine is designed so as to achieve a suitable working position and provide accessible manual controls (actuators).	Complied	P
6.2.2.2	Physical aspects		P
	a) limiting the actuating force to a sufficiently low value so that the actuated part does not generate a mechanical hazard	Complied	P
	b) limiting the mass and/or velocity of the movable elements, and hence their kinetic energy	Complied	P
	c) limiting the emissions by acting on the characteristics of the source using measures for reducing	Complied	P
6.2.3	Taking into account general technical knowledge of machine design		P
	a) mechanical stresses	Complied	P
	b) materials and their properties	Complied	P
	c) emission values	Complied	P
6.2.4	Choice of appropriate technology		P

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EN ISO 12100			
Clause	**Requirement Test**	**Result**	**Verdict**
	One or more hazards can be eliminated or risks reduced by the choice of the technology to be used in certain applications	Complied	P
6.2.5	Applying principle of positive mechanical action		P
6.2.6	Provisions for stability		P
	Machines shall be designed so that they have sufficient stability to allow them to be used safely in their specified conditions of use.	Complied	P
6.2.7	Provisions for maintainability		P
	accessibility, taking into account the environment and the human body measurements, including the dimensions of the working clothes and tools used;	Complied	P
	ease of handling, taking into account human	Complied	P
	limitation of the number of special tools and equipment.	Complied	P
6.2.8	Observing ergonomic principles		P
	Ergonomic principles shall be taken into account in designing machinery so as to reduce the mental or physical stress of, and strain on, the operator.	Complied	P
6.2.9	Electrical hazards		P
	For the design of the electrical equipment of machines, IEC 60204-1 gives general provisions about disconnection and switching of electrical circuits and for protection against electric shock.	Complied	P
6.2.10	Pneumatic and hydraulic hazards		P
6.2.11	Applying inherently safe design measures to control systems		P
6.2.11.1	General		P
	The design measures of the control system shall be chosen so that their safety-related performance provides a sufficient amount of risk reduction (see ISO 13849-1 or IEC 62061).	Complied	P
6.2.11.2	Starting of an internal power source/switching on an external power supply	Complied	P
	The starting of an internal power source or switching-on of an external power supply shall not result in a hazardous situation.	Complied	P
6.2.11.3	Starting/stopping of a mechanism		P
6.2.11.4	Restart after power interruption		P
6.2.11.5	Interruption of power supply		P
	Machinery shall be designed to prevent hazardous situations resulting from interruption or excessive fluctuation of the power supply.	Complied	P
6.2.11.6	Use of automatic monitoring		P
	Automatic monitoring is intended to ensure that a safety function or functions implemented by a protective measure do not fail to be performed if the ability of a component or an element to perform its function is diminished, or if the process conditions are changed such that hazards are generated	Complied	P
6.2.11.7	Safety functions implemented by programmable electronic control systems	Complied	P
6.2.11.7.1	General		P
	A control system that includes programmable electronic equipment (for example, programmable controllers) can, where appropriate, be used to implement safety functions at machinery.	Complied	P
6.2.11.7.2	Hardware aspects		P
	architectural constraints	Complied	P
	selection, and/or design, of equipment and devices with an appropriate probability of dangerous random hardware failure	Complied	P

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EN ISO 12100			
Clause	**Requirement Test**	**Result**	**Verdict**
	the incorporation of measures and techniques within the hardware so as to avoid systematic failures and control systematic faults	Complied	P
6.2.11.7.3	Software aspects		P
6.2.11.8	Principles relating to manual control		P
6.2.11.9	Control mode for setting, teaching, process changeover, fault-finding, cleaning or maintenance	Complied	P
6.2.11.10	Selection of control and operating modes	Complied	P
6.2.11.11	Applying measures to achieve electromagnetic compatibility (EMC)	Complied	P
6.2.11.12	Provision of diagnostic systems to aid fault-finding	Complied	P
6.2.12	Minimizing probability of failure of safety functions		P
6.2.12.1	General		P
	Safety of machinery is not only dependent on the reliability of the control systems but also on the reliability of all parts of the machine.	Complied	P
6.2.12.2	Use of reliable components		P
6.2.12.3	Use of “oriented failure mode” components	Complied	P
6.2.12.4	Duplication (or redundancy) of components or subsystems	Complied	P
6.2.13	Limiting exposure to hazards through reliability of equipment	Complied	P
6.2.14	Limiting exposure to hazards through mechanization or automation of loading (feeding)/unloading (removal) operations	Complied	P
6.2.15	Limiting exposure to hazards through location of setting and maintenance points outside danger zones	Complied	P
6.3	Safeguarding and complementary protective measures		P
6.3.1	General		P
	Guards and protective devices shall be used to protect persons whenever an inherently safe design measure does not reasonably make it possible either to remove hazards or to sufficiently reduce risks.	Complied	P
6.3.2	Selection and implementation of guards and protective devices		P
6.3.2.1	General		P
	This subclause gives guidelines for the selection and the implementation of guards and protective devices the primary purpose of which is to protect persons against hazards generated by moving parts, according to the nature of those parts (see Figure 4) and to the need for access to the danger zone(s).	Complied	P
6.3.2.2	Where access to the hazard zone is not required during normal operation	Complied	P
6.3.2.3	Where access to the hazard zone is required during normal operation	Complied	P
6.3.2.4	Where access to the hazard zone is required for machine setting, teaching, process changeover, fault-finding, cleaning or maintenance	Complied	P
6.3.2.5	Selection and implementation of sensitive protective equipment1)		P
6.3.2.5.1	Selection	Complied	P
6.3.2.5.2	Implementation	Complied	P
6.3.2.5.3	Additional requirements for sensitive protective equipment when used for cycle initiation	Complied	P
6.3.2.6	Protective measures for stability	Complied	P
6.3.2.7	Other protective devices	Complied	P
6.3.3	Requirements for design of guards and protective devices		P
6.3.3.1	General requirements	Complied	P
6.3.3.2	Requirements for guards	Complied	P
6.3.3.2.1	Functions of guards	Complied	P

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Clause	**Requirement Test**	**Result**	**Verdict**
6.3.3.2.2	Requirements for fixed guards	Complied	P
	permanently	Complied	P
	by means of fasteners (screws, nuts) making removal/opening impossible without using tools; they should not remain closed without their fasteners (see ISO 14120).	Complied	P
6.3.3.2.3	Requirements for movable guards		P
	a) as far as possible when open remain fixed to the machinery or other structure (generally by means of hinges or guides)	Complied	P
	b) be interlocking (with guard locking when necessary) (see ISO 14119).	Complied	P
6.3.3.2.4	Requirements for adjustable guards	Complied	P
6.3.3.2.5	Requirements for interlocking guards with a start function (control guards)	Complied	P
6.3.3.2.6	Hazards from guards		P
	the guard construction (sharp edges or corners, material, noise emission, etc.),	Complied	P
	the movements of the guards (shearing or crushing zones generated by power-operated guards and by heavy guards which are liable to fall).	Complied	P
6.3.3.3	Technical characteristics of protective devices	Complied	P
6.3.3.4	Provisions for alternative types of safeguards	Complied	P
6.3.4	Safeguarding to reduce emissions		P
6.3.4.1	General		P
	If the measures for the reduction of emissions at source specified in 6.2.2.2 are not adequate, the machine shall be provided with additional protective measures (see 6.3.4.2 to 6.3.4.5).	Complied	P
6.3.4.2	Noise	Complied	P
6.3.4.3	Vibration	Complied	P
6.3.4.4	Hazardous substances	Complied	P
6.3.4.5	Radiation	Complied	P
6.3.5	Complementary protective measures		P
6.3.5.1	General	Complied	P
6.3.5.2	Components and elements to achieve emergency stop function	Complied	P
6.3.5.3	Measures for the escape and rescue of trapped persons	Complied	P
6.3.5.4	Measures for isolation and energy dissipation	Complied	P
6.3.5.5	Provisions for easy and safe handling of machines and their heavy component parts	Complied	P
6.3.5.6	Measures for safe access to machinery	Complied	P
6.4	Information for use		P
6.4.1	General requirements	Complied	P
6.4.2	Location and nature of information for use	Complied	P
6.4.3	Signals and warning devices	Complied	P
6.4.4	Markings, signs (pictograms) and written warnings		P
	a) for its unambiguous identification	Complied	P
	b) in order to indicate its compliance with mandatory requirements, comprising	Complied	P
	c) for its safe use	Complied	P
6.4.5	Accompanying documents (in particular — instruction handbook)		P
6.4.5.2	Production of instruction handbook	Complied	P
6.4.5.3	Drafting and editing information for use	Complied	P
7	**Documentation of risk assessment and risk reduction**	Complied	P

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EN 201			
Clause	**Requirement Test**	**Result**	**Verdict**
5	**Safety requirements and protective measures**		P
5.1	General		P
	Machinery shall comply with the safety requirements and protective measures of this clause.	Complied	P
	In addition, the machine shall be designed in accordance with the principles of EN ISO 12100 for relevant but not significant hazards, which are not dealt with by this document	Comply with EN ISO 12100	P
5.1.1	Emergency stop		P
	The emergency stop shall function as a category 0 or 1 stop of EN 60204-1:2006, 9.2.2.In the case of machines with electrical axis a category 1 stop shall be used.	Comply with EN 60204-1	P
	Emergency stop devices shall be in accordance with EN ISO 13850:2008 and EN 60204-1:2006, 10.7.	Comply with EN ISO 13850:2008	P
	Actuation of emergency stop actuators shall stop any movement and shall discharge the hydraulic accumulators.	Complied	P
5.1.2	Guards		P
5.1.2.1	Common requirements		P
	Guards shall be designed in accordance with EN 953.They shall be mounted on or close to the injection moulding machine.	Comply with EN 953	P
	Safety distances for guards shall be in accordance with EN ISO 13857:2008.	Comply with EN ISO 13857:2008	P
	Access to dangerous areas shall be prevented by movable interlocking guards	Complied	P
5.1.2.2	Machines with electrical axis and interlocking guards without guard locking		N
	For machines with electrical axis, the following additional requirements for movable interlocking guards without guard locking for this axis shall be fulfilled		N
	--Movable interlocking guards without guard locking shall be positioned so that when the guard is opened, the stopping time is shorter than the access time.		N
	--The access time (t) shall be calculated as follows: $t = \frac{d}{v} + \Delta t$ where t is the access time; d is the distance between guard and dangerous point; v is 1,6 m/s, approach speed as defined in EN 999:1998+A1:2008; Δt is 100 ms, to take into account the time necessary to open the guard sufficiently to gain access to the protected area.		N
	--When calculating or measuring the overall system stopping performance, as defined in EN 999:1998+A1:2008, 3.2, the worst case shall be taken into account related to speed, mass, temperature.		N
5.1.2.3	Machines with electrical axis and interlocking guards with guard locking	Complied	P
5.1.3	Electro-sensitive protective equipment (ESPE) in the form of light curtains	Not such equipment	N
5.1.4	Two-hand control devices	Not such equipment	N
5.1.5	Hold-to run control devices associated with reduced speed of the dangerous movement.		N
5.1.6	Pressure sensitive mats, floors and edges		N
	Pressure sensitive mats or floors shall be designed in accordance with EN 1760-1:1997+A1:2009, and pressure sensitive edges shall be designed in accordance with EN 1760-2:2001+A1:2009.		N

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EN 201			
Clause	**Requirement Test**	**Result**	**Verdict**
	Pressure sensitive mats, floors and edges shall be active when the injection moulding machine is switched on.		N
5.1.7	Common requirements for automatic monitoring	Not such equipment	N
5.1.8	Movements caused by gravity during production		N
5.2	Mould area	No such area	N
5.2.1	Hazards due to the closing movement of the platen during production		N
	Where the movement of the platen is hydraulically operated, the interlocking guards shall be in accordance with Annex C or EN ISO 13849-1:2008		N
5.2.2	Sides of the machine where a cycle cannot be initiated		N
	For hydraulic machines, interlocking guards in accordance with Annex C or EN ISO 13849-1:2008		N
5.2.3	Hazards due to movements other than the closing movement of the platen during production		N
	The guards or protective devices shall also protect against these other movements.		N
5.2.4	Use of control guards		N
	As an alternative to interlocking guards, control guards in accordance with EN ISO 12100-1:2003		N
5.2.5	Thermal hazards		N
	The warning sign for thermal hazard given in Annex L, Figure L.2 shall be fitted to draw attention to the hazards caused by hot moulds and heating elements.		N
5.2.6	Additional safety requirements for machines with a downstroking platen		N
	Hydraulic downstroking injection moulding machines shall be equipped with two independent mechanical and/or hydraulic restraint devices.		N
5.2.7	Additional requirements for machines where whole body access is possible between the interlocking guard or light curtain for the mould area and the mould area itself		N
5.2.8	Additional requirements for machines where whole body access is possible to the mould area.		N
5.2.9	Additional requirements for machines with L-Type configuration during production		N
5.3	Clamping mechanism area or area behind the mobile platen	Complied	P
5.3.1	Basic safety requirements		P
	To prevent access to dangerous movements in the clamping mechanism area or to the area behind the mobile platen, guards in accordance with Annex B or E or EN ISO 13849-1:2008, PL r = d shall be provided.	Comply with EN ISO 13849-1	P
5.3.2	Additional safety requirements for machines with an upstroking platen	Complied	P
	On hydraulic upstroking machines, shearing or crushing hazards below the mobile platen due to unintentional gravity descent of that platen during setting the strokes for the cores and ejectors, shall be prevented by a restraint device that shall be effective over the complete dangerous stroke of the platen when the guards for the clamping mechanism area have been opened or the light curtains have been interrupted or the manual actuators of any two-hand control devices have been released.		P
5.4	Area of movement of core and ejector drive mechanisms outside the mould area and outside the clamping mechanism area		P
5.5	Nozzle area		N
5.5.1	Mechanical hazards		N

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Clause	**Requirement Test**	**Result**	**Verdict**
	Direct access to the nozzle area shall be prevented by interlocking guards or a combination of fixed and interlocking guards.		N
5.5.2	Thermal hazards		N
	Warning notices as shown in Annex L, Figure L.2 shall be displayed drawing attention to the hazards associated with the hot nozzle and unintentional ejection of material from the nozzle.		N
5.6	Plasticising and/or injection unit area		P
5.6.1	Mechanical hazards		P
	The feed opening shall be designed so that access to the crushing, shearing and/or drawing-in points is prevented, even when the automatic feeding system or the hopper are removed.	Complied	P
5.6.2	Thermal hazards		P
	The requirements in accordance with 5.5.2 shall be met.	Complied	P
5.6.3	Mechanical and/or thermal hazards		P
	The temperature of the plasticising and/or injection cylinders shall be automatically monitored to ensure that the temperature does not exceed the maximum permissible value set by the manufacturer with regard to the mechanical strength of the barrel	Complied	P
5.7	Discharge area		P
	The discharge aperture shall be designed or safeguards shall be provided to prevent access to any dangerous movement through this aperture.	Complied	P
5.8	Safety requirements and/or protective measures against hazards not associated with a particular area of the machine		P
5.8.1	Whiplash of flexible hoses		P
5.8.2	Release of fluids under pressure		P
5.8.3	Hazards during adjustment and servicing		P
5.8.4	Electrical hazards and hazards due to electromagnetic interference		P
5.8.5	Thermal hazards		P
5.8.6	Hazards generated by noise		P
5.8.7	Hazards generated by gases, fumes and dusts		P
5.8.8	Slip, trip and fall hazards		P
5.8.9	Hydraulic and pneumatic systems		P
5.8.10	Power operated guards		P
5.9	Additional safety requirements and/or protective measures associated with specific machine design		N
5.9.1	Carousel machines		N
5.9.2	Shuttle-table machines/machines with sliding lower platen and turn-table machines		N
5.9.3	Multistation machines with mobile injection unit		N
5.9.4	Cellular foam injection moulding machines		N
5.10	Additional safety requirements and/or protective measures when using ancillary equipment		N
5.10.1	Power operated mould changing equipment		N
5.10.2	Power operated mould clamping devices		N
5.10.3	Fluid injectors		N
5.10.4	Other ancillary equipment		N
6	**Verification of the safety requirements and/or protective measures**		P
	Type tests shall be used to verify the safety requirements and/or protective measures in accordance with Table 1.	Complied	P
7	**Information for use**		P
7.1	Instruction handbook		P

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Clause	**Requirement Test**	**Result**	**Verdict**
	Each injection moulding machine shall be accompanied by a handbook giving general instructions for use and the following information.	Complied	P
7.1.1	Emergency stop		P
	The manufacturer shall indicate the effects of the emergency stop.	Complied	P
7.1.2	Stopping performance		P
	The manufacturer shall specify the maximum stopping time of the parts driven by electrical axes for which there is an interlocking guard without guard locking.	Complied	P
7.1.3	Stopping time		P
	The manufacturer shall state that the user should ensure that the stopping time relating to the light curtains and two-hand control devices is verified at least once a year.	Complied	P
7.1.4	Light curtains		P
	The manufacturer shall give adequate instructions on the verification of the stopping time and that on an injection moulding machine equipped with light curtains, moulds protruding from the mould area should not be used.	Complied	P
7.1.5	Parking brakes		N
	The manufacturer shall specify the frequency (at least once per shift) and procedure for testing the parking brake system.		N
	The manufacturer shall specify the maximum additional mass that can be added to the parts liable to move by gravity.		N
	The manufacturer shall also specify which replacement belts should be used.		N
7.1.6	Moulds and extensions		N
	The manufacturer shall inform the user that the moulds and extensions should not protrude from the mould area.		N
7.1.7	Movements of cores and ejectors		P
	a) The manufacturer shall indicate to the user that the components in the kinematic line must be selected and arranged so that the maximum speed of cores and ejectors is ≤ 10 mm/s.	Complied	P
	b) The manufacturer shall indicate that in the case that a position selector with a position 3 is installed, it is the responsibility of the user to ensure that if position 3 is selected, the design of the mould, cores and ejectors and their drive mechanisms prevent access to shearing or crushing area created by the movements of the cores and ejectors and their drive mechanisms.	Complied	P
7.1.8	Thermal hazards in the mould area		P
	The manufacturer shall specify which items of personal protective equipment against thermal hazards should be provided by the user to operators working in this area.	Complied	P
7.1.9	Maintenance operations on vertical machines		P
	For machines with downstroking or upstroking platen, the manufacturer shall describe the safe blocking of the platen for maintenance operations.	Complied	P
7.1.10	Machines where whole body access is possible		P
	The manufacturer shall inform the user how the function of pressure sensitive mats and floors should be tested.	Complied	P
7.1.11	Presence detecting devices in the mould area		P
	The manufacturer shall state that presence detecting devices in accordance with 5.2.7 or 5.2.8 may require readjustment after a mould change.	Complied	P
7.1.12	Plasticising and/or injection unit		P
	The manufacturer shall give information for changing the screw and the non return valve for the melt.	Complied	P

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Clause	**Requirement Test**	**Result**	**Verdict**
	The manufacturer shall give information for selecting and for assembly/disassembly of the nozzle.	Complied	P
	The manufacturer shall state that only nozzles, plasticising and/or injection cylinders and their fastening bolts as specified by the manufacturer should be used.	Complied	P
	The manufacturer shall state that due to insufficient pre-drying or degradation of certain plastic materials,unintentional ejection from the nozzle or the feed opening may occur and that in this case appropriate personal protective equipment should be worn.	Complied	P
	The manufacturer shall declare the maximum permissible limit value of the temperature of the plasticising and/or injection cylinders.	Complied	P
	The manufacturer shall state that for all work at the plasticising and/or injection unit at least a face shield and gloves should be used.	Complied	P
7.1.13	Machines with L-Type configuration		P
	The manufacturer shall state that the user should set the heating parameters of the machine in accordance with the specifications of the material supplier.	Complied	P
	The manufacturer shall inform the user about the risks due to degradation of the material due to too high a temperature and/or too long a residence time in the barrel.	Complied	P
	The manufacturer shall state that at least a face-shield and gloves should be worn during setting, start-up and fault-finding etc.	Complied	P
	The manufacturer shall indicate for which moulds and which materials the machine is designed and under which circumstances it should be used.	Complied	P
7.1.14	Flexible hose assemblies		P
	The manufacturer shall give information on regular inspections of flexible hose assemblies and their replacement.	Complied	P
7.1.15	Adjustment and servicing		P
	The manufacturer shall give information for adjustment and servicing and how to use the special tools and equipment.	Complied	P
7.1.16	Exhaust system		P
	The manufacturer shall indicate that some materials can emit harmful gases, vapours or dusts during processing and that an exhaust system is then needed.	Complied	P
7.1.17	Designated access and working positions		P
	The manufacturer shall indicate that all positions which are not marked in accordance with 5.8.8 are not to be used as access or working positions.	Complied	P
	The manufacturer shall remind the user that it is the user's responsibility to keep the floor and the designated access and working positions free from oil and granules.	Complied	P
7.1.18	Non-permanent safe means of access		P
	The manufacturer shall indicate:		P
	--the appropriate characteristics of the non-permanent safe means of access to the designated working positions on the machines;		P
	--the space to be reserved in order to install and use the non-permanent means of access;		P
	--the necessary precautions when installing and using the non-permanent means of access.		P
	The manufacturer shall indicate that the user is responsible for providing non-permanent means of access that are safe against slipping, tripping and falling.		P

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Clause	**Requirement Test**	**Result**	**Verdict**
	The manufacturer shall inform the user about the correct positioning of the non-permanent safe means of access so that danger areas of the machine cannot be reached from those means of access.		P
7.1.19	Automatic feeding of material		P
	The manufacturer shall state that the machine is designed for automatic feeding only. They shall inform the user that all devices for automatic feeding of material should be in place before the machine is started.	Complied	P
7.1.20	Manual feeding of material		P
	The manufacturer shall inform the user that all means of access necessary for manual feeding material should be in place before the machine is started.	Complied	P
7.1.21	The machine manufacturer shall declare the following:	Complied	P
	--the intended use;		P
	--only trained and qualified personal should be allowed to operate the magnetic clamping system;		P
	--the magnetic clamping force for smallest/largest mould under ideal conditions;		P
	--a method to estimate the magnetic clamping force for a particular mould;		P
	--mould and/or base plate material requirements;		P
	--minimum base plate thickness;		P
	--a formula to calculate allowable cantilever force from the mould		P
	--required minimum contact area of mould, taking into account		P
	--required conditions of mating surfaces;		P
	--limit temperature for the magnetic force specified;		P
	--allowable ejector force and importance of properly adjusting the ejector stroke and alignment;		P
	--allowable nozzle force and mould opening force;		P
	--overpacking the mould will increase the force that is necessary to open the mould;		P
	--mould change procedure(s);		P
	--warn users that the magnetic field exerts a high force on ferrous objects placed close to the magnetic clamping system surface and could create pinch points;		P
	--warn users not to magnetise the magnetic clamping system without the mould being in contact with the magnetic clamping system surface;		P
	--optimum magnetic clamping force for each mould is achieved when the magnetic field is built with the surfaces already in contact;		P
	--pacemakers, hearing aids or other medical devices can be damaged or affected by the use of the magnetic clamping system;		P
	--the magnetic clamping system cannot be re-located, re-installed or switched from one horizontal injection moulding machine to another without first contacting the machine manufacturer;		P
	--recommended maintenance schedule;		P
	--the magnetic clamping system shall be switched off when the horizontal injection moulding machine is switched off;		P

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Clause	**Requirement Test**	**Result**	**Verdict**
	--the function of the emergency stop		P
	--the procedures after an alarm.		P
7.1.22	Ancillary equipment		P
	The machine manufacturer shall give adequate information so that the safety level is not reduced when ancillary equipment which has not been supplied by them is installed by the user.	Complied	P
7.1.23	Applying ergonomic principles when using ancillary equipment		P
	The manufacturer shall state that the installation of ancillary equipment should not reduce the necessary visibility of dangerous machine areas, nor prevent access to the working positions specified in the instruction handbook.	Complied	P
7.1.24	Bursting of moulded parts		P
	The manufacturer shall describe suitable measures to reduce the hazard of bursting of the moulded parts after demoulding.	Complied	P
7.1.25	Cellular foam injection moulding		P
	The manufacturer shall inform the user that in case of hotrunners, moulds with shut-off nozzles should be used.	Complied	P
	The manufacturer shall inform the user that with the machine running in manual or semiautomatic mode, the operator should use personal protective equipment.	Complied	P
7.1.26	Hydraulic system cleaning		P
	The manufacturer shall specify procedures and time intervals for the cleaning and changing of filters and refilling the hydraulic system.	Complied	P
	The manufacturer shall advise the user that whilst working on the hydraulic system, appropriate measures should be taken to avoid contamination of the oil.	Complied	P
7.1.27	Noise emission		P
	The instruction handbook shall:	Complied	P
	--give noise emission values of the injection moulding machines in accordance with Annex K of this standard and A.2.2 of EN ISO 4871:2009, as dual-number emission values;		P
	--refer to the noise test code specified in Annex K to this standard upon which the determination of the noise emission values of the injection moulding machine is based and state which basic noise measurement standards have been used.		P
7.1.28	Splashing hazards where two-hand control devices are used		P
	If the machine is designed so that the design of the mould has to contribute to prevent the splashing hazard, the machine manufacturer has to inform the user that only moulds of an appropriate design should be used for processing materials other than rubber.	Complied	P
7.2	Marking		P
	The minimum markings for all machines shall include:		P
	--designation of the machinery;	Injection molding machine	P
	--name and address of the manufacturer and supplier;	ZHEN HUA PRECISION MACHINERY CO., LTD.	P
	--business name and full address of the authorised representative (where applicable);		P
	--CE mark;	CE	P
	--designation of series or type;	See page 1	P
	--serial number if any, or machine number;	Complied	P
	--year of construction;	Complied	P

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Clause	**Requirement Test**	**Result**	**Verdict**
	--designated access positions and designated working positions on the machine;	Complied	P
	--warning notices about hot parts: heat conditioning hoses and fittings, moulds, heating elements and nozzles.	Complied	P
	In addition, where a light curtain or two-hand control device is used, the following shall be included:	Complied	P
	--the stopping time; and	Complied	P
	--the distance between the light curtain and the mould area; or	Complied	P
	--the distance between the two-hand control and the mould area.	Complied	P
	In addition where a magnetic clamping system is delivered by the machine manufacturer at the same time as the machine, safety signs shall be displayed to indicate that:	Complied	P
	--ferromagnetic objects close to the platen may be subjected to a magnetic force; and	Complied	P
	--pacemakers, hearing aids or other medical devices can be damaged or affected by the use of the magnetic clamping system.	Complied	P

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Clause	**Requirement Test**	**Result**	**Verdict**
4	**General requirements**		P
4.1	General		P
4.2	Selection of equipment		P
4.2.1	General		P
	Electrical components and devices shall:		P
	– be suitable for their intended use		N
	– conform to relevant IEC standards where such exist		P
	– be applied in accordance with the supplier's instructions.		N
4.2.2	Electrical equipment in compliance with the EN 60439 series		P
4.3	Electrical supply		P
4.3.1	General		P
	The electrical equipment shall be designed to operate correctly with the conditions of the supply:		P
	– as specified in 4.3.2 or 4.3.3,		P
	– as otherwise specified by the user (see Annex B)		N
	– as specified by the supplier in the case of a special source of supply such as an on-board generator.		N
4.3.2	AC supplies		P
	Voltage Steady state voltage: 0,9 to 1,1 of nominal voltage.		P
	Frequency 0,99 to 1,01 of nominal frequency continuously; 0,98 to 1,02 short time.		P
	Harmonics Harmonic distortion not exceeding 10 % of the total r.m.s. voltage between live conductors for the sum of the 2nd through to the 5th harmonic. An additional 2 % of the total r.m.s. voltage between live conductors for the sum of the 6th through to the 30th harmonic is permissible.		P
	Voltage unbalance Neither the voltage of the negative sequence component nor the voltage of the zero sequence component in three-phase supplies exceeding 2 % of the positive sequence component.		N
	Voltage interruption Supply interrupted or at zero voltage for not more than 3 ms at any random time in the supply cycle with more than 1 s between successive interruptions.		P
	Voltage dips Voltage dips not exceeding 20 % of the peak voltage of the supply for more than one cycle with more than 1 s between successive dips.		P
4.3.3	DC supplies		N
4.3.4	Special supply systems		N
	For special supply systems such as on-board generators, the limits given in 4.3.2 and 4.3.3 may be exceeded provided that the equipment is designed to operate correctly with those conditions.		N
4.4	Physical environment and operating conditions		P
4.4.1	General		P
	The electrical equipment shall be suitable for the physical environment and operating conditions of its intended use. The requirements of 4.4.2 to 4.4.8 cover the physical environment and operating conditions of the majority of machines covered by this part of EN 60204. When special conditions apply or the limits specified are exceeded, an agreement between user and supplier (see 4.1) is recommended (see Annex B).		P
4.4.2	Electromagnetic compatibility (EMC)		P

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Clause	**Requirement Test**	**Result**	**Verdict**
	The equipment shall not generate electromagnetic disturbances above levels that are appropriate for its intended operating environment. In addition, the equipment shall have a level of immunity to electromagnetic disturbances so that it can function in its intended environment.	Comply with the EN61000-6-2 and EN61000-6-4	P
4.4.3	Ambient air temperature		P
	Electrical equipment shall be capable of operating correctly in the intended ambient air temperature. The minimum requirement for all electrical equipment is correct operation between air temperatures of +5 °C and +40 °C. For very hot environments (for example hot climates, steel mills, paper mills) and for cold environments, additional measures are recommended (see Annex B).		P
4.4.4	Humidity		P
	The electrical equipment shall be capable of operating correctly when the relative humidity does not exceed 50 % at a maximum temperature of +40 °C. Higher relative humidities are permitted at lower temperatures (for example 90 % at 20 °C).		P
	Harmful effects of occasional condensation shall be avoided by design of the quipment or, where necessary, by additional measures (for example built-in heaters, air conditioners, drain holes).		N
4.4.5	Altitude		P
	Electrical equipment shall be capable of operating correctly at altitudes up to 1 000 m above mean sea level.		P
4.4.6	Contaminants		N
4.4.7	Ionizing and non-ionizing radiation		N
4.4.8	Vibration, shock, and bump		P
	Undesirable effects of vibration, shock and bump (including those generated by the machine and its associated equipment and those created by the physical environment) shall be avoided by the selection of uitable equipment, by mounting it away from the machine, or by provision of anti-vibration mountings. A special agreement is recommended between the supplier and the user (see Annex B).		P
4.5	Transportation and storage		P
	Electrical equipment shall be designed to withstand, or suitable precautions shall be taken to protect against, the effects of transportation and storage temperatures within a range of –25 °C to +55 °C and for short periods not exceeding 24 h at up to +70 °C. Suitable means shall be provided to prevent damage from humidity, vibration, and shock. A special agreement can be necessary between the supplier and the user (see Annex B).		P
4.6	Provisions for handling		N
	Heavy and bulky electrical equipment that has to be removed from the machine for transport, or that is independent of the machine, shall be provided with suitable means for handling by cranes or similar equipment.		N
4.7	Installation		N
	Electrical equipment shall be installed in accordance with the electrical equipment supplier's instructions.		N
5	**Incoming supply conductor terminations and devices for disconnecting and switching off**		**P**
5.1	Incoming supply conductor terminations	Detachable Power Supply	P
5.2	Terminal for connection to the external protective earthing system		P
5.3	Supply disconnecting (isolating) device		P
5.3.1	General		P

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Clause	**Requirement Test**	**Result**	**Verdict**
5.3.2	Type	Power switch	P
5.3.3	Requirements		P
5.3.4	Operating means		N
5.3.5	Excepted circuits		N
5.4	Devices for switching off for prevention of unexpected start-up		N
5.5	Devices for disconnecting electrical equipment		N
5.6	Protection against unauthorized, inadvertent and/or mistaken connection		N
6	**Protection against electric shock**		P
6.1	General		P
6.2	Protection against direct contact		P
6.2.1	General		P
6.2.2	Protection by enclosures		P
6.2.3	Protection by insulation of live parts		P
6.2.4	Protection against residual voltages		P
6.2.5	Protection by barriers		P
6.2.6	Protection by placing out of reach or protection by obstacles		P
6.3	Protection against indirect contact		P
6.3.1	General		N
6.3.2	Prevention of the occurrence of a touch voltage		N
6.3.2.1	General		N
6.3.2.2	Protection by provision of class II equipment or by equivalent insulation		N
6.3.2.3	Protection by electrical separation		P
6.3.3	Protection by automatic disconnection of supply		N
6.4	Protection by the use of PELV		N
6.4.1	General requirements		N
6.4.2	Sources for PELV		N
7	**Protection of equipment**		P
7.1	General		P
7.2	Overcurrent protection		P
7.2.1	General		P
7.2.2	Supply conductors		N
7.2.3	Power circuits		N
7.2.4	Control circuits		N
7.2.5	Socket outlets and their associated conductors		N
7.2.6	Lighting circuits		N
7.2.7	Transformers	CE certification power supply	P
7.2.8	Location of overcurrent protective devices		N
7.2.9	Overcurrent protective devices	Fuse	P
7.2.10	Rating and setting of overcurrent protective devices		P
7.3	Protection of motors against overheating	CE certification motor	P
7.4	Abnormal temperature protection		P
7.5	Protection against supply interruption or voltage reduction and subsequent Restoration		N
7.6	Motor overspeed protection	Step motor	P
7.7	Earth fault/residual current protection		N
7.8	Phase sequence protection		N
7.9	Protection against overvoltages due to lightning and to switching surges	varistor	P
8	**Equipotential bonding**		N
8.1	General		N

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Clause	**Requirement Test**	**Result**	**Verdict**
8.2	Protective bonding circuit		N
8.2.1	General		N
8.2.2	Protective conductors		N
8.2.3	Continuity of the protective bonding circuit		N
8.2.4	Exclusion of switching devices from the protective bonding circuit		N
8.2.5	Parts that need not be connected to the protective bonding circuit		N
8.2.6	Protective conductor connecting points		N
8.2.7	Mobile machines		N
8.2.8	Additional protective bonding requirements for electrical equipment having earth leakage currents higher than 10 mA a.c. or d.c.		N
8.3	Functional bonding		N
8.4	Measures to limit the effects of high leakage current		P
9	**Control circuits and control functions**		P
9.1	Control circuits		P
9.1.1	Control circuit supply	CE certification power supply	P
9.1.2	Control circuit voltages		P
	The nominal value of the control voltage shall be consistent with the correct operation of the control circuit. The nominal voltage shall not exceed 277 V when supplied from a transformer.		P
9.1.3	Protection		P
	Control circuits shall be provided with overcurrent protection in accordance with 7.2.4 and 7.2.10.		P
9.2	Control functions		P
9.2.1	Start functions		P
9.2.2	Stop functions		P
	There are three categories of stop functions as follows:		--
	– stop category 0: stopping by immediate removal of power to the machine actuators (i.e. an uncontrolled stop – see 3.56);		P
	– stop category 1: a controlled stop (see 3.11) with power available to the machine actuators to achieve the stop and then removal of power when the stop is achieved;		N
	– stop category 2: a controlled stop with power left available to the machine actuators.		N
9.2.3	Operating modes		N
9.2.4	Suspension of safety functions and/or protective measures		N
9.2.5	Operation		P
9.2.5.1	General		P
	The necessary safety functions and/or protective measures (for example interlocks (see 9.3)) shall be provided for safe operation.		N
	Measures shall be taken to prevent movement of the machine in an unintended or unexpected manner after any stopping of the machine (for example due to locked-off condition, power supply fault, battery replacement, lost signal condition with cableless control).		P
	Where a machine has more than one control station, measures shall be provided to ensure that initiation of commands from different control stations do not lead to a hazardous situation.		N
9.2.5.2	Start		P
	The start of an operation shall be possible only when all of the relevant safety functions and/or protective measures are in place and are operational		P
9.2.5.3	Stop		P

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Clause	**Requirement Test**	**Result**	**Verdict**
	Stop category 0 and/or stop category 1 and/or stop category 2 stop functions shall be provided as indicated by the risk assessment and the functional requirements of the machine (see 4.1).	category 0	P
9.2.5.4	Emergency operations (emergency stop, emergency switching off)		P
9.2.5.4.1	General		P
9.2.5.4.2	Emergency stop		P
	Principles for the design of emergency stop equipment, including functional aspects, are given in ISO 13850.		P
	The emergency stop shall function either as a stop category 0 or as a stop category 1 (see 9.2.2). The choice of the stop category of the emergency stop depends on the results of a risk assessment of the machine.	category 0	P
9.2.5.4.3	Emergency switching off		P
9.2.5.5	Monitoring of command actions		P
	Movement or action of a machine or part of a machine that can result in a hazardous situation shall be monitored by providing, for example, overtravel limiters, motor overspeed detection, mechanical overload detection or anti-collision devices.		P
9.2.6	Other control functions		P
9.2.6.1	Hold-to-run controls		P
	Hold-to-run controls shall require continuous actuation of the control device(s) to achieve operation.		N
9.2.6.2	Two-hand control		N
9.2.6.3	Enabling control		N
9.2.6.4	Combined start and stop controls		N
9.2.7	Cableless control		N
9.2.7.1	General		
9.2.7.2	Control limitation		N
	Measures shall be taken to ensure that control commands:		N
9.2.7.3	Stop		N
9.2.7.4	Use of more than one operator control station		N
9.2.7.5	Battery-powered operator control stations		N
9.3	Protective interlocks		N
9.3.1	Reclosing or resetting of an interlocking safeguard		N
9.3.2	Exceeding operating limits		N
9.3.3	Operation of auxiliary functions		N
9.3.4	Interlocks between different operations and for contrary motions		N
9.3.5	Reverse current braking		N
9.4	Control functions in the event of failure		P
9.4.1	General requirements		P
	Where failures or disturbances in the electrical equipment can cause a hazardous situation or damage to the machine or to the work in progress, appropriate measures shall be taken to minimize the probability of the occurrence of such failures or disturbances. The required measures and the extent to which they are implemented, either individually or in combination, depend on the level of risk associated with the respective application (see 4.1).		P
	The electrical control circuits shall have an appropriate level of safety performance that has been determined from the risk assessment at the machine. The requirements of IEC 62061 and/or ISO 13849-1:1999, ISO 13849-2:2003 shall apply.		N
	Measures to reduce those risks include but are not limited to:		N

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Clause	**Requirement Test**	**Result**	**Verdict**
	– protective devices on the machine (for example interlocking guards, trip devices);		N
	– protective interlocking of the electrical circuit;		N
	– use of proven circuit techniques and components (see 9.4.2.1);		P
	– provision of partial or complete redundancy (see 9.4.2.2) or diversity (see 9.4.2.3);		N
	– provision for functional tests (see 9.4.2.4).		P
9.4.2	Measures to minimize risk in the event of failure		P
9.4.2.1	Use of proven circuit techniques and components		P
	These measures include but are not limited to:		P
	– bonding of control circuits to the protective bonding circuit for functional purposes (see 9.4.3.1 and Figure 2);		P
	– connection of control devices in accordance with 9.4.3.1;		P
	– stopping by de-energizing (see 9.2.2);		P
	– the switching of all control circuit conductors to the device being controlled (see 9.4.3.1);		P
	– switching devices having direct opening action (see IEC 60947-5-1);		P
	– circuit design to reduce the possibility of failures causing undesirable operations.		P
9.4.2.2	Provisions of partial or complete redundancy		N
	Where off-line redundancy which is not active during normal operation is provided, suitable measures shall be taken to ensure that those control circuits are available when required.		N
9.4.2.3	Provision of diversity		N
	– the combination of normally open and normally closed contacts operated by interlocking guards;		N
9.4.2.4	Provision for functional tests		P
9.4.3	Protection against maloperation due to earth faults, voltage interruptions and loss of circuit continuity		N
9.4.3.1	Earth faults		P
	Earth faults on any control circuit shall not cause unintentional starting, potentially hazardous motions, or prevent stopping of the machine.		P
	Method a) Control circuits, fed by control transformers:		P
	1) In case of earthed control circuit supplies, the common conductor is connected to the protective bonding circuit at the point of supply. All contacts, solid state elements etc., which are intended to operate an electromagnetic or other device (for example, a relay, indicator light) are inserted between one side, the switched conductor of the control circuit supply and one terminal of the coil or device. The other terminal of the coil or device (preferably always having the same marking) is connected directly to the common conductor of the control circuit supply without any switching elements (see Figure 3).		P
	2) Control circuits fed from a control transformer and not connected to the protective bonding circuit, having the same arrangement as shown in Figure 3 and provided with a device that interrupts the circuit automatically in the event of an earth fault (see also 7.2.4).		P
	Method b) Control circuits fed from a control transformer with a centre-tapped winding, this centre tap connected to the protective bonding circuit, arranged as shown in Figure 4 with the overcurrent protective device having switching elements in all control circuit supply conductors.		N
	Method c) Where the control circuit is not fed from a control transformer and is either:		N

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Clause	**Requirement Test**	**Result**	**Verdict**
	1) directly connected between the phase conductors of an earthed supply, or;		N
	2) directly connected between the phase conductors or between a phase conductor and a neutral conductor of a supply that is not earthed or is earthed through a high impedance,		N
	Multi-pole control switches that switch all live conductors are used for START or STOP of those machine functions that can cause a hazardous situation or damage to the machine in the event of unintentional starting or failure to stop, or in the case of c) 2), a device shall be provided that interrupts the circuit automatically in the event of an earth fault.		N
9.4.3.2	Voltage interruptions		N
9.4.3.3	Loss of circuit continuity		N
	Where the loss of continuity of safety-related control circuits depending upon sliding contacts can result in a hazardous situation, appropriate measures shall be taken (for example by duplication of the sliding contacts).		N
10	**Operator interface and machine-mounted control devices**		N
10.1	General		P
10.1.1	General device requirements		P
	This Clause contains requirements for devices mounted outside or partially outside control enclosures.		P
	As far as is practicable, those devices shall be selected, mounted, and identified or coded in accordance with relevant parts of IEC 61310.		P
10.1.2	Location and mounting	Complied	P
10.1.3	Protection		P
	The degree of protection (see IEC 60529) together with other appropriate measures shall afford protection against:		P
10.1.4	Position sensorsv		P
	Position sensors (for example position switches, proximity switches) shall be so arranged that they will not be damaged in the event of overtravel.		P
	Position sensors in circuits with safety-related control functions shall have direct opening action (see IEC 60947-5-1) or shall provide similar reliability (see 9.4.2).		P
10.1.5	Portable and pendant control stations		N
	Portable and pendant operator control stations and their control devices shall be so selected and arranged as to minimize the possibility of inadvertent machine operations caused by shocks and vibrations (for example if the operator control station is dropped or strikes an obstruction) (see also 4.4.8).		N
10.2	Push-buttons		P
10.2.1	Colours	Complied	P
10.2.2	Markings		P
	In addition to the functional identification as described in 16.3, it is recommended that pushbuttons be marked, near to or preferably directly on the actuators, with the symbols given in Table 3.	Complied	P
10.3	Indicator lights and displays		P
10.3.1	General	Complied	P
10.3.2	Colours	Complied	P
10.3.3	Flashing lights and displays	Complied	P
10.4	Illuminated push-buttons		N

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Clause	**Requirement Test**	**Result**	**Verdict**
	Illuminated push-button actuators shall be colour-coded in accordance with Tables 2 and 4. Where there is difficulty in assigning an appropriate colour, WHITE shall be used. The colour RED for the emergency stop actuator shall not depend on the illumination of its light.		N
10.5	Rotary control devices		P
	Devices having a rotational member, such as potentiometers and selector switches, shall have means of prevention of rotation of the stationary member. Friction alone shall not be considered sufficient.		P
10.6	Start devices		P
	Actuators used to initiate a start function or the movement of machine elements (for example slides, spindles, carriers) shall be constructed and mounted so as to minimize inadvertent operation. However, mushroom-type actuators may be used for two-hand control (see also ISO 13851).		P
10.7	Emergency stop devices		P
10.7.1	Location of emergency stop devices		P
	Devices for emergency stop shall be readily accessible.		P
10.7.2	Types of emergency stop device		P
	The types of device for emergency stop include:		P
	– a push-button operated switch with a palm or mushroom head type;		P
	– a pull-cord operated switch;		N
	– a pedal-operated switch without a mechanical guard.		N
10.7.3	Colour of actuators		P
	Actuators of emergency stop devices shall be coloured RED. If a background exists immediately around the actuator, then this background shall be coloured YELLOW. See also ISO 13850.		P
10.7.4	Local operation of the supply disconnecting device to effect emergency stop		P
	The supply disconnecting device may be locally operated to serve the function of emergency stop when:		P
	– it is readily accessible to the operator; and		P
	– it is of the type described in 5.3.2 a), b), c), or d).		P
10.8	Emergency switching off devices		P
10.8.1	Location of emergency switching off devices		P
	Emergency switching off devices shall be located as necessary for the given application Normally, those devices will be located separate from operator control stations. Where it is necessary to provide a control station with an emergency stop device and an emergency switching off device, means shall be provided to avoid confusion between these devices.		P
10.8.2	Types of emergency switching off device		P
	The types of device for emergency switching off include:		P
	– a push-button operated switch with a palm or mushroom head type of actuator;		P
	– a pull-cord operated switch.		P
10.8.3	Colour of actuators		P
	Actuators of emergency switching off devices shall be coloured RED. If a background exists immediately around the actuator, then this background shall be coloured YELLOW.		P
10.8.4	Local operation of the supply disconnecting device to effect emergency switching off		P
	Where the supply disconnecting device is to be locally operated for emergency switching off, it shall be readily accessible and should meet the colour requirements of 10.8.3.		P

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Clause	**Requirement Test**	**Result**	**Verdict**
10.9	Enabling control device		N
11	**Controlgear: location, mounting, and enclosures**		P
11.1	General requirements		P
	– its accessibility and maintenance;		P
	– its protection against the external influences or conditions under which it is intended to operate;		P
	– operation and maintenance of the machine and its associated equipment.		P
11.2	Location and mounting		P
11.2.1	Accessibility and maintenance		P
11.2.2	Physical separation or grouping		P
	Non-electrical parts and devices, not directly associated with the electrical equipment, shall not be located within enclosures containing controlgear. Devices such as solenoid valves should be separated from the other electrical equipment (for example in a separate compartment).	Complied	P
	Control devices mounted in the same location and connected to the supply voltage, or to both supply and control voltages, shall be grouped separately from those connected only to the control voltages.	Complied	P
11.2.3	Heating effects		P
	Heat generating components (for example heat sinks, power resistors) shall be so located that the temperature of each component in the vicinity remains within the permitted limit.		P
11.3	Degrees of protection		P
	The protection of controlgear against ingress of solid foreign objects and of liquids shall be adequate taking into account the external influences under which the machine is intended to operate (i.e. the location and the physical environmental conditions) and shall be sufficient against dust, coolants, and swarf.		P
11.4	Enclosures, doors and openings		N
11.5	Access to control gear		N
12	**Conductors and cables**		P
12.1	General requirements		P
	Conductors and cables shall be selected so as to be suitable for the operating conditions (for example voltage, current, protection against electric shock, grouping of cables) and external influences (for example ambient temperature, presence of water or corrosive substances, mechanical stresses (including stresses during installation), fire hazards) that can exist.	IEC standard cord	P
12.2	Conductors	Complied	P
12.3	Insulation	polyvinyl chloride (PVC)	P
12.4	Current-carrying capacity in normal service	Complied	P
12.5	Conductor and cable voltage drop	Complied	P
12.6	Flexible cables		N
12.6.1	Generalv		N
	Flexible cables shall have Class 5 or Class 6 conductors.		N
12.6.2	Mechanical rating		N
12.6.3	Current-carrying capacity of cables wound on drums		N
12.7	Conductor wires, conductor bars and slip-ring assemblies		N
12.7.1	Protection against direct contact		N
12.7.2	Protective conductor circuit		P
12.7.3	Protective conductor current collectors		N

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Clause	**Requirement Test**	**Result**	**Verdict**
	Protective conductor current collectors shall have a shape or construction so that they are not interchangeable with the other current collectors. Such current collectors shall be of the sliding contact type.		N
12.7.4	Removable current collectors with a disconnector function		N
	Removable current collectors having a disconnector function shall be so designed that the protective conductor circuit is interrupted only after the live conductors have been disconnected, and the continuity of the protective conductor circuit is re-established before any live conductor is reconnected (see also 8.2.4).		N
12.7.5	Clearances in air		N
	Clearances between the respective conductors, and between adjacent systems, of conductor wires, conductor bars, slip-ring assemblies and their current collectors shall be suitable for at least a rated impulse voltage of an overvoltage category III in accordance with IEC 60664-1.		N
12.7.6	Creepage distances		N
	Creepage distances between the respective conductors, between adjacent systems of conductor wires, conductor bars and slip-ring assemblies, and their current collectors shall be suitable for operation in the intended environment, for example open air (IEC 60664-1), inside buildings, protected by enclosures.		N
12.7.7	Conductor system sectioning		N
	Where conductor wires or conductor bars are arranged so that they can be divided into isolated sections, suitable design measures shall be employed to prevent the energization of adjacent sections by the current collectors themselves.		N
12.7.8	Construction and installation of conductor wire, conductor bar systems and slip-ring assemblies		N
	Conductor wires, conductor bars and slip-ring assemblies in power circuits shall be grouped separately from those in control circuits.		N
13	**Wiring practices**		P
13.1	Connections and routing		P
13.1.1	General requirements	Complied	P
13.1.2	Conductor and cable runs		P
	Conductors and cables shall be run from terminal to terminal without splices or joints.		P
13.1.3	Conductors of different circuits		N
	Conductors of different circuits may be laid side by side, may occupy the same duct (for example conduit, cable trunking system), or may be in the same multiconductor cable provided that the arrangement does not impair the proper functioning of the respective circuits. Where those circuits operate at different voltages, the conductors shall be separated by suitable barriers or shall be insulated for the highest voltage to which any conductor within the same duct can be subjected, for example line to line voltage for unearthed systems and phase to earth voltage for earthed systems.		N
13.1.4	Connection between pick-up and pick-up converter of an inductive power supply system		N
	– as short as practicable;		N
	– adequately protected against mechanical damage.		N
13.2	Identification of conductors		P
13.2.1	General requirements	Complied	P

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Clause	**Requirement Test**	**Result**	**Verdict**
	Each conductor shall be identifiable at each termination in accordance with the technical documentation (see Clause 17).		P
	It is recommended (for example to facilitate maintenance) that conductors be identified by number, alphanumEngine, colour (either solid or with one or more stripes), or a combination of colour and numbers or alphanumEngine. When numbers are used, they shall be Arabic; letters shall be Roman (either upper or lower case).		P
13.2.2	Identification of the protective conductor	Complied	P
13.2.3	Identification of the neutral conductor	Complied	N
13.2.4	Identification by colour	Complied	N
13.3	Wiring inside enclosures		N
	Conductors inside enclosures shall be supported where necessary to keep them in place.		N
13.4	Wiring outside enclosures		N
13.4.1	General requirements		N
	The means of introduction of cables or ducts with their individual glands, bushings, etc., into an enclosure shall ensure that the degree of protection is not reduced (see 11.3).		N
13.4.2	External ducts		N
13.4.3	Connection to moving elements of the machine		N
13.4.4	Interconnection of devices on the machine		P
	Where several machine-mounted switching devices (for example position sensors, pushbuttons) are connected in series or in parallel, it is recommended that the connections between those devices be made through terminals forming intermediate test points. Such terminals shall be conveniently placed, adequately protected, and shown on the relevant diagrams.		P
13.4.5	Plug/socket combinations		N
13.4.6	Dismantling for shipment		N
13.4.7	Additional conductors		N
	Consideration should be given to providing additional conductors for maintenance or repair. When spare conductors are provided, they shall be connected to spare terminals or isolated in such a manner as to prevent contact with live parts.		N
13.5	Ducts, connection boxes and other boxes		N
13.5.1	General requirements		N
	Ducts shall provide a degree of protection suitable for the application (see IEC 60529).		N
13.5.2	Percentage fill of ducts		N
	Consideration of the percentage fill of ducts should be based on the straightness and length of the duct and the flexibility of the conductors.		N
13.5.3	Rigid metal conduit and fittings		N
	Rigid metal conduit and fittings shall be of galvanized steel or of a corrosion-resistant material suitable for the conditions.		N
13.5.4	Flexible metal conduit and fittings		N
	A flexible metal conduit shall consist of a flexible metal tubing or woven wire armour. It shall be suitable for the expected physical environment.		N
13.5.5	Flexible non-metallic conduit and fittings		N

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Clause	**Requirement Test**	**Result**	**Verdict**
	Flexible non-metallic conduit shall be resistant to kinking and shall have physical characteristics similar to those of the sheath of multiconductor cables.		N
13.5.6	Cable trunking systems		N
	Cable trunking systems external to enclosures shall be rigidly supported and clear of all moving or contaminating portions of the machine.		N
13.5.7	Machine compartments and cable trunking systems		N
	The use of compartments or cable trunking systems within the column or base of a machine to enclose conductors is permitted provided the compartments or cable trunking systems are isolated from coolant or oil reservoirs and are entirely enclosed..		N
13.5.8	Connection boxes and other boxes		N
	Connection boxes and other boxes used for wiring purposes shall be accessible for maintenance. Those boxes shall provide protection against the ingress of solid bodies and liquids, taking into account the external influences under which the machine is intended to operate		N
13.5.9	Motor connection boxes		N
	Motor connection boxes shall enclose only connections to the motor and motor-mounted devices		N
14	**Electric motors and associated equipment**		P
14.1	General requirements		P
	Electric motors should conform to the relevant parts of IEC 60034 series.		P
	The protection requirements for motors and associated equipment are given in 7.2 for overcurrent protection, in 7.3 for overload protection, and in 7.6 for overspeed protection.		P
	As many controllers do not switch off the supply to a motor when it is at rest, care shall be taken to ensure compliance with the requirements of 5.3, 5.4, 5.5, 7.5, 7.6 and 9.4. Motor control equipment shall be located and mounted in accordance with Clause 11.		P
14.2	Motor enclosures		N
	It is recommended that motor enclosures be chosen from those included in IEC 60034-5.		N
14.3	Motor dimensions		N
	As far as is practicable, the dimensions of motors shall conform to those given in the IEC 60072 series.		N
14.4	Motor mounting and compartments		P
	Each motor and its associated couplings, belts, pulleys, or chains, shall be so mounted that they are adequately protected and are easily accessible for inspection, maintenance, adjustment and alignment, lubrication, and replacement. The motor mounting arrangement shall be such that all motor hold-down means can be removed and all terminal boxes are accessible.		N
14.5	Criteria for motor selection		N
	The characteristics of motors and associated equipment shall be selected in accordance with the anticipated service and physical environmental conditions (see 4.4).		N
14.6	Protective devices for mechanical brakes		N
	Operation of the overload and overcurrent protective devices for mechanical brake actuators shall initiate the simultaneous de-energization (release) of the associated machine actuators.		N
15	**Accessories and lighting**		N
15.1	Accessories		N

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Clause	**Requirement Test**	**Result**	**Verdict**
	– the socket-outlets should conform to IEC 60309-1. Where that is not practicable, they should be clearly marked with the voltage and current ratings;		N
	– the continuity of the protective bonding circuit to the socket-outlet shall be ensured except where protection is provided by PELV;		N
	– all unearthed conductors connected to the socket-outlet shall be protected against overcurrent and, when required, against overload in accordance with 7.2 and 7.3 separately from the protection of other circuits;		N
	– where the power supply to the socket-outlet is not disconnected by the supply disconnecting device for the machine or the section of the machine, the requirements of 5.3.5 apply.		N
15.2	Local lighting of the machine and equipment		N
15.2.1	General		N
	Connections to the protective bonding circuit shall be in accordance with 8.2.2.		N
	The ON/OFF switch shall not be incorporated in the lampholder or in the flexible connecting cords.		N
	Stroboscopic effects from lights shall be avoided by the selection of appropriate luminaires.		N
15.2.2	Supply		N
	The nominal voltage of the local lighting circuit shall not exceed 250 V between conductors. A voltage not exceeding 50 V between conductors is recommended.		P
	– a dedicated isolating transformer connected to the load side of the supply disconnecting device. Overcurrent protection shall be provided in the secondary circuit;		N
	– a dedicated isolating transformer connected to the line side of the supply disconnecting device. That source shall be permitted for maintenance lighting circuits in control enclosures only. Overcurrent protection shall be provided in the secondary circuit (see also 5.3.5 and 13.1.3);		N
	– a machine circuit with dedicated overcurrent protection;		P
	– an isolating transformer connected to the line side of the supply disconnecting device, provided with a dedicated primary disconnecting means (see 5.3.5) and secondary overcurrent protection, and mounted within the control enclosure adjacent to the supply disconnecting device (see also 13.1.3);		N
15.2.3	Protection		N
	Local lighting circuits shall be protected in accordance with 7.2.6.		N
15.2.4	Fittings		N
	– in accordance with the relevant IEC standard;		N
	– constructed with an insulating material protecting the lamp cap so as to prevent unintentional contact.		N
16	**Marking, warning signs and reference designations**		P
16.1	General		P
	Warning signs, nameplates, markings, and identification plates shall be of sufficient durability to withstand the physical environment involved.		P
16.2	Warning signs		P
16.2.1	Electric shock hazard		N
	Enclosures that do not otherwise clearly show that they contain electrical equipment that can give rise to a risk of electric shock shall be marked with the graphical symbol IEC 60417-5036 (DB:2002-10).		N

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Clause	**Requirement Test**	**Result**	**Verdict**
	The warning sign shall be plainly visible on the enclosure door or cover.		N
	The warning sign may be omitted (see also 6.2.2 b)) for:		N
	– an enclosure equipped with a supply disconnecting device;		N
	– an operator-machine interface or control station;		N
	– a single device with its own enclosure (for example position sensor).		N
16.2.2	Hot surfaces hazard		N
	Where the risk assessment shows the need to warn against the possibility of hazardous surface temperatures of the electrical equipment, the graphical symbol IEC 60417-5041 (DB:2002-10) shall be used.		N
16.3	Functional identification		N
	Control devices, visual indicators, and displays (particularly those related to safety) shall be clearly and durably marked with regard to their functions either on or adjacent to the item. Such markings may be as agreed between the user and the supplier of the equipment (see Annex B). Preference should be given to the use of standard symbols given in IEC 60417-DB:2002 and ISO 7000.		P
16.4	Marking of equipment		P
	– name or trade mark of supplier;		P
	– certification mark, when required;		P
	– serial number, where applicable;		P
	– rated voltage, number of phases and frequency (if a.c.), and full-load current for each supply;		P
	– short-circuit rating of the equipment;		N
	– main document number (see IEC 62023).		P
16.5	Reference designations		P
	All enclosures, assemblies, control devices, and components shall be plainly identified with the same reference designation as shown in the technical documentation.		P
17	**Technical documentation**		P
18	**Verification**		P
18.1	General		P
	a) verification that the electrical equipment complies with its technical documentation;		P
	b) in case of protection against indirect contact by automatic disconnection, conditions for protection by automatic disconnection shall be verified according to 18.2;		N
	c) insulation resistance test (see 18.3);		P
	d) voltage test (see 18.4);		P
	e) protection against residual voltage (see 18.5);		N
	f) functional tests (see 18.6).		P
	The results of the verification shall be documented.		P
18.2	Verification of conditions for protection by automatic disconnection of supply		N
18.2.1	General		N
18.2.2	Test methods in TN-systems		N
	Test 1 – Verification of the continuity of the protective bonding circuit		N
	Test 2 – Fault loop impedance verification and suitability of the associated overcurrent protective device		N
18.2.3	Application of the test methods for TN-systems		N
18.3	Insulation resistance tests		P

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Clause	**Requirement Test**	**Result**	**Verdict**
	When insulation resistance tests are performed, the insulation resistance measured at 500 V d.c. between the power circuit conductors and the protective bonding circuit shall be not less than 1 M.The test may be made on individual sections of the complete electrical installation.	See Table18.3	P
18.4	Voltage tests		P
	When voltage tests are performed, test equipment in accordance with IEC 61180-2 should be used.	See Table18.4	P
18.5	Protection against residual voltages		N
	Where appropriate, tests shall be performed to ensure compliance with 6.2.4.		N
18.6	Functional tests		P
	The functions of electrical equipment shall be tested.		P
	The function of circuits for electrical safety (for example earth fault detection) shall be tested.		P
18.7	Retesting		P
	Where a portion of the machine and its associated equipment is changed or modified, that portion shall be reverified and retested, as appropriate (see 18.1).		P
Annex A	**Protection against indirect contact in TN-systems**		N
A.1	General		N
A.2	Conditions for protection by automatic disconnection of the supply by overcurrent protective devices		
A.3	Condition for protection by reducing the touch voltage below 50 V		N
A.4	Verification of conditions for protection by automatic disconnection of the supply		N
A.4.1	General		N
A.4.2	Measurement of the fault loop impedance		N
A.4.3	Consideration of the difference between the measured value of resistance of the conductors and the actual value under fault conditions		N
Annex B	**Enquiry form for the electrical equipment of machines**		P
	It is recommended that the following information be provided by the intended user of the equipment. It can facilitate an agreement between the user and supplier on basic conditions and additional user requirements to enable proper design, application and utilization of the electrical equipment of the machine (see 4.1).		P
Annex C	**Examples of machines covered by this part of IEC 60204**		N
	The following list shows examples of machines whose electrical equipment should conform to this part of IEC 60204. The list is not intended to be exhaustive but is consistent with the definition of machinery (3.35). This part of IEC 60204 need not be applied to machines that are household and similar domestic appliances within the scope of the IEC 60335 series of standards.		N
Annex D	**Current-carrying capacity and overcurrent protection of conductors and cables in the electrical equipment of machines**		N
	The purpose of this Annex is to provide additional information on the selection of conductor sizes where the conditions given for Table 6 (see Clause 12) have to be modified (see notes to Table 6).		N
D.1	General operating conditions		N
D.1.1	Ambient air temperature		N
	The current carrying capacity for PVC insulated conductors given in Table 6 is related to an ambient air temperature of +40 °C. For other ambient air temperatures, the correction factors are given in Table D.1.		N
D.1.2	Methods of installation		N

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Clause	**Requirement Test**	**Result**	**Verdict**
D.1.3	Grouping		N
	Where more loaded conductors in cables or conductor pairs are installed, derate the values of Iz, given in Table 6 or by the manufacturer in accordance with Tables D.2 or D.3.		N
D.2	Co-ordination between conductors and protective devices providing overload protection		N
D.3	Overcurrent protection of conductors		N
Annex E	**Explanation of emergency operation functions**		P
	Emergency stop		P
	An emergency operation intended to stop a process or a movement that has become hazardous.		P
	Emergency start		P
	An emergency operation intended to start a process or a movement to remove or to avoid a hazardous situation.		P
	Emergency switching off		P
	An emergency operation intended to switch off the supply of electrical energy to all or a part of an installation where a risk of electric shock or another risk of electrical origin is involved.		P
	Emergency switching on		P
	An emergency operation intended to switch on the supply of electrical energy to a part of an installation that is intended to be used for emergency situations.		P
Annex F	**Guide for the use of this part of IEC 60204**		N
F.1	General		N

TABLE: 18.3	**Insulation resistance and dielectric strength**		**P**
Test points		Measured value	Limit
From	To		
Line &neutral	Metal Enclosure	>100MΩ	1MΩ
Line &neutral	Plastic Enclosure	>100MΩ	1MΩ

TABLE: 18.4	**Eectric strength measurements**	**P**
Test voltage applied between:	Test voltage (V rms)	Breakdown
Line &neutral to Metal Enclosure	1000	No
Line &neutral to Plastic Enclosure	1000	No

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Appendix for photo





******** END OF THE REPORT ********

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China National Accreditation Service for Conformity Assessment

LABORATORY ACCREDITATION CERTIFICATE

(Registration No. CNAS L5885)

Shenzhen Tianhai Test Technology Co., Ltd.

(Legal Entity: Shenzhen Tianhai Test Technology Co., Ltd.)

4B/F., Building A3, The Silicon Valley Power Intelligent Terminal Industrial Park, Guanlan Street, Longhua District, Shenzhen, Guangdong, China

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Effective Date：2019-01-22

Expiry Date：2025-01-21

Signed on behalf of China National Accreditation Service for Conformity Assessment

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