



Technical Construction File

File No.: TCF(15)-365-1-MD

Type of Equipment:	SUBMERSIBLE PUMP
Model No.:	DVX 25,DVX 35,DVX 80,DVX 100 , DVX 150M , DVX 150T, DVX 200M ,DVX 300M,DVX 300T, BAFA 150M,BAFA 200M,BAFA 200T, BAFA 300M, BAFA 300T,BKS 150M , BKS 200M,2BKS 100M,2 BKS 150M, 3 BKS 200M , 4 BKS 200M
Issued Date:	2015-06-24
Brand Name/ Trade mark:	NORTEK
Directive(S)	2006/42/EC Machinery Directive
standard(s):	EN ISO 12100:2010



Presented for

NORTEK POMPA SAN.TİC.LTD.ŞTİ.
1203/7 SOK NO 1-C YENİŞEHİR / İZMİR / TURKEY

Presented by

Shanghai ECO Information Technology Co., Ltd.
Room 721-722, Cimic Plaza, No.800 Shangcheng Road, Pudong New Zone, Shanghai 200120 P.R.C



TEST REPORT

EN ISO 12100:2010

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

Report

Report reference No. : No: TCF(15)-365-1-MD

Tested by(+ signature).....: *Downey Xue*

Reviewed by(+ signature).....: *Guo Zhijiang*

Date of issue : 2015-06-24

Number of pages (Report) : 39

Testing laboratory

Name : Shanghai ECO Information Technology Co., Ltd.

Address : Room 721-722, Cimic Plaza, No.800 Shangcheng Road, Pudong
New Zone, Shanghai 200120 P.R.C

Testing location : GUANZHUANG VILLAGE, RUOHENG TOWN, WENLING
CITY, ZHEJIANG PROVINCE, P.R.CHINA

Client

Name : NORTEK POMPA SAN.TİC.LTD.ŞTİ.

Address : 1203/7 SOK NO 1-C YENİŞEHİR / İZMİR / TURKEY

Manufacturer

Name : TAIZHOU WENGGE PUMPS CO.,LTD

Address : GUANZHUANG VILLAGE, RUOHENG TOWN, WENLING
CITY, ZHEJIANG PROVINCE, P.R.CHINA

Test specification

Standard : EN ISO 12100:2010

Test procedure : CE-MD

Procedure deviation : N.A.

Non-standard test method : N.A.

General description

This device is ideal for fume and dust purification in industrial processing, welding, cutting and grinding.

Ambient temperature: 22°C humidity: 60% Complete File was conducted on DVX 25

DVX 25, DVX 35, DVX 80, DVX 100, DVX 150M, DVX 150T, DVX 200M, DVX 300M, DVX 300T, BAFA 150M, BAFA 200M, BAFA 200T, BAFA 300M, BAFA 300T, BKS150M, BKS 200M, 2BKS 100M, 2 BKS 150M, 3 BKS 200M, 4 BKS 200M are series products.

They belong to the same circuit type except the difference in power, weight and the dimension.

1. Risk assessment

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

S : Severity of possible harm

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

A : Frequency any duration of exposure

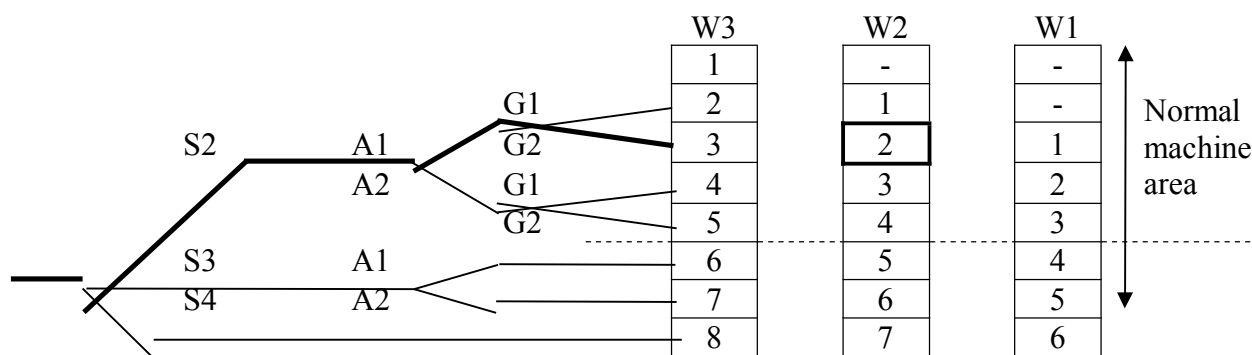
- A1 : Seldom to very often
- A2 : Frequent to continuous

G : Possibilities of avoidance

- G1 : Possible
- G2 : Impossible

W : Probability of occurrence of harm

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



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					
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	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	-
2.2	Contact with parts which have become live under faulty conditions	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	-
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 (deafness), other physiological disorders					
4.2	Interference with speech communication, acoustic signals, etc.					
Hazards generated by vibration						
5.1	Use of hand-help machines resulting in a variety of neurological and vascular disorder					
5.2	Whole body vibration, particular when combined with poor postures					
Hazards generated by radiation						
6.1	Low frequency, radio frequency radiation, microwaves					
6.2	Infrared, visible and ultraviolet light					
6.3	X and gamma rays					
6.4	Alpha, beta rays, electron or ion beams, neutrons					
6.5	Lasers					
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 micro-biological (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	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	-
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	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	-
10.2	Restoration of energy on supply after an interruption					
10.3	External influences on electrical equipment	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	-
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 from 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 from the engine and the batteries					
24.2	Hazards from the transmission of power between machines					
24.3	Hazards from coupling and towing					
Form/to third persons						
25.1	Unauthorized start-up/use					
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	<i>I</i>	<i>I</i>	<i>I</i>	<i>I</i>	-
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	2	1
Where	The Impeller parts					
When	Adjustment or maintenance of the machine					
Improvement result						
Method		S	A	G	W	Level
1. Affixing suitable warning signs.		1	1	1	1	-
2. Only operation by training/authorized persons.						
3. Operation of the machine shall conform to the instructions of the instruction manual.						
4. Check and inspection according to the specified durations of the instruction manual.						
5. Using fixed guards.						

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

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

NO.	Hazards source	S	A	G	W	Level
8.6	Human error, human behavior	2	1	1	1	1
Where	Whole machine					
When	Operation, adjustment or maintenance of the machine					
Improvement result						
Method		S	A	G	W	Level
1. Only authorized person can use the machine.		1	1	1	1	-
2. Training before using this machine.						
3. Make reference to the instruction manual before using this machine.						

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

NO.	Hazards source	S	A	G	W	Level
10.3	External influences on electrical equipment	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	-

Where	All electrical equipments equipped on the machine					
When	Working of the electrical equipments					
Improvement result						
Method		S	A	G	W	Level
1. All electrical equipments have been submitted to carry out the EMC 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
26	Insufficient instructions for the driver/operator	1	1	1	1	-
Where	Whole machine					
When	Installation, assembly/disassembly, operation, adjustment or maintenance of the machine					
Improvement result						
Method		S	A	G	W	Level
1. Edit the instruction manual in conformity with those requirement of Machinery Directive and EN ISO 12100: 2010 standard.		1	1	1	1	-
2. Each machine accompanied with a complete instruction manual.						

2. EN ISO 12100:2010 part 6-7

EN ISO 12100:2010			
Clause	Requirement	Result-Remark	Verdict
6	Risk reduction	-	
6.1	General		
	The objective of risk reduction can be achieved by the elimination of hazards, or by separately or simultaneously reducing each of the two elements that determine the associated risk: - severity of harm from the hazard under consideration; - probability of occurrence of that harm.		P
6.2	Inherently safe design measures		P
6.2.1	General		P
	Inherently safe design measures are the first and most important step in the risk reduction process because protective measures inherent to the characteristic of the machine are likely to remain effective, whereas experience has shown that even well-designed safeguarding may fail or be violated and information for use may not be followed.	Appropriate machine design has been performed by the manufacturer	P
	Inherently safe design measures are achieved by avoiding hazards or reducing risks by a suitable choice of design features of the machine itself and/or interaction between the exposed person and the machine.		P
6.2.2	Consideration of geometrical factors and physical aspects		P
6.2.2.1	Geometrical factors		P
	Such factors can be, e.g.		P
	-designing the shape of machinery to maximise direct visibility of the working areas and hazard zones from the control position, (e.g. mirrors) so as to take into account the characteristics of human vision, particularly when safe operation requires permanent direct control by operator, e.g.: -the traveling and working area of mobile machines;		P
	-the zone of movement of lifted loads or of the carrier of machine with the material being worked; The design of the machine shall be such that, from the main control position, the operator is able to ensure that there are no exposed persons in the danger zones.		P
	-the shape and the relative location of the mechanical component parts; for instance,		P

EN ISO 12100:2010			
Clause	Requirement	Result-Remark	Verdict
	crushing and shearing hazards are avoided by increasing the minimum gap between the moving parts, such that the part of the body under consideration can enter the gap safely, or by reducing the gap so that no part of the body can enter it(see ISO13852, ISO13853, ISO13854);		
	-avoiding sharp edges and corners, protruding parts. In so far as their purpose allows, accessible parts of the machinery shall have no sharp edges, no sharp angels, no rough surfaces, no protruding parts likely to cause injury, and no opening which may “trap” shall be capped;		P
	-designing the shape of the machine to achieve a proper working position and accessibility of manual controls(actuators)		P
6.2.2.2	Physical aspects		P
	Such aspects can be, e.g.		P
	-limiting the actuating force to a sufficiently low value so that the actuated part does not generate a mechanical hazard; -limiting the mass and/or velocity of the movable elements, and hence their kinetic energy;	The actuating force has been limited to be a sufficiently low value so that the actuated part does not generate a mechanical hazard	P
	-limiting the emission by acting on the characteristics of the source: -measures for reducing noise emission at source(see ISO/TR 1168-1); -measures for reducing the emission of vibration at source include e.g. redistribution or addition of mass and change of process parameters, e.g. frequency and/or amplitude of movements(for handheld and hand-guided machinery, see CR 1030-1); -measures for reducing the emission of hazardous substances include e.g. use of less hazardous substances or use of dust reducing processes; -measures for reducing radiation emissions include e.g. avoiding the use of hazardous radiation sources, limiting the power of radiation to the lowest level sufficient for the proper functioning of the machine, designing the source so that the beam is concentrated on the target, increasing the distance between the source and the operator or providing for remote operation of the machinery. -measures for the reduction of emission of		N

EN ISO 12100:2010			
Clause	Requirement	Result-Remark	Verdict
	non-ionizing radiation are given in 5.4.5(see also EN 121198-1 and -3).		
6.2.3	Taking into account the general technical knowledge regarding machine design		P
	This general technical knowledge can be derived from technical specifications for design (e.g. standards, design codes, calculation rules). These should be used to cover.		P
	a) mechanical stresses, e.g.:		P
	- stress limitation by implementation of correct calculation, construction and fastening methods as regards, e.g. bolted assemblies, welded assemblies;		P
	- stress limitation by overload prevention,(e.g. “fusible” plugs, pressure-limiting valves,breakage points, torque-limiting devices);		P
	- avoiding fatigue in elements under variable stresses(notably cyclic stresses);		P
	- static and dynamic balancing of rotating elements;		P
	b) materials and their properties , e.g.:		P
	- resistance to corrosion, ageing, abrasion and wear;		P
	- hardness, ductility, brittleness;		P
	- homogeneity;		P
	- toxicity		N
	- flammability		N
	c) emission values for:		N
	- noise;		N
	- vibration;		N
	- hazardous substances;		N
	- radiation .		N
	When the reliability of particular components or assemblies is critical for safety (e.g. ropes, chains, lifting accessories for lifting loads or persons),stress values shall be multiplied by appropriate working coefficients.	Appropriate working coefficients have been taken into account during design and calculation	P
6.2.4	Choice of an appropriate technology		N
	One or more hazards can be eliminated or risks reduced by the choice of the technology to be used in certain applications, e.g.:		N
	a) on machines intended for use in explosive atmospheres: - fully pneumatic or hydraulic control system and machine actuators; -“intrinsically safe”electrical equipment(see EN50020);		N

EN ISO 12100:2010			
Clause	Requirement	Result-Remark	Verdict
	b) For particular products to be processed such as a solvent: equipment assuring that the temperature will remain far below the flash point.		N
	c) Alternative equipment to avoid high noise level, e.g.: - electrical instead of pneumatic equipment; - in certain conditions, water cutting instead of mechanical equipment.		N
6.2.5	Applying the principle of the positive mechanical action of a component on another component		P
	If a moving mechanical component inevitably moves another component along with it, either by direct contact or via rigid elements, these components are connected in the positive mode. An example of this is positive opening operation of switching devices in an electrical circuit (see IEC 60947-5-1 and ISO 14119:1998,5.7). NOTE Where a mechanical component moves and thus allows another one to move freely (e.g. by gravity, by spring force), there is no positive mechanical action of the first one on the other one.	The principle of the positive mechanical action of a component on another component has been applied.	P
6.2.6	Provisions for stability		P
	Machines shall be designed to have sufficient stability to allow them to be used safely in their specified conditions of use.	These machines have been designed to have sufficient stability to allow them to be used safely in their specified conditions of use.	P
	Factors to be taken into account include:		P
	- geometry of base;	The factor has been taken into account during design	P
	- weight distribution, including loading;		P
	- dynamic forces due to movements of parts of the machine, of the machine itself, or of elements held by the machine which may result in an overturning moment;		P
	- vibration;		P
	- oscillations of the centre of gravity;		N
	- characteristics of the supporting surface in case of travelling or installation on different sites(e.g. ground conditions, slope);		P
	- external forces(e.g. wind pressure, manual forces).		P
	Stability shall be considered in all phases of the machine, including handling, travelling, installation, use, de-commissioning and		P

EN ISO 12100:2010			
Clause	Requirement	Result-Remark	Verdict
	dismantling.		
	Other protective measures for stability relevant to safeguarding are given in 5.2.6.		P
6.2.7	Provision for maintainability		P
	When designing a machine, the following maintainability factors shall be taken into account:		P
	- accessibility, taking into account the environment and human body measurements, including the dimensions of the working clothes and tools used;	These factors have been taken into account during design	P
	- ease of handling, taking into account human capabilities;	The factor has been taken into account during design	P
	- limitation of the number of special tools and equipment	The factor has been taken into account during design	P
6.2.8	Observing ergonomic principles		P
6.2.8.1	Ergonomic principles shall be taken into account in designing machinery to reduce mental or physical stress strain of the operator.	Appropriate ergonomic principles have been taken into account in designing machinery to reduce mental or physical stress and strain of the operator	P
	These principles shall be considered when allocating functions to operator and machine	These principles have been taken into account during allocating functions to operator and machine	P
	Account shall be taken into of body size likely to be found in the intended user population, strengths and postures, movement amplitudes, frequently of cyclic actions	All these factors have been taken into account during design	P
	All elements of the “operator-machine” interface such as controls, signaling or data display elements, shall be designed to be easily understood so that clear and unambiguous interaction between the operator and the machine is possible.	All arrangement and design of manual controls have been checked in compliance with	P
	Designers’ attention is especially draw to following ergonomic aspects of machine design:		P
6.2.8.2	Avoiding stressful postures and movements during use the machine (e.g. by providing facilities to adjust the machine to suit the various operators).	Stressful postures and movements during use of the machine have been avoided	P
6.2.8.3	Designing machines , and more especially hand-held and mobile machines to enable them to be operated easily taking into account human	This machine has been adjusted to the human strength and convenient	P

EN ISO 12100:2010			
Clause	Requirement	Result-Remark	Verdict
	effort, actuation of controls and hand, arm and leg anatomy.	movement	
6.2.8.4	Avoiding as far as possible noise, vibration, thermal effects (e.g. extreme temperatures).	This machine has been designed with low noise, vibration	P
6.2.8.5	Avoiding linking the operator's working rhythm to an automatic succession of cycles.	This situation has been avoided	P
6.2.8.6	Providing local lighting on or in the machine for the illumination of the working area and of adjusting, setting-up, and frequent maintenance zones when the design features of the machine and/or its guards render the ambient lighting inadequate.		N
	Flicker, dazzling, shadows and stroboscopic effects shall be avoided if they can cause a risk.		N
6.2.8.7	Selecting, locating and identifying manual controls(actuators) so that:		P
	- they are clearly visible and identifiable and appropriately marked where necessary(see 6.3.4);		P
	- they can be safely operated without hesitation or loss of time and without ambiguity(e.g.a standard layout of controls reduces the possibility of error when an operator changes from a machine to another one of similar type having the same pattern of operation;		P
	-their location (for push-buttons) and their movement(for levers and handwheels) are consistent their effect(see IEC61310-3);		P
	- their operation can not cause additional risk. See also EN 894-3.		N
	Where a control is designed and constructed to perform several different actions, namely where there is no one-to-one correspondence (e.g. keyboards), the action to be performed shall be clearly displayed and subject to confirmation where necessary.		N
	Controls shall be so arranged that their layout, travel and resistance to operation are compatible with the action to be performed, taking account of ergonomic principles. Constrains due to the necessary or foreseeable use of personal protective equipment(such as footwear, gloves)shall be taken into account.		N
6.2.8.8	Selecting, designing and locating indicators, dials and visual display units so that:		N
	- they fit with the parameters and characteristics of human perception;		N

EN ISO 12100:2010			
Clause	Requirement	Result-Remark	Verdict
	- information displayed can be detected, identified and interpreted conveniently, i.e. long lasting, distinct, unambiguous and understandable with respect to the operator's requirements and the intended use;		N
	- the operator is able to perceive them from the control position.		N
6.2.9	Preventing electrical hazard		P
	For the design of the electrical equipment of machines IEC 60204-1:2006 gives general provisions, especially in clause 6 for protection against electric shock.		P
	For requirements related to specific machines, see corresponding IEC standards (e.g. series of IEC 61029, IEC 60745, IEC 60335).		N
6.2.10	Preventing hazards from pneumatic and hydraulic equipment		N
	Pneumatic and hydraulic equipment of machinery shall be designed so that:		N
	- the maximum rated pressure can not be exceeded in the circuits(e.g. by means of pressure limiting devices);		N
	- no hazard results from pressure surges or rises, pressure losses or drops or losses of vacuum;		N
	- no hazardous fluid jet or sudden hazardous movement of the hose(whiplash)results from leakage or component failures;		N
	-air receivers, air reservoirs or similar vessels(e.g. in gas loaded accumulators)comply with the design rules for these elements;		N
	- air elements of the equipment, and especially pipes and hoses, be protected against harmful external effects;		N
	- as far as possible, reservoirs and similar vessels(e.g. in gas loaded accumulators) are automatically depressurized when isolating the machine from its power supply (see 6.3.5.4)and, if it is not possible, means are provided for their isolation, local depressurizing and pressure indication(see also ISO 14118:2000,clause 5):		N
	- all elements which remain under pressure after isolation of the machine from its power supply be provided with clearly identified exhaust devices, and a warning label drawing attention to the necessity of depressurizing those elements before any setting or maintenance activity on the machine.		N

EN ISO 12100:2010			
Clause	Requirement	Result-Remark	Verdict
6.2.11	Applying inherently safe design measures to control system		P
6.2.11.1	General		P
	The design measures of the control system shall be chosen so that their safety-related performance provides a sufficient amount of risk reduction		P
	The correct design of machine control systems can avoid unforeseen and potentially hazardous machine behaviour.		P
	Typical cause of hazardous machine behaviour are:		P
	- an unsuitable design or modification(accidental or deliberate) of the control system logic:		P
	- a temporary or permanent defect or a failure of one or several components of the control system;		P
	- a variation or a failure in the power supply of the control system;		P
	- inappropriate selection, design and location of the control devices;		P
	Typical examples of hazardous machine behaviour are unintended / unexpected start-up		P
	- uncontrolled speed change;		P
	- failure to stop moving parts;		P
	- dropping or ejection of a mobile part of the machine or of a workpiece clamped by the machine;		P
	- machine action resulting from inhibition (defeating or failure) of protective devices.		P
	In order to prevent hazardous machine behaviour and to achieve safety functions, the design of control systems shall comply with the principles and methods presented in this subclause 6.2.11 and in 4.12.		P
	These principles and methods shall be applied singly or in combination as appropriate to the circumstances (see ISO13849-1 and IEC60204-1:2006, clauses 9 to 12).		P
	Control systems shall be designed to enable the operator to interact with machine safely and easily; this requires one or several of the following solutions:		P
	- systematic analysis of start and stop conditions;		P
	- provision for specific operating modes(e.g. start-up after normal stop, restart after cycle interruption or after emergency stop, removed of the workpieces contained in the machine, operation of a part the machine in case of a		N

EN ISO 12100:2010			
Clause	Requirement	Result-Remark	Verdict
	failure of a machine element);		
	- clear display of the faults;		N
	- measures to prevent accidental generation of unexpected start commands(e.g. shrouded start device) likely to cause dangerous machine behaviour (see SO14118:2000, figure1);		P
	- maintained stop commands(e.g. interlock) to prevent restarting that could result in dangerous machine behaviour(see ISO14118:2000,figure1).		P
	An assembly of machines may be divided into several zones for emergency stopping, for stopping as a result of protective devices and/or for isolation and energy dissipation.		N
	The different zones shall be clearly defined and it shall be obvious which parts of the machine belong to which zone.		N
	Likewise it shall be obvious which control devices(e.g. emergency stop devices, supply disconnecting devices) and/or protective devices belong to which zone.		N
	The interfaces between zones shall be designed such that no function in one zone creates hazards in another zone which has been stopped for an intervention.		N
	Control systems shall be designed to limit the movement of parts of the machinery, the machine itself, or workpieces and/or loads held by the machinery, to the safe design parameters(e.g. range, speed, acceleration, deceleration, load capacity). Allowance shall be made for dynamic effects(e.g. the swinging of loads).		N
	For example:		N
	- the traveling speed of mobile pedestrian controlled machinery other than remote-controlled shall be compatible with walking speed;		N
	- the range, speed, acceleration and deceleration of movements of the person-carrier and carrying vehicle for lifting persons shall be limited to non-hazardous values, taking into account the total reaction time of the operator and the machine;		N
	- the range of movements of parts of machinery for lifting loads shall be kept within specified limits.		N
	When machinery is designed to use synchronously different elements which can also		

EN ISO 12100:2010			
Clause	Requirement	Result-Remark	Verdict
	be used independently, the control system shall be designed to prevent risks due to lack of synchronization.		N
6.2.11.2	Starting of an internal power source / switching on an external power supply		P
	Starting of an internal power source or switching on an external power supply shall not result in starting of working parts(e.g. starting the internal combustion engine shall not lead to movement of a mobile machine, connection to mains electricity supply shall not result in starting of working parts of an electrical machine; see IEC 60204-1:2006,7.5).		P
6.2.11.3	Starting/stopping of a mechanism		P
	The primary action for starting or accelerating the movement of a mechanism should be performed by application or increase of voltage or fluid pressure, or, if binary logic elements are considered, by passage from state 0 to state 1(if state 1 represents the highest energy state).		P
	The primary action for stopping or slowing down should be performed by removal or reduction of voltage or fluid pressure, or, if binary logic elements are considered, by passage from state 1 to state 0(if state 1 represents the highest energy state).		P
	When, in order for the operator to maintain permanent control of deceleration, this principle not observed (e.g. a hydraulic braking device of a self-propelled mobile machine), the machine shall be equipped with a means of slowing and stopping in case of failure of the main braking system.		N
6.2.11.4	Restart after power interruption		P
	If it may generate a hazard, the spontaneous restart of a machine when it is re-energized after power interruption shall be prevented(e.g. by use of a self-maintained relay, contactor or valve)		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. At least the following requirements shall be met;		P
	- the stopping function of the machinery shall remain;		P
	- all devices whose permanent operation is required for safety shall operate in an effective		N

EN ISO 12100:2010			
Clause	Requirement	Result-Remark	Verdict
	way to maintain safety(e.g. locking, clamping devices, cooling or heating devices, power-assisted steering of self-propelled mobile machinery);		
	- parts of machinery or workpieces and/or loads held by machinery which are liable to move as a result of potential energy shall be retained for the time necessary to allow them to be safely lowered.		N
6.2.11.6	Use of automatic monitoring		N
	Automatic monitoring is intended to ensure that a safety function(s) implemented by a protective measure do(es) not fail to be performed if the ability of a component or an element to perform its function is diminished, or if the process conditions are changed in such a way that hazards are generated.		N
	Automatic monitoring either detects a fault immediately or carries out periodic checks so that a fault is detected before the next demand upon the safety function.		N
	In either case, the protective measure can be initiated immediately or delayed until a specific event occurs(e.g. the beginning of the machine cycle).		N
	The protective measures may be, e.g.:		-
	- the stopping of the hazardous process;		N
	- preventing the re-start of this process after the first stop following the failure;		N
	- the triggering of an alarm.		N
6.2.11.7	Safe functions implemented by programmable electronic control systems		N
6.2.11.8	Principles relating to manual control		N
	a) Manual control devices shall be designed and located according to the relevant ergonomic principles given in 6.2.8.7		N
	b) A stop control device shall be placed near each start control device. Where the start/stop function is performed by means of a hold-to-run control, a separate stop control device shall be provided when a risk can result from the hold-to-run control device failing to deliver a stop command when released.		N
	c) Manual controls shall be located out of reach of the danger zones(see IEC61310-3:1999, clause 4), except for certain controls where, of necessity, they are located within a danger zone, such as		N

EN ISO 12100:2010			
Clause	Requirement	Result-Remark	Verdict
	emergency stop or teach pendant.		
	d) Whenever possible, control devices and control positions shall be located so that the operator is able to observe the working area or hazard zone.		N
	e) if it is possible to start the same hazardous element by means of several controls, the control circuit shall be so arranged that only one control is effective at a given time		N
	f) control actuators shall be designed or guarded so that their effect, where a risk is involved, cannot occur without intentional operation(see ISO 9355-1 and ISO 447)		N
	g) for machine functions whose safe operation depends on permanent, direct control by the operator, measures shall be taken to ensure the presence of the operator at the control position, e.g. by the design and location of control devices.		N
	h) for cableless control an automatic stop shall be performed when correct control signals are not received, including loss of communication (see IEC60204-1:2006,9.2.7).		N
6.2.11.9	Control mode for setting, teaching, process changeover, fault-finding, cleaning or maintenance		N
	Where, for setting, teaching, process changeover, fault-finding, cleaning or maintenance of machinery, a guard has to be displaced or removed and/or a protective device has to be disabled, and where it is necessary for the purpose of these operations for the machinery or part of the machinery to be put in operation, safety of the operator shall be achieved using a specific control mode which simultaneously:		N
	- disables all other control modes;		N
	- permit operation of the hazardous elements only by continuous actuation of an enabling device, a hold-to-run control device or a two-hand control device;		N
	- permits operation of the hazardous elements only in reduced risk conditions.		N
	This control mode shall be associated with one or more of following measures:		N
	- restriction of access to the danger zone as far as possible;		N
	- emergency stop control within immediate reach		N

EN ISO 12100:2010			
Clause	Requirement	Result-Remark	Verdict
	of the operator;		
	- portable control unit and/or local controls allowing sight of the controlled elements.		N
6.2.11.10	Selection of control and operating modes		N
	If machinery has designed and built to allow for its use in several control or operating modes requiring different protective measures and/or work procedures, it shall be fitted with a mode selector which can be locked in each position.		N
	Each position of the selector shall be clearly identifiable and shall exclusively allow one control or operating mode		N
	The selector may be replaced by another selection means which restricts the use of certain functions of the machinery to certain categories of operators.		N
6.2.11.11	Applying measures to achieve electromagnetic compatibility(EMC)		P
	For guidance on electromagnetic compatibility, see IEC 60204-1:2006,6.2.4.2 and IEC 61000-6 series.	EN 55014	P
6.2.11.12	Provision of diagnostic systems to aid fault-finding		N
	Diagnostic systems to aid fault finding should be included in the control system so that there is no need to disable any protective measure.		N
6.2.12	Minimizing the probability of failure of safety functions		P
	Safety of machinery is not only dependent on the reliability of the control system but also on the reliability of all parts of the machine.		P
	The continued operation of the safety functions is essential for the safe use of use of the machine. This can be achieved by:		P
6.2.12.1	Use of reliable components “reliable components” means components which are capable of withstanding all disturbances and stresses associated with the usage of the equipment in the conditions of intended use, for the period of time or the number of operations fixed for the use, with a low probability of failures generating a hazardous malfunctioning of the machine. Components shall be selected taking into account all factors mentioned above.	Reliable components have been used	P
6.2.12.2	Use of “oriented failure mode” components		N
	“oriented failure mode” components or systems are those in which the predominant failure mode		

EN ISO 12100:2010			
Clause	Requirement	Result-Remark	Verdict
	is known in advance and which can be used to that such a failure leads to a non-hazardous alteration of the machine function.		N
	The use of such components should always be considered, particularly in cases where redundancy is not employed.		N
6.2.12.3	Duplication(or redundancy) of components or subsystems		N
	In the design of safety-related parts of the machine, duplication(or redundancy) of components may be used so that, if one component fails, another component(or redundancy) continue(s) to perform its (their) function, thereby ensuring that the safety function remains available.		N
	In order to allow the proper action to be initiated, component failure shall be preferably detected by automatic monitoring(see 6.2.11.6) or in some circumstances by regular inspection, provided that the inspection interval is shorter than the expected lifetime of the components.		N
	Diversity of design and/or technology can be used to avoid common cause failures or common mode failures.		N
6.2.13	Limiting exposure to hazards through reliability of equipment		P
	Increased reliability of all component parts of machinery reduces the frequency of incidents requiring rectification, thereby reducing exposure to hazards.	This requirement is complied with	P
	This applies to power systems as well as to control systems, to safety functions as well as to other functions of machinery.	This requirement is complied with	P
	Safety-critical components with a known reliability shall be used,	Safety-critical components are used in this machine	P
	The elements of guards and of protective devices shall be particularly reliable, as their failure can expose persons to hazards, and also as poor reliability would encourage attempts to defeat them.	This requirement is complied with	P
6.2.14	Limiting exposure to hazards through mechanization or automation of loading (feeding)/unloading (remove) operations		N
	Mechanization and automation of machine loading/unloading operations and more generally of handling operations(of workpieces, materials, substances) limit the risk generated by these		N

EN ISO 12100:2010			
Clause	Requirement	Result-Remark	Verdict
	operations by reducing the exposure of persons to hazards at the operating points.		
	Automation can be achieved e.g. by robots, handling devices, transfer mechanisms, air blast equipment.		N
	Mechanization can be achieved, e.g. by feeding slides, push rods, hand-operated indexing tables.		N
	While automatic feeding and removal devices have much to offer in preventing accidents to machine operators, they can create danger when any fault are being rectified.		N
	Care shall be taken to ensure that the use of these devices does not introduce further hazards (e.g. trapping , crushing)between the devices and parts of the machine or workpieces/materials being processed.		N
	Suitable safeguards shall be provided if this can not be ensured.		N
	Automatic feeding and removal devices with their own control systems and the control system of the associated machine shall be interconnected after thoroughly studying how all safety functions are performed in all control and operation modes of the whole equipment		N
6.2.15	Limiting exposure to hazards through location of the setting and maintenance points outside of danger zones		P
	The need for access to danger zones shall be minimized by locating maintenance, lubrication and setting points outside these zones.		P
6.3	Safeguarding and complementary protective measures		P
6.3.1	General		P
	Guards and protective devices shall be used to protect persons whenever inherently safe design does not reasonably make it possible either to remove hazards or to sufficiently reduce risks.	Appropriate guards and protective devices have been used	P
	Complementary protective measures involving additional equipment (e.g. emergency stop equipment) may have to be taken (see ISO 120100-1:12003, 6.3.4).		P
	The different kinds of guards and protective devices are defined in ISO 12100-1:2003, 3.25 and 3.26.		P
	Certain safeguards may be used to avoid exposure to more than one hazard (e.g. a fixed guard preventing access to a mechanical hazard is		P

EN ISO 12100:2010			
Clause	Requirement	Result-Remark	Verdict
	present being used to reduce noise level and collect toxic emissions).		
6.3.2	Selection and implementation of guards and protective devices		P
6.3.2.1	General		P
	This subclause gives guidelines for the selection and the implementation of guards and protective devices the primary purpose of which is to protect persons against hazards generated by moving parts, according to the nature of those parts (see figure 1) and to the need for access to the danger zone(s).		P
	The exact choice of safeguard for a particular machine shall be made on the basis of the risk assessment for that machine.		P
	In selecting an appropriate safeguard for a particular type of machinery or hazard zone, it shall be borne in mind that a fixed guard is simple and shall be used where access of an operator to the danger zone is not required during normal operation of the machinery.		P
	As the need for frequency of access increases this inevitably leads to the fixed guard not being replaced. This requires the use of an alternative protective measure.		P
	A combination of safeguards may sometimes required. For example, where, in conjunction with a fixed guard, a mechanical loading device is used to feed a workpiece into a machine, thereby removing the need for access to primary hazard zone, as trip device may be required to protect against the secondary drawing-in or shearing hazard between the mechanical loading device, when reachable, and the fixed guard.		P
	Consideration shall be given to the enclosure of control positions or intervention zones to provide combined protection against several hazards which may include:	No such hazards exist in this machine	P
	- hazards from falling or ejected objects		P
	- emissions hazards;		P
	- hazards due to the environment;		P
	- hazards due to tipping over or rolling over of machinery;		P
	The design of such enclosed work stations shall take into account ergonomic principles concerning visibility, lighting, atmospheric conditions, access, posture.		P

EN ISO 12100:2010			
Clause	Requirement	Result-Remark	Verdict
6.3.2.2	Where access to the hazard zone is not required during normal operation		P
	Where access to the hazard zone is not required during normal operation of the machinery, safeguards should be selected from the following:		P
	a) fixed guard (see also ISO 14120);	Fixed guards are provided	P
	b) interlocking guard with or without guard locking;		N
	c) self-closing guard;		P
	d) sensitive protective equipment, e.g. electro-sensitive protective equipment.		N
6.3.2.3	Where access to the hazard zone is required during normal operation.		N
	Where access to the hazard zone is required during normal operation of the machinery, safeguards should be selected from the following:		N
	a) interlocking guard with or without guard locking;		N
	b) sensitive protective equipment, e.g. electro-sensitive protective equipment;		N
	c) adjustable guard;		N
	d) self-closing guard		N
	e) interlocking guard with a start function.		N
6.3.2.4	Where access to the hazard zone is required for machine setting, teaching, process changeover, fault finding, cleaning or maintenance		N
	As far as possible, machines shall be designed so that the safeguards provided for the protection of the production operator may ensure also the protection of personnel in charge of setting, teaching, process changeover, fault finding, cleaning or maintenance without hindering them in performing their task.		N
	Such tasks shall be identified and considered in the risk assessment as parts of the use of machine.		N
6.3.2.5	Selection and implementation of sensitive protective equipment		N
6.3.2.6	Protective measures for stability		P
	If stability cannot be achieved by inherently safe design measures such as weight distribution(see4.6), it will be necessary to maintain it by protective measures such as the use of :		P
	- anchorage bolts;		N
	- locking devices;		P
	- movement limiters or mechanical stops;		N

EN ISO 12100:2010			
Clause	Requirement	Result-Remark	Verdict
	- acceleration or deceleration limiters;		N
	- load limiters;		N
	- alarms warning of the approach to stability or tipping limits.		N
6.3.2.7	Other protective devices		N
	When a machine requires continuous control by the operator and an error of the operator can generate a hazardous situation, this machine shall be equipped with the necessary devices to enable the operation to remain within specified limits, in particular		N
	Automatic protective measures triggered by such devices which take operation of the machinery out of the control of the operator should be preceded or accompanied by a warning signal to enable the operator to take appropriate action.		N
6.3.3	Requirements for the design of guards and protective devices		P
6.3.3.1	General requirements		P
	Guards and protective devices shall be designed to be suitable for the intended use, taking into account mechanical and other hazards involved.	Guards and protective devices have been appropriately designed	P
	Guards and protective devices shall be compatible with the working environment of the machine and designed so that they can not be easily defeated.		P
	They shall provide the minimum possible interference with activities during operation and other phases of machine life, in order to reduce any incentive to defeat them.		P
	Guards and protective devices shall:		P
	- be of robust construction;	This requirement has been taken into account during design	P
	- not give rise to any additional hazard;	This requirement has been taken into account during design	P
	- not be easy to by-pass or render non-operational;		P
	- be located at an adequate distance from the danger zone(see ISO13852,ISO13853 and ISO13855);		P
	- cause minimum obstruction to the view of the production process;		P
	- enable essential work to be carried out on installation and/or replacement of tools and also for maintenance by allowing access only to the		P

EN ISO 12100:2010			
Clause	Requirement	Result-Remark	Verdict
	area where the work has to be done, if possible without the guard or protective device having to be move		
	For openings in the guards see ISO13852 and ISO13853.		P
6.3.3.2	Requirements of guards		P
6.3.3.2.1	Functions of guards		N
6.3.3.2.2	Requirements for fixed guards		P
	Fixed guards shall be securely held in place:		P
	- either permanently(e.g. by welding);		P
	- or by means of fasteners making removal/opening impossible without using tools, they should not remain closed without their fasteners.	All the fixed guards are securely held in place by appropriate fasteners	P
6.3.3.2.3	Requirements for movable guards		N
	a) movable guards which provide protection against hazards generated by moving transmission parts shall:		N
	-as far as possible remain fixed to the machinery or other structure when open;		N
	- be interlocking guards(with guard locking when necessary)		N
	b) movable guards against hazards generated by non-transmission moving parts shall be design and associated with the machine control system so that:		-
	- moving parts cannot start up while they are within the operator's reach and the operator cannot reach moving parts once they have started up; this can be achieved by interlocking guards, with guard locking when necessary;		N
	- they can be adjusted only by an intentional action, such as the use of a tool or a key;		N
	- the absence or failure of one of their components prevents starting of the moving parts or stops them; this can be achieved by automatic monitoring.		N
6.3.3.2.4	Requirements for adjustable guards		N
	Adjustable guards may only be used where the hazard zone cannot for operational reasons be completely enclosed.		N
	They shall:		N
	- be designed so that the adjustment remains fixed during a given operation;		N
	- be readily adjustable without the use of tools.		N
6.3.3.2.5	Requirements for interlocking guards with a start Function (control guards)		N

EN ISO 12100:2010			
Clause	Requirement	Result-Remark	Verdict
	An interlocking guard with a start function may be used only when all the following requirements are met:		N
	- all requirements for interlocking guards are satisfied;		N
	- the cycle time of the machine is short;		N
	- the maximum opening time of the guard is preset to a low value. When this time is exceeded, the hazardous function(s) cannot be initiated by the closing of the interlocking guard with a start function and resetting is necessary before restarting the machine;		N
	- the dimensions or shape of the machine do not allow a person, or part of a person, to stay in the hazard zone or between the hazard zone and the guard while the guard is closed;		N
	- all other guard whether fixed(removable type) or movable are interlocking guards;		N
	- the interlocking device associated with the interlocking guard with a start function is designed in such a way- e.g. by duplication of position detectors and use of automatic monitoring- that its failure cannot lead to an unintended/unexpected start-up;		N
	- the guard is securely held open such that it cannot initiate a start while falling by its own weight.		N
6.3.3.2.6	Hazards from guards		P
	Care shall be taken to prevent hazard which might be generated by:	No such hazards exist in this machine	P
	- the guard construction		P
	- the movements of the guards		P
6.3.3.3	Technical characteristics of protective devices		P
	Protective devices shall be selected of designed and connected to the control system so as to ensure correct implementation of their safety function(s).	This requirement has been taken into account during design	P
	Protective devices shall be either selected as meeting the appropriate product standard or designed according to one or several of the principles formulated in ISO 13849-1.		P
	Protective devices shall be installed and connected to the control system so that they can not be easily defeated.		P
6.3.3.4	Provisions for alternative types of safeguards		N
	Provisions should be made to facilitate the fitting of alternative types of safeguards on machinery		N

EN ISO 12100:2010			
Clause	Requirement	Result-Remark	Verdict
	where it is known that this fitting will be necessary because the work to be done on it will vary.		
6.3.4	Safeguarding for reducing emissions		P
6.3.4.1	General		P
	If the measures for the reduction of emission at source mentioned in 4.2.2 are not adequate, the machine shall be provided with additional protective measures.		P
6.3.4.2	Noise		P
	Additional protective measures include, for example:		P
	- enclosures(see ISO 15667);		P
	- screens fitted to the machine;		N
	- silencers(see ISO 14163).		N
6.3.4.3	Vibration		N
	Additional protective measures include, for example, damping devices for vibration isolation between the source and the exposed person such as resilient mounting or suspended seats.		N
	For measures for vibration isolation of stationary industrial machinery see EN1299.		N
6.3.4.4	Hazardous substances		N
	Additional protective measures include, for example:		N
	— encapsulation of the machine(enclosure with negative pressure);		N
	— local exhaust ventilation with filtration;		N
	— wetting with liquids;		N
	— special ventilation in the area of the machine(air curtains, cabins for operators).		N
6.3.4.5	Radiation		N
	Additional protective measures include, for example:		N
	— use of filtering and absorption;		N
	— use of attenuating screens or guards.		N
6.3.5	Complementary protective measures		N
6.3.5.1	General		N
	Protective measures which are neither inherently safe design measures, nor safeguarding (implementation of guards and/or protective devices), nor information for use may have to be implemented as required by the intended use and the reasonably foreseeable misuse of the machine.		N
	Such measures include, but are not limited to, the ones dealt with in 6.3.5.2 to 6.3.5.6.		N

EN ISO 12100:2010			
Clause	Requirement	Result-Remark	Verdict
6.3.5.2	Components and elements to achieve the emergency stop function		N
	If following a risk assessment, a machine needs to be fitted with components and elements to achieve an emergency stop function to enable actual or impending emergency situations to be averted, the following requirements apply:		N
	— the actuators shall be clearly identifiable, clearly visible and readily accessible;		N
	— the hazardous process shall be stopped as quickly as possible without creating additional hazards. If this is not possible or the risk cannot be reduced, it should be questioned whether implementation of an emergency stop function is the best solution;		N
	— the emergency stop control shall trigger or permit the triggering of certain safeguard movements where necessary.		N
	Once active operation of the emergency stop device has ceased following an emergency stop command, the effect of this command shall be sustained until it is reset.		N
	This reset shall be possible only at that location where the emergency stop command has been initiated.		N
	The reset of the device shall not restart then machinery, but only permit restarting.		N
	More details for the design and selection of electrical components and elements to achieve the emergency stop function are provided in IEC 60204 series.		N
6.3.5.3	Measures for the escape and rescue of trapped persons		N
	Measures for the escape and rescue of trapped persons may consist, e.g. of:		N
	— escape routes and shelters in installations generating operator-trapping hazards;		N
	— arrangements for moving some elements by hand, after an emergency stop;		N
	— arrangements for reversing the movement of some elements;		N
	— anchorage points for descender devices;		N
	— means of communication to enable trapped operators to call for help.		N
6.3.5.4	Measures for isolation and energy dissipation		P
	Especially with regard to their maintenance and repair, machines shall be equipped with the		

EN ISO 12100:2010			
Clause	Requirement	Result-Remark	Verdict
	technical means to achieve the isolation from power supply(ies) and dissipation of stored energy as a result of following actions:		P
	a) isolating (disconnecting, separating) the machine (or defined parts of the machine) from all power supplies;		P
	b) locking (or otherwise securing) all the isolating units in the isolating position;		P
	c) dissipating or, If this is not possible or practicable, restraining (containing) any stored energy which may give rise to a hazard;		P
	d) verifying, by means of a safe working procedure, that the actions taken according to a),b)and c) above have produced the desired effect.		P
6.3.5.5	Provisions for easy and safe handling of machines and their heavy component parts		P
	Machines and their component parts which cannot be moved or transported by hand shall be provided or capable of being provided with suitable attachment devices for transport by means of lifting gear.	Appropriate attachments are provided	P
	These attachments may be, e.g.:		P
	— standardized lifting appliances with slings, hooks, eyebolts, or tapped holes for appliance fixing;	Such devices are used	P
	— appliances for automatic grabbing with a lifting hook when attachment is not possible from the ground;		N
	— guiding grooves for machines to be transported by a fork truck;		N
	— lifting gear and appliances integrated into the machine.		N
	Parts of machinery which can be removed manually in operation shall be provided with means for their safe removal and replacement.		P
6.3.5.6	Measures for safe access to machinery		P
	Machinery shall be so designed as to enable operation and all routine tasks relating to setting and/or maintenance, to be carried out, as far as possible, by a person remaining at ground level.		P
	Where this is not possible, machines shall have built-in platforms, stairs or other facilities to provide safe access for those tasks, but care should be taken to ensure that such platforms or stairs do not give access to danger zones of machinery.		N

EN ISO 12100:2010			
Clause	Requirement	Result-Remark	Verdict
	The walking areas shall be made from materials which remain as slip resistant as practicable under working conditions and, depending on the height from the ground, suitable guard-rails		N
	In large automated installations, particular attention shall be given to safe means of access such as walkways, conveyor bridges or crossover points.		N
	Means of access to parts of machinery located at a height shall be provided with collective means of protection against falls (e.g. guard-rails for stairways, stepladders and platforms and/or safety cages for ladders).		N
	As necessary, anchorage points for personal protective equipment against falls from a height shall also be provided (e.g. in carriers of machinery for lifting persons or with elevating control stations).		N
	Openings shall whenever possible open towards a safe position. They shall be designed to prevent hazards due to unintended opening.		N
	The necessary aids for access shall be provided(e.g. steps, handholds). Control devices shall be designed and located to prevent their being used as aids for access.		N
	When machinery for lifting goods and/or persons includes landings at fixed levels, these shall be equipped with interlocking guards preventing falls when the platform is not present at the level.		N
	Movement of the lifting platform shall be prevented while the guards are open.		N
	For detailed provisions see ISO 14122-1, ISO 14122-2, ISO 14122-3 and ISO 14122-4.		N
6.4	Information for use		P
6.4.1	General requirements		P
	Drafting information for use is an integral part of the design of a machine (see ISO 12100-1:2003, figure 1).		P
	Information for use consists of communication links, such as texts, words, signs, signals, symbols or diagrams, used separately or in combination to convey information to the user.	All the information is stated in the appropriate place	P
	It is directed to professional and/or nonprofessional users.	All the information is stated in the appropriate place	P
6.4.1.1	Information shall be provided to the user about the intended use of the machine, taking into		P

EN ISO 12100:2010			
Clause	Requirement	Result-Remark	Verdict
	account, notably, al its operating modes.		
	It shall contain all directions required to ensure safe and correct use of the machine.	All the information is stated in the appropriate place	P
	With this in view, it shall inform and warn the user about residual risk.	All the information is stated in the appropriate place	P
	The information shall indicate:		P
	— if training is needed;		P
	— if personal protective equipment is needed;		P
	— the possible need for additional guards or protective devices(see ISO 12100-1:2003. figure 1, note 4).		P
	It shall not exclude uses of the machine that can reasonably be expected from its designation and description and shall also warn about the risk which would result from using the machine in other ways than the ones described in the information, especially considering its reasonably foreseeable misuse.	All the information is stated in the appropriate place	P
6.4.1.2	Information for use shall cover, separately or in combination, transport, assembly and installation, commissioning, use (setting, teaching/programming or process changeover, operation, cleaning, fault finding and maintenance) of the machine, and, if necessary, de-commissioning, dismantling and disposal.		P
6.4.2	Location and nature of the information for use		P
	Depending on the risk, the time when the information is needed by the user and the machine design, it shall be decided whether the information-or parts thereof-are to be given:		P
	— in/on the machine itself (see 6.4.3 and 6.4.4);		P
	— in accompanying documents (in particular instruction handbook, see 6.4.5);	Adequate information is stated in the accompanying documents	P
	— on the packaging;	Adequate informatio9n is stated on the packaging	P
	— by other means such as signals and warnings outside the machine.	Adequate information is stated	P
	Standardized phrases shall be considered where important messages such as warnings need to be given (see also IEC 62079).	This requirement is considered	P
6.4.3	Signals and warning devices		P
	Visual signals (e.g. flashing lights) and audible signals (e.g. sirens) may be used to warn of an		P

EN ISO 12100:2010			
Clause	Requirement	Result-Remark	Verdict
	impending hazardous event such as machine start-up or overspeed.		
	Such signals may also be used to warn the operator before the triggering of automatic protective measures (see last paragraph of 5.2.7).		P
	It is essential that these signals:		-
	— are emitted before the occurrence of the hazardous event;		P
	— are unambiguous;		P
	— can be clearly perceived and differentiated from all other signals used;		P
	— can be clearly recognized by the operator and other persons.		P
	The warning devices shall be designed and located such that checking is easy.		P
	The information for use shall prescribe regular checking of warning devices.		P
	The attention of designers is drawn to the risks from “sensorial saturation” which results from too many visual and/or acoustic signals, which may also lead to defeating the warning devices.		P
6.4.4	Markings, signs(pictograms), written warnings		P
	Machinery shall bear all markings which are necessary:		P
	a) for its unambiguous identification, at least:		P
	— name and address of the manufacturer,	Adequate information is provided	P
	— designation of series or type;	Adequate information provided	P
	— serial number, if any;		P
	b) in order to indicate its compliance with mandatory requirements:		P
	— marking;		P
	— written indications(e.g. for machines intended for use in potentially explosive atmosphere);		P
	c) for its safe use, e.g.:		P
	— maximum speed of rotating parts;	2850rpm	P
	— maximum diameter of tools;		N
	— mass (expressed in kilograms) of the machine itself and/or of removable parts;		P
	— maximum working load;		N
	— necessity of wearing personal protective equipment;		P
	— guard adjustment data;		P
	— frequency of inspection.		P
	Information printed directly on the machine should be permanent and remain legible		P

EN ISO 12100:2010			
Clause	Requirement	Result-Remark	Verdict
	throughout the expected life of the machine.		
	Signs or written warnings only saying “danger” shall not be used.		P
	Markings, signs and written warnings shall be readily understandable and unambiguous, especially as regards the part of the function(s) of the machine which they are related to.	All the markings are standard	P
	Readily understandable signs (pictograms) should be used in preference to written warnings		P
	Signs and pictograms should only be used if they are understood in the culture in which the machinery is to be used.		P
	Written warnings shall be drawn up in the language(s) of the country in which the machine will be used for the first time and , on request, in the language(s) understood by operators.		P
6.4.5	Accompanying documents (in particular, Instruction handbook)		P
6.4.5.1	Contents		P
	The instruction handbook or other written instructions (e.g. on the packaging) shall contain among others:		P
	a) information relating to transport, handling and storage of the machine, e.g.:	All the related information is stated	P
	— storage conditions for the machine;		P
	— dimensions, mass value(s), position of the centre(s) of gravity;		P
	— indications for handling (e.g. drawings indicating application points for lifting equipment);		P
	b) information relating to installation and commissioning of the machine, e.g.:	All the related information is stated	P
	— fixing/anchoring and vibration dampening requirements;		P
	— assembly and mounting conditions;		P
	— space needed for use and maintenance;		P
	— permissible environmental conditions (e.g. temperature, moisture, vibration, electromagnetic radiation);		P
	— instructions for connecting the machine to power supply (particularly about protection against electrical overloading);		P
	— advice about waste removal/disposal;		P
	— if necessary, recommendations about protective measures which have to be taken by the user, e.g. additional safeguards (see ISO 12100-1:2003, figure 1,NOTE 4), safety		P

EN ISO 12100:2010			
Clause	Requirement	Result-Remark	Verdict
	distances, safety signs and signals;		
	c) information relating to the machine itself, e.g.:	All the related information is stated in the instruction handbook	P
	— detailed description of the machine, its fittings, its guards and/or protective devices;		P
	— comprehensive range of applications for which the machine is intended, including prohibited usages, if any, taking into account variations of the original machine if appropriate;		P
	— diagrams (especially schematic representation of safety functions);		P
	— data about noise and vibration generated by the machine, about radiation, gases, vapours ,dust emitted by it ,with reference to the measuring methods used;		P
	— technical documentation about electrical equipment(see IEC 60204 series)		P
	— documents attesting that the machine complies with mandatory requirements;		P
	d) information relating to the use of the machine, e.g. about:	All the related information is stated	P
	— intended use;		P
	— description of manual controls (actuators);		P
	— setting and adjustment;		P
	— modes and means for stopping (especially emergency stop);		P
	— risks which could not be eliminated by the protective measures taken by the designer;		P
	— particular risks which may be generated by certain applications, by the use of certain fittings, and about specific safeguards which are necessary for such applications;		P
	— reasonably foreseeable misuse and prohibited usages;		P
	— personal protective equipment which need to be used and training required;		P
	e) information for maintenance, e.g.:	All the related information is stated	P
	— nature and frequency of inspections for safety functions;		P
	— instructions relating to maintenance operations which require a definite technical knowledge or particular skills and hence should be carried out exclusively by skilled persons (e.g. maintenance staff, specialists);		P
	- instructions relating to maintenance actions (e.g.		P

EN ISO 12100:2010			
Clause	Requirement	Result-Remark	Verdict
	replacement of parts) which do not require specific skills and hence may be carried out by users (e.g. operators);		
	— drawings and diagrams enabling maintenance personnel to carry out their task rationally (especially fault-finding tasks);		P
	f) information relating to de-commissioning, dismantling and disposal;	All the related information is stated	P
	g) information for emergency situations, e.g.:		N
	— type of fire-fighting equipment to be used;		N
	— warning about possible emission or leakage of harmful substance(s), and if possible, indication of means to fight their effects;		N
	h) maintenance instructions provided for skilled persons (second dash in e)) and maintenance instructions provided for unskilled persons (third dash in e)), that should appear clearly separated from each other.		P
6.4.5.2	Production of the instruction handbook		P
	a) Type and size of print shall ensure the best possible legibility. Safety warnings and/or cautions should be emphasized by the use of colours, symbols and/or large print.		P
	b) Information for use shall be given in the language(s) of the country in which the machine will be used for the first time and in the original version. If more than one language are to be used, each language should be readily distinguished from the other(s), and efforts should be made to keep the translated text and the relevant illustration together.		P
	c) Whenever helpful to the understanding, text should be supported by illustrations. Illustrations should be supplemented with written details enabling, for instance, manual controls (actuators) to be located and identified; they should not be separated from the accompanying text and should follow sequential operations		P
	d) Consideration should be given to presenting information in tabular form where this will aid understanding. Tables should be adjacent to the relevant text.		P
	f) When information for use is lengthy, a table of contents and/or an index should be given.		P
	g) Safety-relevant instructions which involve immediate action should be provided in a form		P

EN ISO 12100:2010			
Clause	Requirement	Result-Remark	Verdict
	readily available to the operator.		
6.4.5.3	Advice for drafting and editing information for use		P
	a) Relationship to model: the information shall clearly relate to the specific model of machine.		P
	b) Communication principles: when information for use is being prepared, the communication process “see-thing-use” should be followed in order to achieve the maximum effect and should follow sequential operations. The questions “how?” and “why?” should be anticipated and the answers provided.		P
	c) Information for use shall be as simple and as brief as possible, and should be expressed in consistent terms and units with a clear explanation of unusual technical terms.		P
	d) When it is foreseen that a machine will be put to non-professional use, the instructions should be written in a form that is readily understood by the non-professional users. If personal protective equipment is required for the safe use of the machine, clear advice should be given, e.g. on the packaging as well as on the machine, so that this information is prominently displayed at the point of sale.		P
	e) Durability and availability of the documents: documents giving instructions for use should be produced in durable form (i.e. they should be able to survive frequent handling by the user).		P
	It may be useful to mark them “keep for future reference”		P
	Where information for use is kept in electronic form (e.g. CD, DVD, tape) information on safety-related issues that need immediate action shall always be backed up with a hard copy that is readily available.		N
7	Documentation of risk assessment and risk reduction	See the risk assessment report in detail.	P
	The documentation shall demonstrate the procedure that has been followed and the results that have been achieved. This includes, when relevant, documentation of		P
	a) the machinery for which the risk assessment has been made (for example, specifications, limits, intended use);		P
	b) any relevant assumptions that have been made (loads, strengths, safety factors, etc.);		P

EN ISO 12100:2010			
Clause	Requirement	Result-Remark	Verdict
	c) the hazards and hazardous situations identified and the hazardous events considered in the risk assessment;		P
	d) the information on which risk assessment was based (see 5.2):		P
	1) the data used and the sources (accident histories, experience gained from risk reduction applied to similar machinery, etc.);		P
	2) the uncertainty associated with the data used and its impact on the risk assessment;		P
	e) the risk reduction objectives to be achieved by protective measures;		P
	f) the protective measures implemented to eliminate identified hazards or to reduce risk;		P
	g) residual risks associated with the machinery;		P
	h) the result of the risk assessment (see Figure 1);		P
	i) any forms completed during the risk assessment.		P
	Standards or other specifications used to select protective measures referred to in f) above should be referenced.		P



Technical Construction File

File No.: TCF(15)-365-2-MD

Type of Equipment:	SUBMERSIBLE PUMP
Model No.:	DVX 25,DVX 35,DVX 80,DVX 100 , DVX 150M , DVX 150T, DVX 200M ,DVX 300M,DVX 300T, BAFA 150M,BAFA 200M,BAFA 200T, BAFA 300M, BAFA 300T,BKS 150M , BKS 200M,2BKS 100M,2 BKS 150M, 3 BKS 200M , 4 BKS 200M
Issued Date:	2015-06-24
Brand Name/ Trade mark:	NORTEK
Directive(S)	2006/42/EC Machinery Directive
standard(s):	EN 809:1998+A1:2009+AC:2010



Presented for

NORTEK POMPA SAN.TİC.LTD.ŞTİ.
1203/7 SOK NO 1-C YENİŞEHİR / İZMİR / TURKEY

Presented by

Shanghai ECO Information Technology Co., Ltd.
Room 721-722, Cimic Plaza,No.800 Shangcheng Road,Pudong New
Zone,Shanghai 200120 P.R.C

TEST REPORT

EN 809:1998+A1:2009+AC:2010 Pumps and pump units for liquids — Common safety requirements

Report

Report reference No. : No: TCF(15)-365-2-MD

Tested by(+ signature).....: *Downey Xue*

Reviewed by(+ signature).....: *Guo Zhigang*

Date of issue : 2015-06-24

Number of pages (Report) : 17

Testing laboratory

Name : Shanghai ECO Information Technology Co., Ltd.

Address : Room 721-722, Cimic Plaza, No.800 Shangcheng Road, Pudong
New Zone, Shanghai 200120 P.R.C

Testing location : GUANZHUANG VILLAGE, RUOHENG TOWN, WENLING
CITY, ZHEJIANG PROVINCE, P.R.CHINA

Client

Name : NORTEK POMPA SAN.TİC.LTD.ŞTİ.

Address : 1203/7 SOK NO 1-C YENİŞEHİR / İZMİR / TURKEY

Manufacturer

Name : TAIZHOU WENGGE PUMPS CO.,LTD

Address : GUANZHUANG VILLAGE, RUOHENG TOWN, WENLING
CITY, ZHEJIANG PROVINCE, P.R.CHINA

Test specification

Standard : EN 809:1998+A1:2009+AC:2010

Test procedure : CE-MD

Procedure deviation : N.A.

Non-standard test method : N.A.

General description

This device is ideal for fume and dust purification in industrial processing, welding, cutting and grinding.

Ambient temperature: 22°C humidity: 60% Complete File was conducted on DVX 25

DVX 25, DVX 35, DVX 80, DVX 100, DVX 150M, DVX 150T, DVX 200M, DVX 300M, DVX 300T, BAFA 150M, BAFA 200M, BAFA 200T, BAFA 300M, BAFA 300T, BKS150M, BKS 200M, 2BKS 100M, 2 BKS 150M, 3 BKS 200M, 4 BKS 200M are series products.

They belong to the same circuit type except the difference in power, weight and the dimension.

EN 809:1998+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
1	Scope		
	Liquid pumps are described as: — rotodynamic pumps; — rotary positive displacement pumps; — reciprocating displacement pumps; supplied separately without driver.	This machine is within this scope.	P
2	Normative references		
3	Definitions		
4	List of hazards	See the risk assessment of EN ISO 12100.	P
5	Safety requirements and/or measures		P
5.1	General requirements		P
	The operating conditions and features required of every pump and/or pump unit falling within the scope of this standard shall be defined in a specification. This may be in the form of a manufacturer's description, or as a published national or international standard or in a data sheet within a contract.		P
5.1.1	Environmental and working conditions		P
	In constructing the specification for the pump or pump unit particular attention shall be given to any special environmental and/or working conditions. Examples of such special conditions are, amongst others:		P
	environmental conditions at the place of installation, such as:		P
	— abnormal temperature;	<40°C	P
	— high humidity;	<90%	P
	— corrosive atmospheres;		N
	— explosive and/or fire danger zones;		N
	— dust, sandstorms;	Pollution 2	P
	— earthquakes and other external imposed such conditions;		N
	— vibrations;		P
	— altitude;	1000m	P
	— flooding;		N
	type of liquid to be pumped, such as:		P
	— pumped liquid (denomination);	Water	P

EN 809:1998+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	— mixture (analysis);		N
	— solid containing (solid matter content);		N
	— gaseous (content);		N
	property of the liquid when being pumped, such as:		P
	— flammable;		N
	— toxic;		N
	— corrosive;		N
	— abrasive;		N
	— crystallizing;		N
	— polymerizing;		N
	— viscosity;		N
	operating fluctuation in the system, such as:		P
	— temperature;		P
	— pressure;		P
	— flow rate;		P
	— dry running of the pump.		P
5.2	Special requirements		P
5.2.1	Requirements to avoid mechanical hazards		P
5.2.1.1	Crushing, cutting and entanglement		P
	Exposed moving parts may create a hazard and means shall be incorporated to reduce the risk. Such means shall include as appropriate:		P
	— barriers conforming to EN 294 preventing contact with moving parts;		N
	— gaps at the end-of-travel conforming to EN 349	Comply with the requirements	P
	— guards conforming to EN 953.	Comply with the requirements	P
	Rotating shafts with exposed keys, keyways or other projections liable to cut or catch shall be protected or guarded. Guards or permanent enclosures shall be used for rotating or reciprocating transmission couplings or crossarms.	Permanent enclosure and guard are used.	P
	Guards for the reduction of risks from contact with parts of a pump or pump unit shall be removable only with the use of a tool.	Be removable only with the use of a tool.	P
	Movable or removable guards giving access for adjustment or setting of controls or sensors whilst the pump is in operation shall not be required to be interlocked and shall be secured against unintended disturbance.	No sensors and interlock control are used.	N
	Movable guards which remain attached to the pump shall be secured also when in the opened position. Removable guards shall be completely disengaged from the pump.	Comply with the requirements	P

EN 809:1998+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	Unhindered access to the shaft seal where required for checking of its function and/or for its adjustment shall be permitted.		P
	Machined or cut parts which are exposed or likely to be exposed at any stage during the installation, operation, or servicing of the pump or pump unit shall be treated to remove burrs, rags and sharp edges by radiusing or chamfering.	No burrs, rags and sharp edges by radiusing or chamfering.	P
5.2.1.2	High pressure fluid ejection		P
5.2.1.2.1	Shaft, piston rod or plunger sealing system		P
	The pump shall be equipped with a shaft-, piston rod- or plunger sealing system compatible with the pumped fluid and appropriate to the hazard likely to result from a leakage of that fluid.	Shaft sealing system	P
	In assessing the compatibility attention shall be given concerning the nature of the liquid, the pressure, and temperature. Because of the range of characteristics of pumped liquids it is not possible to give any precise requirements to reduce the risks.		P
5.2.1.2.2	Pressure containing elements		P
	Pressure containing parts and components of a pump are to be designed to be suitable for the maximum allowable working pressure. Movement resulting from the loss of pressure shall not create a hazard.		P
	For reciprocating displacement pumps the maximum allowable working pressure is the highest value for the mean pressure in the outlet section of the pump.		N
	In the case where the pump potentially can generate pressure in any part greater than the maximum allowable working pressure of that part, the supplier shall either provide a pressure relief valve or other device to prevent the pressure in the part exceeding 90 % of the hydrostatic test pressure (see 6.2.4), or shall advise the user of the need to make such a provision.		P
5.2.1.2.3	Permitted forces and moments on pipe connections		P
	The permitted forces and moments on pump inlet and outlet branches are to be stated by the manufacturer/supplier.		P
	For rotodynamic pumps typical values for permissible forces and moments can be taken from EN 25199, ISO 9905, ISO 9908.		P
	For rotary positive displacement pumps typical		N

EN 809:1998+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	values for permissible forces and moments can be taken from prEN ISO 14847.		
	Other connections shall be capable of withstanding the forces and moments which may arise from normal operation and from foreseeable misuse.		P
5.2.1.3	Ejection of transmission parts		P
	The upper and lower limits for torque, speed, and loads, for coupling, gears, links, etc. shall not be exceeded.		P
5.2.1.4	Loss of stability		P
	The pump or pump unit shall remain stable in all phases of transport, assembly, dismantling in the conditions foreseen when tilted to an angle of 10° in any direction from its normal position.	The pump could remain stable.	P
	If the pump or pump unit does not meet this requirement the manufacturer/supplier shall define the supporting devices needed to achieve stability, or include specific reference to their need in the information for use/instruction for use.		N
	The supporting devices shall be treated as special tools (see 5.2.8.4), and details of their use shall be provided in the information for use/instruction for use.		N
	When the pump is installed it shall be made stable by the use of holding-down bolts or by the use of other anchoring methods. Holding-down bolts or other anchoring methods shall be strong enough to prevent unintended bodily movement of the equipment.	Holding-down bolts are used.	P
5.2.2	Requirements to avoid electrical hazards		P
	The electrical equipment of a pump unit shall satisfy the general requirements set out in EN 60204-1. Particular features shall conform to the particular clauses of EN 60204-1 as indicated in this standard.	See the EN 60204-1.	P
	Electrical equipment shall be selected for safe operation in the intended application when used in the specified environment and working conditions, and on the declared characteristics and tolerances of the electrical supply taking into account predictable malfunctions	See the EN 60204-1.	P
	The electrical supply on the pump unit shall be	See the EN 60204-1.	P

EN 809:1998+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	provided with means for its isolation from energy supply, or recommendations shall be included in the information for use/instruction for use. Such means shall allow for switching-off during normal operation and/or in an emergency.		
	Access to connections shall be restricted by devices e.g. shrouds or enclosures, which shall be adequate to prevent the entry of predictable fluids or solids and will require tools for removal	IP68.	P
	The pump unit shall be protected by an earth terminal against the build-up of positive charge. The earth terminal shall be connected directly to an earth conductor.	Earth terminal is used.	P
	Unbonded pipe connections shall not be considered as providing a continuous earth path.		N
	Conductors shall be adequately sized for the maximum power load and insulated against the supply voltage and its tolerances, and be unambiguously identifiable by means of colour or other indicators	Unambiguously identifiable by means of colour.	P
	Systems provided for the operational control of the pump unit shall be constructed from components and conductors meeting the requirements of this clause, and take into account the appropriate requirements and considerations set out in EN 60204-1, clauses 9, 10, 12, 18, and 19.	See the EN 60204-1.	P
5.2.2.1	Electrical contact		P
	Enclosures of electrical motors and control systems on the pump unit shall as a minimum give protection in accordance with EN 60529 IP 22.	IP68	P
5.2.2.2	Electrostatic phenomena		P
	In order to prevent the build-up of electrostatic charge, an electrical potential balance for the related equipment is to be provided, if necessary by the use of an earthing route.	By the use of an earthing route.	P
	Care shall be taken to ensure that the electrical potential balance of the pump is not changed by lining, coating or similar treatment.		P
5.2.2.3	External effects on electrical equipment		P
	Electrical enclosures and other protection arrangements together with their means of fitting shall be so constructed that no operating conditions		P

EN 809:1998+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	occur which can lead to danger to personnel.		
5.2.2.4	Electromagnetic compatibility		P
	The equipment shall conform to the requirements set out in EN 50081 parts 1 or 2, and to EN 50082 parts 1 or 2 and relevant parts of EN 61000 with regard to electromagnetic compatibility.		P
5.2.3	Requirements to avoid thermal hazards		P
	The pump or pump unit shall have reduced hazards to personnel arising from temperatures which result from the operation of the pump.		P
	This standard does not deal with means to reduce hazards from surface temperatures which derive from the temperature at which the pumped fluid is delivered to the pump inlet.		P
	Steps shall be taken to minimize contact with or to warn operator/users of any surface which in normal operation will achieve a temperature exceeding those set out in Table 2.		P
5.2.4	Requirements to avoid the danger of noise and vibrations		P
5.2.4.1	Requirements to avoid the danger of noise		P
	This standard does not deal with the reduction of risks of hearing loss arising from prolonged exposure to noise from pumps and pump units. The pump manufacturer shall not take into account the effects of the installation in assessing the noise level.		P
5.2.4.2	Requirements to avoid the danger of vibrations		P
	This standard does not deal with the reduction of risks arising from the prolonged exposure to vibrations generated by the pump or pump unit.		P
5.2.5	Requirements to avoid hazards from materials		P
	Materials shall be selected taking into account the chemical and mechanical characteristics of the liquid to be pumped and of the operating environment, its ability to safely withstand operating loads, its working life and the effect of fatigue, ageing, abrasion, thermal, electrostatic and any other factor which it is expected may arise from the application and impact upon the materials.	Comply with the requirements	P
	Full attention shall be given to local regulations regarding materials suitable for particular purposes such as use with potable water, with foodstuffs, designated for fire protection reasons, etc.	Comply with the requirements	P

EN 809:1998+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	Materials used shall not endanger the health and safety of personnel.		P
	Materials used shall be appropriate with the liquid being pumped and identified in the specification, and with any lubricants, cooling/heating means, barrier or other fluids that may be introduced	Comply with the requirements	P
5.2.5.1	Disposal of liquid		N
	A pump or pump unit operating on a flammable, toxic, corrosive or otherwise hazardous liquid, or on a liquid at a temperature of more than 60 °C shall be provided with a means such as a pipe connection, for use by the user, to collect for safe disposal any drained liquid or leakage from the shaft seal or discharge from a pressure relief valve.		N
	Due to the varied nature of the liquid it is not possible to specify more precise means of disposal.	Used for water	N
5.2.5.2	Disposal of gases	Used for water	N
	Pump units driven by an IC engine shall be provided with a means to collect exhaust gases for safe disposal. Advice on safe disposal of exhaust gases, and the provision of combustion air into the room of installation, shall be included in the information for use/instruction for use.		N
5.2.5.3	Fire and explosion hazards		P
	Equipment supplied for installation in zones designated in degrees of hazard shall meet the technical requirements set down for such zones in local regulations. Where required, the equipment shall be appropriately certificated or otherwise approved.		N
	Materials shall be selected to minimize the possibility of them providing a source of ignition during normal operation or by the inadvertent contact of moving parts.	Steel	P
	Where excessive heat generated during the operation of the pump or pump unit is to be dissipated , the means of dissipation is to be provided, or details of what is needed are to be given in the information for use/instruction for use.		N
5.2.6	Requirements to avoid hazards from neglecting ergonomic principles of machine design		P
	Pump units incorporating signal displays and/or control actuators shall be designed in accordance		P

EN 809:1998+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	with the principles set down in EN 894.		
	Signals shall be arranged to be easy to read and unambiguous in meaning. Manual controls and other operating devices shall be easy to reach and operable without unreasonable effort.	Comply with the requirements	P
	In particular, starting and stopping devices shall be clearly identified. Steps shall be taken, including marking if necessary, to avoid errors arising from confusion.	No such devices.	N
5.2.7	Requirements to avoid hazards caused by failure of energy supply, breakdowns of machinery components and other malfunctions		P
5.2.7.1	Errors of fitting		P
	Hazards arising from misassembly of parts shall be eliminated by design	Comply with the requirements	P
	If fasteners with special requirements are used, then interchangeable parts from other fasteners shall have the same quality.		P
5.2.7.2	Non-return device		P
	If after switching off the pump unit, risks of hazards can occur through reverse flow in the pump, the manufacturer/supplier shall advise the necessity of a non-return device.		P
5.2.7.3	Direction of rotation of the pump		P
	The direction of rotation of the pump shall be indicated in a distinctive place with a suitable arrow in a permanent form.	With a suitable arrow in a permanent form.	P
5.2.7.4	Auxiliary piping		P
	Auxiliary piping necessary for the operation of the pump is to be set out in the information/instruction for use and/or arrangement drawing.		P
	Where functions of connections may be confused, leading to an unacceptable risk of hazard, connections shall be marked permanently on the pump.		N
5.2.7.5	Unexpected start-up		P
	When the hazard exists the requirements of prEN 1037 shall be fulfilled.		P
5.2.8	Requirements to avoid hazards through breakdown and/or wrong installation of protection devices		P
5.2.8.1	All types of guards		P
	Removeable or openable guards shall be designed so that the reduction in risk will not be diminished by incorrect replacement.	Comply with the requirement	P

EN 809:1998+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
5.2.8.2	Measuring instruments and measuring instrument connections		N
	If for reasons of operating security of the pump or pump unit monitor and/or alarm devices are necessary, the necessary connections for them shall be made available.		N
5.2.8.3	Emergency stop	No emergency stop	N
	If a dangerous situation arises which has to be stopped through manual intervention, then an emergency stop facility shall be provided conforming with the requirements of EN 418, or instructions shall be provided for its provision.		N
	If it can be shown that a normal cut-off device functions as an emergency stop with the same efficiency this is admissible and it shall be marked as such.		N
5.2.8.4	Special tools		N
	If special tools are required to install, set up, or start the pump, or during its maintenance, they shall be fully specified and offered for supply by the manufacturer/supplier.		N
5.2.8.5	Safety devices (by-pass, control valve, pressure relief valve)	No such device	N
	Safety devices which are adjustable shall be adjustable only by the use of tools or shall be contained in enclosures which can only be opened by the use of tools.		N
	The manufacturer shall include warnings of the risks arising from adjusting such devices incorrectly.		N
6	Verification of the safety requirements and/or measures		P
6.1	General reference		P
	Verification shall be carried out with the equipment assembled for normal use as intended. Accessories and covers may or may not be fitted as long as the effect is not to obscure the validity of the test.	Comply with the requirement	P
	When dimensions, mass, or other factors make particular tests on complete equipment impractical, tests on sub-assemblies or components are permitted provided that it is verified that the result can be considered representative of the fully		P

EN 809:1998+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	assembled equipment		
6.2	Specific methods of verification		P
6.2.1	Inspection		P
	Verification shall be by appropriate physical examination and measurements of the pump or pump unit, of the specification defining it, and of the labelling and documentation describing it.	Comply with the requirement	P
6.2.2	Review of documentation		P
	The stated performance and features of the pump or pump unit shall be compared with those specified in the data sheet, standard, suppliers' data, or any other appropriate source to demonstrate compliance.		P
6.2.3	Calculations		P
	Calculations used to establish compliance with a requirement shall be recorded by the manufacturer, be checked, and be retained for subsequent examination.		P
6.2.4	Hydrostatic pressure test for pressure containing parts		P
	All pressure containing parts shall be hydrostatically pressure tested in accordance with prEN 12162. The test pressure shall be related by a factor to the maximum allowed working pressure set out in the specification. In no case shall the factor be less than 1,3.		P
6.2.5	Noise measurement		P
	The noise emission of the equipment shall be assessed by reference to measured values. These may be measured on the equipment concerned or from similar equipment operating under similar conditions. Noise emissions shall refer to the unit fully assembled with all auxiliary equipment, guards, and any noise control elements. The noise measurements shall be made in accordance with prEN 12639.	<70dB	P
6.2.6	Guarding		P
	Guards provided to prevent contact with surfaces or with moving parts shall be considered adequate if contact is not made when tested with the test fingers defined in EN 60529 with respect to penetration, rigidity, and impact.	Comply with the requirement	P

EN 809:1998+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
6.2.7	Stability		P
	The conformity can be demonstrated by test, or by calculation for equipment other than for portable units.		P
	The base shall be tilted to up to 10° and no loss of stability shall be acceptable. Care should be taken during the test to ensure that in the event of instability no damage can occur to people or to property.		P
	If calculations are to be the basis of conformity checking, they shall be based upon the centres of gravity method and shall not show any likely instability up to displacements of 12,5° .		P
6.2.8	Surface temperatures		P
	Temperatures of touchable external surfaces are to be measured in accordance with the method defined in EN 563:1994	<55°C.	P
7	Information for use		P
7.1	General		P
	The information for use shall correspond to the rules set out in EN 292-2, clause5.	See the EN ISO 12100.	P
7.2	Instruction for use — instruction handbook		P
7.2.1	General		P
	The instruction for use/instruction handbook shall correspond to the rules set out in EN 292-2, 5.5.	See the instruction handbook.	P
	The customer/purchaser shall receive the instruction handbook not later than when the pump or the pump unit is delivered by the manufacturer.		P
	An instruction handbook shall be included with the delivery.		P
7.2.2	Contents		P
	The instruction handbook shall include safety information on the following subjects as far as they are relevant for the pump or pumping unit and any auxiliary equipment supplied and if they are necessary for reducing the risks during use:	See the instruction handbook.	P
	— general;		P
	— transport and intermediate storage;		P

EN 809:1998+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	— description of the pump or pump unit;		P
	— installation/assembly;		P
	— commissioning startup, operation, shutdown;		P
	— maintenance and servicing;		P
	— faults; cause and remedies;		P
	— relevant documentation.		P
	Additional information may be provided		P
7.2.2.1	General		P
	— Fields and limits of application or use, intended or permissible use, including any site conditions;	See the instruction handbook.	P
	— details of the pump/pump unit:		P
	a) details which relate the operating manual to particular product;	See the instruction handbook.	P
	b) manufacturer, importer or supplier;		P
	c) designation, type, size;	DVX25	P
	d) version no. and/or date of issue of instruction handbook		P
	e) noise emission.	<70dB	P
	f) utility requirements e.g. electrical supplies, water supplies;	220V	P
	— warnings against foreseeable misuse.	See the instruction handbook.	P
7.2.2.2	Transport and intermediate storage		P
	— Preservative measures:		--
	a) durability of protection;		P
	b) any subsequent preservation;		P
	c) removal of protection;		P
	— protection against environmental influences.		P
7.2.2.3	Description of the pump or pump unit		P
	— General description;	See the instruction handbook.	P
	— design and function;	See the instruction handbook.	P

EN 809:1998+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	— design, function and use of safety protection devices;	See the instruction handbook.	P
	— additional descriptions for accessories;	See the instruction handbook.	P
	— dimensions, mass, centres of gravity, capacities	See the instruction handbook.	P
7.2.2.4	Installation/assembly		P
	— Special assembly tools;		N
	— initial installation;		P
	— data on installation site: a) space requirement for operation and maintenance; b) inspection before start of installation; c) details of base, foundation; d) installation of pump assembly; e) alignment requirements including flexible couplings;	See the instruction handbook.	P
	— assembly of driver and accessories;	See the instruction handbook.	P
	— correct installation of safety devices and control systems;	See the instruction handbook.	P
	— electrical connection, connecting cables;	See the instruction handbook.	P
	— grouting and other completion work;	See the instruction handbook.	P
	— pipework: a) general; b) allowable forces and moments on inlet and outlet branches;	See the instruction handbook.	P
	— tightening torques for screw threads.		P
7.2.2.5	Commissioning startup, operation, shutdown		P
	— Documentation: a) measuring point and piping diagrams (e.g. PI-diagram); b) list of lubricants;		N
	— making the product ready for operation:	See the instruction	P

EN 809:1998+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	a) bearings; b) shaft seal; c) filling up/venting; d) electric connections; e) check of direction of rotation;	handbook.	
	— control and monitoring devices: a) functional testing; b) setting values; c) additional facilities (cooling, circulating, heating etc.); d) motor protection (setting); e) emergency switch;		N
	— safety devices: a) mechanical (e.g. guards for coupling or belts); b) sound insulation (e.g. protective hood); c) splash protection (e.g. hood); d) relevant electrical regulations; e) special devices;	Guards and protective hood	P
	— commissioning: a) initial commissioning; b) start after interruptions to the operation; c) pump-related requirements to the plant; d) activation/switching frequency; e) operation and start-up with close valve; f) special information (e.g. stand-by mode, faults);	See the instruction handbook.	P
	— shutdown: a) switching off; b) draining; c) preservation; d) storage;	See the instruction handbook.	P
7.2.2.6	Maintenance and servicing		P
	— Maintenance and inspection: a) consumable items including spare parts;	See the instruction handbook.	P

EN 809:1998+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	b) monitoring during operation; c) any preventive action to be taken (e.g. regarding parts subject to wear, lubrication, sealing medium);		
	— disassembly and re-assembly: a) tools; b) re-assembly procedure;	See the instruction handbook.	P
	— tightening torques for screw threads.	See the instruction handbook.	P
7.2.2.7	Faults; cause and remedies		
	— Faults: a) hydrodynamic; b) mechanical; c) electrical;	See the instruction handbook.	P
	— remedying of causes using product-related check list.		P
7.2.2.8	Relevant documentation		N
	As agreed between manufacturer/supplier and customer/purchaser.		N
8	Marking		P
	The pump or pump unit shall carry the following minimum marking:		P
	— name and address of the manufacturer/supplier;	TAIZHOU WENGGE PUMPS CO.,LTD	P
	— type, designation;	DVX25	P
	— year of manufacture, serial number (if any);	2013. serial number:2013030001	P
	— for pump units with electric motor, information about the electrical data, e.g.:		P
	a) voltage;	220V	P
	b) frequency;	50Hz	P
	c) power rating.	0.18KW	P
	Additional details may be provided for the pump as, e.g.:		P
	— rate of flow;	8m ³ /h	P

EN 809:1998+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	— head;	7 mt.	P
	— speed of rotation.	2850rpm	P



Technical Construction File

File No.: TCF(15)-365-3-MD

Type of Equipment:	SUBMERSIBLE PUMP
Model No.:	DVX 25,DVX 35,DVX 80,DVX 100 , DVX 150M , DVX 150T, DVX 200M ,DVX 300M,DVX 300T, BAFA 150M,BAFA 200M,BAFA 200T, BAFA 300M, BAFA 300T,BKS 150M , BKS 200M,2BKS 100M,2 BKS 150M, 3 BKS 200M , 4 BKS 200M
Issued Date:	2015-06-24
Brand Name/ Trade mark:	NORTEK
Directive(S)	2006/42/EC Machinery Directive
standard(s):	EN 60204-1:2006+A1:2009+AC:2010



Presented for

NORTEK POMPA SAN.TİC.LTD.ŞTİ.
1203/7 SOK NO 1-C YENİŞEHİR / İZMİR / TURKEY

Presented by

Shanghai ECO Information Technology Co., Ltd.
Room 721-722, Cimic Plaza,No.800 Shangcheng Road,Pudong New
Zone,Shanghai 200120 P.R.C

TEST REPORT

EN 60204-1:2006+A1:2009+AC:2010

**Safety of machinery — Electrical equipment of machines — Part 1:
General requirements**

Report

Report reference No. : No: TCF(15)-365-3-MD

Tested by(+ signature).....: *Downey Xue*

Reviewed by(+ signature).....: *Guo Zhijiang*

Date of issue : 2015-06-24

Number of pages (Report) : 55

Testing laboratory

Name : Shanghai ECO Information Technology Co., Ltd.

Address : Room 721-722, Cimic Plaza, No.800 Shangcheng Road, Pudong
New Zone, Shanghai 200120 P.R.C

Testing location : GUANZHUANG VILLAGE, RUOHENG TOWN, WENLING
CITY, ZHEJIANG PROVINCE, P.R.CHINA

Client

Name : NORTEK POMPA SAN.TİC.LTD.ŞTİ.

Address : 1203/7 SOK NO 1-C YENİŞEHİR / İZMİR / TURKEY

Manufacturer

Name : TAIZHOU WENGGE PUMPS CO.,LTD

Address : GUANZHUANG VILLAGE, RUOHENG TOWN, WENLING
CITY, ZHEJIANG PROVINCE, P.R.CHINA

Test specification

Standard : EN 60204-1:2006+A1:2009+AC:2010

Test procedure : CE-MD

Procedure deviation : N.A.

Non-standard test method : N.A.

General description

This device is ideal for fume and dust purification in industrial processing, welding, cutting and grinding.



Ambient temperature: 22°C humidity: 60% Complete File was conducted on DVX 25

DVX 25, DVX 35, DVX 80, DVX 100, DVX 150M, DVX 150T, DVX 200M, DVX 300M, DVX 300T, BAFA 150M, BAFA 200M, BAFA 200T, BAFA 300M, BAFA 300T, BKS150M, BKS 200M, 2BKS 100M, 2 BKS 150M, 3 BKS 200M, 4 BKS 200M are series products.

They belong to the same circuit type except the difference in power, weight and the dimension.

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
1	Scope		
	This part of EN 60204 applies to the application of electrical and electronic equipment and systems to machines not portable by hand while working. Including a group of machines working higher level system aspects	This machine is within this scope.	P
	This part is applicable to the electrical equipment or parts of the electrical equipment that operate with nominal supply voltages not exceeding 1000V for alternating current and not exceeding 1500V for direct current, and with nominal frequencies not exceeding 200Hz	AC 220V 50Hz.	P
2	Normative references		
3	Definitions		
4	General requirements		
4.1	The risks associated with the hazards relevant to the electrical equipment shall be assess as part of the overall requirements for risk assessment of the machine	See the risk assessment report in detail.	P
4.2	Selection of equipment		P
	Electrical components and devices shall be suitable for their intended use and shall conform to relevant IEC standards where such exist	Suitable for their intended use	P
4.3	Electrical supply		P
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:	220V 1~, comply with $\pm 5\%$ rated voltage	P
	Frequency:	50Hz	P
	Harmonics:	<10% of the total r.m.s voltage	P
	Voltage unbalance:	<2% positive sequence	P
	Voltage interruption:	Comply with requirement	P
	Voltage dips:	Comply with requirement	P
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	Not onboard power supply	N
4.4	Physical environment and operating conditions	See instruction	P
4.4.1	Electrical equipment to be suitable for use in		P

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	physical environment and operating conditions		
4.4.2	Electromagnetic compatibility (EMC)		N
	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		P
4.4.4	Electrical equipment to be capable for correct operation at specified relative humidity: at and	< 75%,for a short time, maximum 95%	P
4.4.5	Electrical equipment capable of operating correctly at altitudes up to 1000 m above m.s.l.		P
4.4.6	Electrical equipment shall be adequately protected against ingress of solid properties and liquids		P
4.4.7	Ionizing and non-ionizing radiation Electrical equipment subject to radiation, additional measures to be taken to avoid equipment malfunction	The electrical equipment of the machine is not subject to ionizing and non-ionizing radiation.	N
4.4.8	Undesirable effects of vibration, shock and bump avoided	The machine equips with cushion reduced vibration	P
4.5	Transportation and storage		P
	-2.5. C to + 55. C And short periods not exceeding 24 h at up to + 70. C	Comply with the requirements	P
4.6	Provisions for handling		P
	Heavy and bulky equipment shall be moved by cranes or similar equipment	Appropriate equipments are provided.	P
4.7	Installation and operation		P
	According to supplier's instructions	All the related information is stated in the instruction manual.	P
5	Incoming supply conductors terminations and devices for disconnecting and switching off		P
5.1	Incoming supply conductor terminations		P
	Single or multiple power supply	Single power supply.	P
	The supply conductors are terminated at the supply disconnection device if not, the separate terminals shall be provided		P
	If a neutral conductor is used, it shall be indicated clearly in the technical documentation		N
	No connection between the protective bonding		N

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	circuit and the neutral conductor		
	All terminals for the incoming supply connection shall be identified clearly		P
5.2	Terminal for connection to the external protective earthing system		P
	Shall be in the vicinity of the associated phase conductor terminals		P
	Cross-sectional area of the external protective copper conductor according to table 1		P
	Marking of the external protective conductor with the letters "PE"	'PE' is marked.	P
	Other protective terminals shall be marked with the symbol 		P
	All protective terminals shall be coloured by use of the bicolor combination Green-And-Yellow	Green-And-Yellow	P
5.3	Supply disconnecting (isolating) device		P
5.3.1	General		-
	Shall disconnect (isolate) the electrical equipment of the machine from supply when required		P
	If two or more supply disconnecting devices are provided, protective interlocks shall be used		N
5.3.2	Type		-
	a) Switch-disconnector according to en60947-3 b) A disconnector with auxiliary contact c) Circuit breaker according to EN 60947-2 d) any other switching device in accordance with an IEC product standard e) a plug/socket combination for a flexible cable supply.	e)	P
5.3.3	Requirements		P
	Have one OFF and one ON position only		P
	Marked clearly with "I" and "O"		N
	Have a reset(tripped) position between "O" and "I"		N
	Have an external operating means		N
	The handle should be Black or Grey		N
	Could be locked in the OFF position		P
	Disconnect all live conductors of its power supply circuit		P
	Sufficient breaking capacity		N
5.3.4	Operating handle		-
	Shall be easily accessible and located:0.6 m~1.9 m		N
5.3.5	Excepted circuits		-
	Following circuits not disconnect by supply disconnecting device:		-
	Lighting circuits during maintenance or repair		N

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	Plug/socket outlets exclusively used for maintenance or repair		N
	Undervoltage protection circuits used for automatic tripping only at power supply failures	No undervoltage protection circuits	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		P
	Means shall be provided to prevent inadvertent and / or mistaken closure of the disconnecting device		P
	Such devices appropriate and convenient for intended use		P
	Suitable placed		P
	Readily identifiable	marking used	P
	Disconnecting devices acc. to cl. 5.3.2 used:		N
	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		P
	Supply-disconnecting device used		P

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	Disconnecting device provided for each separated part of the machine or partial machine where necessary		P
	Disconnectors, fuse links etc. used only in enclosed electrical operating areas		P
	Such disconnecting devices appropriate and convenient for intended use and		P
	Suitably located and		P
	readily identifiable to which part it serves and		P
5.6	Provided with adequate means to prevent unauthorised, inadvertent and /or mistaken closing		P
	Devices acc. to cl. 5.4 and 5.5 provided with locking means		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 under immediate supervision of the person carrying out the work		P
6	Protection against electric shock		P
6.1	General	See the relevant clauses.	P
6.2	Protection against direct contact		P
6.2.1	General		-
	Either 6.2.2 or 6.2.3 and, where applicable, 6.2.4 shall be applied	See the relevant clauses.	P
	When the equipment is located in places open to all persons, measures of either 6.2.3 or 6.2.2 with a min. degree of protection against direct contact corresponding to IP4X or IPXXD shall be applied	This machine shall be located in the factory, and be operated by the authorized persons.	N
6.2.2	Protection by enclosures		P
	Min protection degree for live parts: IP2X or IPXXB	IP68	P
	Min. protection degree for top surface: IP4X or IPXXD	IP68	P
	Opening an enclosure shall only be possible under one of the following conditions:		-
a)	The use of a key or tool is necessary by skilled or instructed persons	Open the enclosure by using a tool	P
	Min. protection degree for live parts on the inside of doors: IP1X or IPXXA		N

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	live parts likely to be touched during resetting or adjustment with protection degree IP2X or IPXXB		P
b)	The disconnection of live parts inside the enclosure before the enclosure may be opened (Use of the supply disconnecting device)		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 disconnector 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.17.2		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. 14.2.4		N
	- Terminals of supply disconnecting device when latter mounted alone in a separate enclosure		N
c)	Opening without the use of a key or a tool and without disconnection of live parts shall be possible only when the min. protection degree is IP2X or IPXXB		N
6.2.3	Protection by insulation of live parts		P
	Live parts shall be covered by insulation which can only be removed by destruction		P
	Such insulation shall withstand the mechanical, chemical, electrical and thermal stresses under normal service conditions		P
6.2.4	Protection against residual voltages		P

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	After disconnecting, any exposed conductive part having a residual voltage that shall be discharged to 60V or less within 5 seconds	0V within 1s, comply with requirement	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. 13.8.4)		N
6.2.5	Protection by barriers		-
	For protection by barriers, see 412.2 of IEC 60364-4-41		N
6.2.6	Protection by placing out of reach or protection by obstacles		-
	For protection by placing out of reach see 412.4 of IEC 60364-4-41		N
	For protection by obstacles see 412.3 of IEC 60364-4-41		N
	For collector wire systems or collector bar systems with a degree of protection less than IP2X see 13.8.1		N
6.3	Protection against indirect contact		P
6.3.1	General		-
	For each circuit or part, at least one of the measures in accordance with 6.3.2 to 6.3.3 shall be applied	See the following descriptions.	P
6.3.2	Measure to prevent the occurrence of a hazardous touch voltage		P
6.3.2.1	General		-
6.3.2.2	use of class II electrical devices or apparatus (double insulation, reinforced insulation or by equivalent insulation acc. to EN 60536)	double insulation	P
	use of switchgear and control gear assemblies with total insulation acc. to EN 60439-1		P
	application of supplementary or reinforced insulation acc. to EN 60364-4-41, 413.2		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
6.3.3	Protection by automatic disconnection of supply		N
	a) Use of protective device for automatic cut-off in the event of an insulation failure in a TN – or TT-		N

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	system		
	b) Use of earth fault detection device to initiate automatic disconnection in an IT-System.		N
	initiation of warning signal only in case of first occurrence of a fault permitted		N
6.4	Protection by the use of PELV		N
6.4.1	General requirements	-	
	a) nominal voltage not to exceed 25 AC (r.m.s.) or 60 DC (ripple-free) or	No PELV circuit	N
	6VAC or 15VDC for all other cases		N
	b) one side of PELV- circuit or one point of source of supply to be connected to PE- circuit		N
	c) live parts of PELV- circuits to be electrically separated from other live circuits.		N
	Electrical separation equal as required for safety isolating transformers (see IEC 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. 14.1.3 shall be applied		
	e) plugs and socket outlets for PELV- circuits shall conform to following requirements:		
	plugs shall not be able to enter socket outlets of other voltage systems		N
	socket outlets shall not admit plugs of other voltage systems		N
6.4.2	Sources for PELV		N
	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
7	Protection of equipment		P
7.1	General		-
7.2	Over current protection		N
7.2.1	Overcurrent protection device provided		N


EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
7.2.2	Supply conductors		P
	The supplier is not responsible for providing the over current device for the supply conductors		P
	Installation diagram with data necessary for selection of the over current protective device		P
7.2.3	Power circuits		N
	All conductors shall be protected against over current (except earthed neutral conductor)		N
	Cross-section area of neutral conductor		N
	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		N
	Conductors of control circuits directly connected to supply voltage and circuits feeding control voltage transformers protected against overcurrent acc. to cl. 7.2.3		N
	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	No winding of secondary connect to PE terminal	N
7.2.5	Socket outlets and their associated conductors		N
	Overcurrent protection devices for socket outlets provided for non-earthed live conductors of each circuit feeding such socket outlets	No socket outlets and associated conductors	N
7.2.6	Lighting circuits		N
	All unearthed conductors of local lighting circuits protected by overcurrent protective devices		N
7.2.7	Transformers	No Transformers	N
	Transformers shall be protected against overcurrent in accordance with the manufacturer's instructions		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		N

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	acc. to recommendations of transformer manufacturer		
7.2.8	Location of over current protective device		P
	Overcurrent protective device 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		P
	Each connecting conductor to overcurrent protective devices not longer than 3 meters		P
	Conductor protected by enclosure or duct		P
7.2.9	Over current protective devices		P
	Rated short-circuit breaking capacity at least equal to prospective fault current at point of installation		P
	Current other than those coming from supply side taken into account		N
	Reduced breaking capacity is permitted, where another protective device is installed at supply side with the necessary breaking capacity		P
	Back-up protection carefully checked, no destruction of conductor or overcurrent protective device may result		P
	Co-ordination with other protective devices in circuit required		P
	Overcurrent protective devices in power circuits include fuses and circuit breakers. Electronic current limiting devices may also be used in protected circuits		N
7.2.10	Rating and setting of over current protective devices		P
	Rated current of fuses or overcurrent setting of other protective devices selected as low as possible, but adequate for anticipated overcurrents.		P
	Settings of overcurrent protective devices appropriately listed in technical documentation		P
7.3	Overload protection of motors		P
	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	Can't be overloaded	P
	Overload protection achieved by current sensing or		P

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	limiting devices or temperature sensors.		
	Current overload detection provided for each live conductor except for neutral conductor		P
	For motors supplied by single phase AC or DC power supply, current detection in one non-earthed live conductor only is permitted	1~ AC power applied	N
	If overload protection is achieved by switching-off device, all live conductors cut from power supply except neutral conductor	Comply with requirement	P
	For special duty motors, appropriate protective devices are recommended		N
	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	Excessive temperature reached, motors stop, and start the motor using a start-button located on operator area	P
7.4	Abnormal temperature protection		P
	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		N
	Undervoltage protection provided for applications where loss of supply or undervoltage causes a hazardous condition	Undervoltage protection is not provided.	N
	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		N
	Upon restoration of supply voltage, automatic or unexpected restarting of machine prevented		N
	Undervoltage protection to initiate appropriate control responses to ensure co-ordination the groups of machines working together		N
7.6	Motor over speed protection		P
	Overspeed protection provided where overspeeding causes a hazardous condition		P

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	Overspeed protection initiates appropriate control response and prevents automatic restarting		N
7.7	Earth fault/residual current protection		N
	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		N
	Where an incorrect sequence of the supply voltage can cause a hazardous condition or damage to the machine, protection shall be provided		N
7.9	Protection against over voltage due to lighting and to switching surges		P
	Protective devices for the suppression of overvoltages caused by lightning strikes or switching surges provided		P
	Devices for suppression of overvoltages due to lightning, connected at incoming terminals of the supply disconnecting device		P
	Devices for suppression of overvoltages due to switching surges connected across terminals of all equipment requiring such protection		P
8	Equipotential bonding		P
8.1	General		-
8.2	Protective bonding circuit		P
8.2.1	General		-
	On mobile machines with on-board power supplies, it shall be connected to a protective bonding terminal to provide protection against electric shock	Not movable machine	N
	When a mobile machine is also capable of being connected to an external incoming supply, the protective bonding terminal shall be the connection point for the external protective conductor	Not movable machine	N
	All parts of the protective bonding circuit shall be so designed that they are capable of withstanding the highest thermal and mechanical stresses	Provided by user according to instructions	P
	Any structural part of the electrical equipment or of the machine may be used as part of protective bonding circuit		P
	If an IT distribution system is used, the machine structure shall be used as part of the protective bonding circuit in conjunction with an earth fault supervision system	No IT system applied	N

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
8.2.2	Protective conductors		P
	Protective conductors shall be identified according to 14.2.2	See clause 14.2.2 in detail.	P
	Copper conductors should be used	Copper used	P
	Where a conductors material other than copper is used, its electrical resistance per unit length shall not exceed that of the allowable copper conductor and such conductors shall not be less than 16 mm ² in cross-sectional area	Only copper conductors are used.	N
	The cross-sectional area of protective conductors shall be determined according to the requirements of: -543 of IEC 60364-5-54; or -7.4.3.1.7 of IEC 60439-1, as appropriate		P
	Relationship between cross-section area of phase conductor and PE acc. to table 1		P
8.2.3	Continuity of the protective bonding circuit		P
	All exposed conductive parts shall be connected to the protective bonding circuit	Connect to protective bonding circuits	P
	In case of removal of parts of PE system, remaining parts not to be interrupted	If one part removed, protective continuity not interrupted	P
	Connection and bonding points shall be so designed that their current-carrying capacity is not impaired by mechanical, chemical, or electrochemical influence	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 of flexible or rigid construction and metallic cable sheathes shall not be used as protective bonding conductors	No metal ducts and cable armouring used as or connected to protective bonding circuits	P
	Where the electrical equipment is mounted on lids, doors, or cover plates, continuity of the protective bonding circuit shall be ensured and it is recommended that a protective conductor is used	No such electrical equipment	N
	Continuity of protective conductor ensured at cables which are exposed to damage		N
8.2.4	Exclusion of switching devices from the protective bonding circuit		P
	Protective bonding circuit not incorporate a switching-/overcurrent protective device nor a means for current detection	No switching devices or any other current protective devices	P

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	Interruption of protective conductors permitted by links, intended to be opened by instructed/skilled persons for test or measurement purposes by using a tool		P
8.2.5	Parts that need not to be connected to the protective bonding circuit		P
	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		P
	are located in such way, that either contact with live parts or an insulation failure is unlikely		P
8.2.6	Protective conductor connecting points		P
	All protective conductors shall be terminated in accordance with 14.1.1	Please see the related clause.	P
	Shall have no other function and shall not be used to attach or connect appliances or parts	Only for earth connection	P
	Use of earthing symbol 	Earthing symbol is used.	P
	By the bicolor combination GREEN-AND-YELLOW	GREEN-AND-YELLOW	P
8.3	Functional bonding		P
	Protection against maloperation as a result of insulation failures can be achieved by connecting to a common conductor in accordance with 9.4.3.1.	See the following descriptions.	P
	For recommendations regarding functional bonding to avoid maloperation due to electromagnetic disturbances, see 4.4.2.		P
8.4	Measures to limit the effects of high leakage current		N
	The effects of high leakage current can be restricted to the equipment having high leakage current by connection of that equipment to a dedicated supply transformer having separate windings.		N
9	Control circuits and control functions		P
9.1	Control circuits		P
9.1.1	Control circuit supply		P
	Transformers shall be used for supplying the control circuits	No transformer	N
	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		N

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	single motor starter and maximum of two control devices		
9.1.2	Control circuit voltages		P
	The nominal voltage shall not exceed 277 V when supplied from a transformer		P
9.1.3	Protection		P
	Over current protection shall be provided according to 7.2.4 and 7.2.10		P
9.2	Control functions		P
9.2.1	Start functions		P
	Start functions shall operate by energizing the relevant circuit		P
9.2.2	Stop functions		P
	Category 0: Stopping by immediate removal of power to machine actuators		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	Not provided	N
9.2.3	Operating modes		N
	When hazardous conditions can arise from mode selection, such selection shall be prevented by suitable means.		N
	Mode selection by itself shall not initiate machine operation (A separate action by the operator shall be required)		N
	Safeguarding shall remain effective for all operating modes		N
	Indication of the selected operating mode shall be provided		N
9.2.4	Suspension of safety functions and/or protective measures		N
	Where it is necessary to suspend safety functions and/or protective measures (for example for setting or maintenance purposes), protection shall be ensured by:		-
	-disabling all other operating (control) modes; and		N
	-other relevant means (see 4.11.9 of ISO 12100-2:2003), that can include, for example, one or more of the following:		N
	-initiation of operation by a hold-to-run device or by a similar control device;		N

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	-a portable control station with an emergency stop device and, where appropriate, an enabling device. Where a portable control station is in use, initiation of motion shall only be possible from that control station;		N
	-a cableless control station with a device to initiate stop functions in accordance with 9.2.7.3 and, where appropriate, an enabling device.		N
	-limitation of the speed or the power of motion;		N
	-limitation of the range of motion.		N
9.2.5	Operation		P
9.2.5.1	General		P
	The necessary interlocks (see 9.3) shall be provided for safe operation		P
	Measures shall be taken to prevent movement of the machine in an unintended manner after any stopping of the machine		P
9.2.5.2	Start		P
	The start of an operation shall be possible only when all the safeguards are in place and functional (except described in 9.2.4)		P
	Hold-to-run control shall be used for the others machines, as appropriate		N
	Suitable interlocks shall be provided to secure correct sequential starting		N
	The use of more than one control station to initiate a start		N
9.2.5.3	Stop		P
	Category 0, category 1 and/or category 2 stops shall be provided where indicated by the risk assessment and the functional requirements of the machines		P
	Stop functions shall override related start functions		P
	Facilities provided for connection of protective devices / interlocks		P
	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)		N
	Resetting of stop function must not initiate any hazardous condition		N
9.2.5.4	Emergency operations (emergency stop, emergency switching off)		N
9.2.5.4.1	General		-
9.2.5.4.2	Emergency stop		N
	Shall function either as a category 0 stop or as a		N

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	category 1 stop		
	The choice of the emergency stop shall be determined by the risk assessment of the machine		N
	Where a category 0 stop is used for emergency stop function, it shall have only hard-wired electromechanical components		N
	Emergency stop has priority over all other functions and over all modes of operation		N
	Power to machine actuators that can cause hazardous condition(s) removed as quickly as possible without creating other hazards		N
	Resetting must not initiate a restart		N
9.2.5.4.3	Emergency switching off		N
	Functional aspects of emergency switching-off function are given in IEC 60364-4-46 and should be provided where:		N
	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		N
	Movement or action of a machine or parts of it, that can result in a hazardous condition be monitored		N
	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	Other control functions		N
9.2.6.1	Hold-to-run controls		N
	Hold-to run controls shall require continuous actuation of the control devices to achieve operation		N
9.2.6.2	Two-hand control		N
	Three types of two-hand control are available, the selection of which is determined by the assessment		N

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
9.2.6.3	Enabling device		N
	It shall be designed to allow motion when actuated in one position only (In any other position motion shall be stopped)		N
9.2.6.4	Combined start and stop controls		N
	Push-buttons and similar devices that, when operated, alternately initiate and stop motion shall only be used for functions which cannot result in a hazardous condition	No this kind of device has been used.	N
9.2.7	Cableless control	Not provided	N
9.2.7.1	General		N
	Means shall be provided to readily remove or disconnect the power supply of the operator control station	No cableless control is used.	N
	Means shall be provided, as necessary, to prevent unauthorized use of the operator control station	No cableless control is used.	N
	Each operator control station shall carry an unambiguous indication of which machine is intended to be controlled by that operator control station	No cableless control is used.	N
9.2.7.2	Control limitation		N
	Measures shall be taken to prevent the machine from responding to signals other than those from the intended operator control station	No cableless control is used.	N
	Where necessary, means shall be provided so that the machine can only be controlled from operator control station in one or more predetermined zones or locations	No cableless control is used.	N
9.2.7.3	Stop		N
	Operator control stations shall include a separate and clearly identifiable means to initiate the stop function of the machine or of all the motions that can cause a hazardous condition	No cableless control is used.	N
	The actuating means to initiate this stop function shall not be marked or labeled as an emergency stop device	No cableless control is used.	N
	A machine which is equipped with cableless control shall have a means of automatically initiating the stopping of the machine and of preventing a potentially hazardous operation	No cableless control is used.	N
9.2.7.4	Use of more than one operator control station		N
	Where a machine has more than one operator control station, measures shall be taken to ensure that only one control station can be enabled at a given time	No cableless control is used.	N

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	An indication of which operator control station is in control of the machine shall be provided at suitable locations as determined by the risk assessment of the machine	No cableless control is used.	N
9.2.7.5	Battery-powered operator control stations		N
	A variation in the battery voltage shall not cause a hazardous condition	No cableless control is used.	N
	If one or more potentially hazardous motions are controlled using a battery-powered operator control station, a clear warning shall be given to the operator when a variation in battery voltage exceeds specified limits	No cableless control is used.	N
	Under those circumstances, the operator control station shall remain functional long enough to put the machine into a non-hazardous condition	No cableless control is used.	N
9.3	Protective interlocks		N
9.3.1	Reclosing or resetting of an interlocking safeguard		N
	The reclosing or resetting of an interlocking safeguard shall not initiate machine motion or operation		N
9.3.2	Exceeding operating limits		N
	Where an operating limit (for example speed, pressure, position) can be exceeded leading to a hazardous situation, means shall be provided to detect when a predetermined limit(s) is exceeded and initiate an appropriate control action.		N
9.3.3	Operation of auxiliary functions		N
	The correct operation of auxiliary functions shall be checked by appropriate devices		N
	Use of appropriate interlocking		N
9.3.4	Interlocks between different operations and for contrary motions		N
	Interlocks of contactors, relays, etc. between different operations and for opposite motions, interlocks against such incorrect operation provided		N
	Reversing contactors interlocked in such way, that in normal service no short circuit occurs during switching operation		N
	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		N

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	controller		
	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 braking		N
	Reverse current braking 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	No reverse current braking used for AC rotating motor	N
	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		P
9.4.1	General requirements		P
	Measures to reduce those risks include but are not limited to:		-
	protective devices on the machine, (e.g. interlocking guards, trip devices)		P
	protective interlocking of electrical circuit		P
	use of proven circuit techniques and components (see cl. 9.4.2.)		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)		P
	single failures only are to be considered		P
	Where memory retention is achieved for example, by battery power, measures shall be taken to prevent hazardous situations arising from failure or removal of the battery.		N
	Means shall be provided to prevent unauthorized or inadvertent memory alteration by, for example, requiring the use of a key, access code or tool.		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
	bonding of control circuits to protective circuit for operational purposes (see cl. 9.4.3.1)		P
	connection of control devices in accordance with cl. 9.1.4		N

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	stopping by de-energising (see cl. 9.2.2)		N
	switching of all live conductors to device being controlled (see cl. 9.4.3.1)		N
	use of switching devices having positive (or direct) opening operation (see IEC 60947-5-1)		N
	circuit design to reduce possibility of failures causing undesirable operations		N
9.4.2.2	Provisions of partial or complete redundancy		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
	on-line redundancy for normal operation		N
9.4.2.3	Provision of diversity		N
	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	Provision for functional tests		P
	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 maloperation due to earth faults, voltage interruptions and loss of circuit continuity		P
9.4.3.1	Earth faults		P

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	Earth faults on any control circuit causes no unintentional starting, potentially hazardous motions or prevent stopping of machine	No motion	P
	For fulfilment of this requirement, bonding to PE-circuit provided and correct connection of devices ensured	PE circuit connected to conductor	P
	Control circuits fed from transformer and not connected to PE- circuit provided with an insulation monitoring device	Control circuits connected to PE circuits	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.	No multi-pole control switches	N
9.4.3.2	Voltage interruptions		P
	Where a memory device is used, proper functioning in the event of power failure shall be ensured to prevent any loss of memory that can result in a hazardous condition	Any loss of memory can't result in a hazardous condition.	P
9.4.3.3	Loss of circuit continuity		P
	Where the loss of continuity of safety-related control circuits depending upon sliding contacts can result in hazardous condition, appropriate measures shall be taken	No sliding contact used	N
10	Operator interface and machine-mounted control devices		P
10.1	General		P
10.1.1	General device requirements		P
	As far as is practicable, those devices shall be selected, mounted, and identified or coded according to IEC 60073 and IEC 60447		P
10.1.2	Location and mounting		P
	Machine-mounted control devices readily accessible for service and maintenance and		P
	Mounted to minimize possibility of damage from activities such as 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)		N
	Placed so that operator is not exposed to a hazardous situation when operating them		N

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	Possibility of inadvertent operation is minimised		N
10.1.3	Protection		P
	Degree of protection sufficient for expected use against:		-
	Effects of aggressive liquids, vapours or gases in environment of machine		P
	Ingress of contaminants		P
	Operator interface control devices have a minimum degree of protection against direct contact of IPXXD		P
10.1.4	Position sensors		N
	Position sensors shall not be damaged in the event of over travel		N
	Position sensors used in circuits with safety-related functions shall have positive opening operation or shall provide similar reliability		N
10.1.5	Portable and pendant control stations		N
	Portable and pendant control stations and their control devices shall be so selected and arranged as to minimize the possibility of inadvertent machine operations caused by shocks and vibrations		N
10.2	Push-buttons		P
10.2.1	Colors		P
	Push-button actuators shall be color -coded according to table 2		P
10.2.2	Markings		P
	Recommendation that pushbuttons are preferably marked directly on actuator with symbols acc. to table 3		P
10.3	Indicator lights and displays		P
10.3.1	Colours for indication lights: RED, YELLOW, GREEN, BLUE Colours for confirmation: GREEN and WHITE		P
10.3.2	Colors		P
	Color-coded according to table 4 (Unless otherwise agree between the supplier and the user)		P
10.3.3	Flashing lights and displays		N
	Flashing lights for further information may be used for following purposes:		-
	to attract attention or		N
	to request immediate action or		N

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	to indicate a discrepancy between command and actual state or		N
	to indicate a change in process (flashing during transition)		N
	higher frequency of flashing lights (pulse/pause ratios) recommended for higher priority of information		N
10.4	Illuminated push-buttons		N
	Illuminated push-button actuators colour-coded acc. to tables 2 and 4		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		P
	Devices having a rotational member shall be mounted to prevent rotation of the stationary member (Friction alone shall not be sufficient)		P
10.6	Start devices		P
	Start devices use to initiate start functions or movement of machine or elements designed and mounted such as to minimize inadvertent operation		P
	Mushroom - type actuators use for two-hand control devices		P
10.7	Devices for emergency stop		N
10.7.1	Location		N
	Devices for emergency stop shall be readily accessible		N
	Emergency stop devices shall be located at each operator control station and at other locations where the initiation of an emergency stop can be required		N
10.7.2	Types		N
	Use of type - a push-button operated switch - a pull-cord operated switch - a pedal-operated switch without a mechanical guard		N
	Shall be of the self-latching type and shall have positive opening operation		N
10.7.3	Colour of actuators		N

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	Actuators of emergency stop devices are coloured RED		N
	Background immediately around actuator is coloured YELLOW		N
10.7.4	Local operation of the supply disconnecting device to effect emergency switching off		N
	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	Emergency switching off devices		N
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: 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	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
10.8.4	When supply disconnecting device is locally operated for emergency switching-off, it shall be readily accessible		N
	Supply disconnecting device locally operated for		N

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	emergency switching-off, shall meet colour requirement acc. to cl. 10.8.3.		
10.9	Enabling control device		N
	When an enabling control device is provided as a part of a system, it shall signal the enabling control to allow operation when actuated in one position only.		N
11	Control gear: location, mounting, and enclosures		P
11.1	General requirements		P
	All control gear located and mounted so, as to cover the following points: facilitate 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		P
11.2	Location and mounting		P
11.2.1	Accessibility and maintenance		P
	all control-gear components placed and oriented so, that identification is possible without moving them or the associated wiring		P
	Components checked for correct operation or possible replacement without dismantling other equipment or parts of the machine		P
	Terminals not associated with control gear also to conform to this requirement		P
	Operation and maintenance of all control gear possible from front of cabinet		P
	Special tools for removal of electronic devices provided with the equipment		P
	Access for regular maintenance or adjustment to equipment, relevant devices located between 0.4m to 2.0 m above servicing level		P
	Terminals located at least 0.2 m above servicing level and placed such, that conductors and cables can be easily connected		P
	No devices mounted on doors, except those for operating, indicating, measuring and cooling purposes on normally removable access-covers of enclosure		N

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	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. 14.4.5)		P
	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		P
	Use of plug/socket combinations shall be unobstructed access		P
	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. 18.3)		N
	adequately insulated		N
11.2.2	Physical separation or grouping		N
	Non-electrical parts and devices, not directly associated with the electrical equipment, not located within enclosures containing control gear		N
	Devices such as solenoid valves separated from other electrical equipment		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		N
	Terminals separated into groups for: power circuits or		N
	associated control circuits or		N
	other control circuits, fed from external sources		N
	Terminal groups mounted adjacently, providing that each group is readily identified		N
	When arranging the location of devices, clearances and creepage distances specified for them shall be maintained, taking into account external influences or physical conditions of its environment		N

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
11.2.3	Heating effects		P
	Heat generating components shall be located so that the temperature of each component in the vicinity remains within the permitted limit		P
11.3	Degrees of protection		P
	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		P
	Its protection sufficient against dust, coolants and swarf		P
	Enclosures of control gear provide a degree of protection of at least 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		P
	Enclosures to withstand mechanical, electrical and thermal stress as well as effects of humidity during normal service		P
	Fasteners for doors or covers of captive type		P
	Windows for viewing internally mounted indicating devices, made of material suitable to withstand mechanical stress and chemical attack		N
	Doors of enclosure not wider than 0,9 meter		N
	Doors with vertical hinges		N
	Doors with opening angle of at least 95 °		N
	Gaskets of doors, lids, covers and enclosures withstand the chemical effects of aggressive liquids, vapours or gases use on the machine		P
	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		P

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	enclosure		
	not deteriorate due to removal or replacement of door or cover and so impair degree of protection		P
	all openings in enclosure closed by supplier(s), ensuring degree of protection specified for equipment		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		N
	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		N
	Minimum dimensions of doors and corridors for access to electrical operating areas: at least 0.7 meter wide and 2.0 meter high		N
	Doors open outwards		N
	Doors equipped with means to allow opening from inside without the use of a key or tool	Not provided	N
12	Conductors and cables		P
12.1	General requirements		P
	Conductors and cables selected so as to be suitable for operating conditions and external influences that are existing	Input cables and outer ground bonding conductors are supplied by user according to instructions	P

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	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	Conductors		P
	Conductors shall be of copper	Copper.	P
	Conductors of any other material shall have a nominal cross-sectional area such that, carrying the same current, the max. temperature shall not exceed the value given in table 5	Only copper conductors are used.	P
	If aluminium is used, the cross-sectional area shall be at least 16mm ²	Only copper conductors are used.	P
	All conductors that are subject to frequent movement shall have flexible stranding of class 5 or class 6 (see table C.4)	Comply with requirement	P
12.3	Insulation		P
	Types of insulation include: Polyvinyl chloride (PVC)		N
	Rubber, natural and synthetic	Rubber	P
	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 min. of 2000VAC for cables operating with voltages >50V AC or >120 VDC	2000V, no breakdown	P
	For separate PELV circuits, dielectric strength adequate for test voltage of 500VAC for a duration of 5 minutes		N
	Mechanical strength and thickness of insulation such that, insulation cannot be damaged during cable laying or in operation	Not be damaged during cable laying or in operation	P


EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
12.4	Current-carrying capacity in normal service		P
	The current-carrying capacity depends on several factors, for example insulation material, number of conductors in a cable, design (sheath), methods of installation, grouping and ambient temperature.		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 6		P
12.5	Conductor and cable voltage drop		P
	The voltage drop for conductors and cables shall not exceed 5% of the nominal voltage	Not exceed 5%.	P
12.6	Flexible cables		P
12.6.1	General		P
	Flexible cables shall have class 5 or class 6 conductors		P
	cables exposed to severe duties shall be of adequate construction to protect against:		-
	abrasion due to mechanical handling and dragging across rough surfaces		P
	kinking to operation without cable guides		P
	stress resulting from guide rollers and forced guiding, being wound and re-wound on cable drums		P
12.6.2	Mechanical rating		P
	Cable handling system of machine designed such, as to keep tensile stress of conductors as low as practicable during machine operation		P
	tensile stress for copper conductors not to exceed 15 N/mm ² of copper cross section area	<15 N/mm ² of copper cross section area	P
	where tensile stress of conductors is exceeding 15 N/mm ² , cables of special design are use		N
	maximum stress for flexible cables agreed with the cable manufacturer		P
12.6.3	Current-carry capacity of cables wound on drums		N
	Cables wound on drums selected such, as the maximum allowable conductor temperature is not exceeded	Not be wound on drums	N
	cables for circular cross-section area, installed on drums, max. current-carrying capacity in free air as declared acc. to table 7		N
12.7	Collector wires, collector bars and slip-ring assemblies		N

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
12.7.1	Protection against direct contact		N
	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		N
	protection by enclosure or barriers provide a degree of protection of at least IP2X		N
	horizontal top surfaces of barriers or enclosures which are readily accessible provide a degree of protection of at least IP4X		N
	if required degree of protection is not achieved, protection by placing live parts out of reach in combination with emergency switching-off acc. to cl. 9.2.5.4.3 applied		N
	collector wires and bares 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
12.7.2	Protective conductor circuit		N
	Where collector wires, collector bars and slip-ring assemblies are installed as part of the protective bonding circuit(PE), they shall not carry current in normal operation		N
	The continuity of the protective conductor circuit using sliding contacts shall e ensured by taking appropriate measures	Not use sliding contacts	N
12.7.3	Protective conductor current collectors		N
	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		N
12.7.4	Removable current collectors with a disconnect function		N
	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		N
12.7.5	Clearance in air		N
	Clearances between respective conductors and		N

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	between adjacent systems of collector wires, bars, slip-ring assemblies and their current collectors designed for operation in pollution degree III conditions		
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
	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
12.7.7	Conductor system sectioning		N
	Suitable design measures taken, in order to prevent energisation of adjacent sections by current collectors themselves		N
12.7.8	Construction and installation of collector wire, collector bar systems and slip-ring assemblies		N
	Collector wires, collector bar systems and slip-ring assemblies use for power circuits kept separately from those use for control circuit applications		N
	above systems capable of withstanding without damage to mechanical forces and thermal effects of short circuit currents		N
	removable covers to above systems, laid underground or under floor, designed that they cannot be opened by one person without the use of a tool		N
	collector bars which are installed in a common metal enclosure, the individual section of it bonded together and earthed at several points depending		N

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	upon their length		
	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
13	Wiring practices		P
13.1	Connections and routing		P
13.1.1	General requirements		P
	All connections shall be secured against accidental loosening	Fixed by screws	P
	The means of connection shall be suitable for the cross-sectional areas and neutral of the conductors being terminated	Fixed by screws	P
	The connection of two or more conductors to one terminal is permitted (only when the terminal is designed for that purpose)	No terminal has been connected with three or more conductors.	P
	One protective bonding circuit conductor shall be connected to one terminal connecting point	One conductor connected to one terminal.	P
	Soldered connections shall only be permitted if terminals are suitable for soldering	No soldered connection has been taken.	N
	Terminals on terminal blocks shall be plainly identified to correspond with markings on the diagrams	All of them have been marked corresponding to markings on the diagrams.	P
	The installation of flexible conduits and cables shall be such that liquids shall drain away from the fittings	No liquids	N
	Means to retain stranded conductors together when terminating conductors at terminals/ devices provided		P
	Solder not use for that purpose	No solder used	N
	Shielded conductors terminated so, as to prevent fraying of strands and to permit easy disconnection		N
	Identification tags shall be legible, permanent, and appropriate for the physical environment	The tags are legible, permanent, and appropriate for the physical environment.	P
	Terminal blocks shall be so mounted and wired, that the internal and external wiring does not cross over the terminals	No conductor cross over the terminals.	P
13.1.2	Conductor and cable runs		N
	Shall be run from terminal to terminal without splices or joints		N
	If it is necessary to connect and disconnect cables		N

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	assemblies, a sufficient extra length shall be provided		
	The terminations of cables shall be adequately supported to prevent mechanical stresses at the terminations of the conductors		N
	The protective conductor shall be placed close to the associated live conductors in order to decrease the impedance of the loop.		N
13.1.3	Conductors of different circuits		N
	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		N
	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		N
13.1.4	Connection between pick-up and pick-up converter of an inductive power supply system		N
	The cable between the pick-up and the pick-up converter as specified by the manufacturer of the inductive power supply shall be:		-
	as short as practicable;		N
	adequately protected against mechanical damage.		N
13.2	Identification of conductors		P
13.2.1	General requirements		P
	Conductors shall be identifiable at each termination according to the technical documentation (see clause 17)	Identification at each termination	P
	Conductors are identified by number, alphanumeric, colour (either solid or with one or more stripes), or a combination of colour and numbers or alphanumeric.	A combination of colour and numbers or alphanumeric.	P
	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		P
	Shall be really distinguishable by shape, location, marking or color	By marking and color.	P
	When identification is by color alone, the bicolor combination GREEN-AND YELLOW shall be used	By GREEN-AND-YELLOW.	P
	For the bicolor combination GREEN-AND YELLOW : one of the color covers at least 30% and		P

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	not more than 70% of the surface of the conductor, the other color covering the remainder of the surface		
	Use of graphical symbol 	The earthing symbol has been used.	P
13.2.3	Identification of the neutral conductor		P
	The color shall be Light Blue	Light blue	P
	LIGHT BLUE must not be use for identification of any other conductor where confusion is possible		P
	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		P
	Bare conductor colour coloured LIGHT BLUE over its full length		P
13.2.4	Identification by colour		P
	Identification of other conductors by colour, number, alphanumeric or a combination of colour and numbers or alphanumeric		P
	When numbers are use, they are in Arabic writing ; letters are in Roman characters		P
13.3	Wiring inside enclosures		P
	Panel wiring supported where necessary to keep it in place	Fixed by screws	P
	Non-metallic ducts permitted only when they are of flame-retardant insulating material		N
	Electrical equipment mounted inside cabinets, designed to permit modification of wiring from front of cabinet (see cl. 11.2.1)		P
	Where that is not possible, access, doors or swing out panels provided		N
	Connections to devices mounted on doors or to other movable parts made with flexible conductors (acc. to cl.13.2) 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	Fixed by screws and rubber cushion anchor	P
	Conductors and cables that do not run in ducts are		P

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	adequately supported		
	Terminal blocks or plug /socket combinations use for control wiring, that extends beyond the enclosure	Terminal blocks used for control wiring that extend beyond the enclosure	P
	Power cables and cables for measuring-circuits are directly connected to terminals of field located devices		P
13.4	Wiring outside enclosures		P
13.4.1	General requirements		P
	The protection degree shall be ensured when cables or ducts are introduced into the enclosure		P
13.4.2	External ducts		P
	Shall be enclosed in suitable ducts as described in 13.5 except for suitably protected cables		P
	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 used with ducts or multiconductor cable shall be suitable for the physical environment		N
	Flexible conduction or flexible multiconductor cable shall be used where it is necessary to employ flexible connections to pendant push-button stations		P
	The weight of the pendant stations shall be supported by means other than the flexible conduit or the flexible multiconductor cable		N
	Flexible conduit or flexible multiconductor cable shall be used for connections involving small or infrequent movements		N
13.4.3	Connection to moving elements of the machine		N
	Connection to frequently moving parts shall be made using conductors according to 12.2 and 12.6	Not used	N
	Flexible cable and flexible conduit shall be so installed as to avoid excess flexing and straining, particularly at the fittings		N
	Cables subject to movement shall be supported in such a way that there is no mechanical strain on the connection points nor any sharp flexing		N
	If the requirement mentioned above is achieved by using of a loop, it shall have sufficient length to provide for a bending radius of the cable 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		N

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	damage due to factors, that include the following cable use or potential abuse:		
	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
	If cables subject to movement are close to moving parts, it shall have a space of at least 25 mm between the moving parts and the cables		N
	Where the distance mentioned above is not practicable, fixed barriers shall be provided between the cables and the moving parts		N
	The cable handing system shall be so designed that the lateral cable angles do no exceed 5°, avoiding torsion in the cable		N
	Measures shall be taken to ensure that at least two turns of flexible cables always remain on a drum		N
	Min. permitted bending radii for the forced guiding of flexible cables shall not less than the values given in table 8		N
	The strength section between section between two bends in an S-shaped length or a bend into another plane shall be at least 20 times the diameter of the cable		N
	Where flexible conduit is adjacent to moving parts, the construction and supporting means shall prevent damage to the flexile conduit under all conditions of operation		N
13.4.4	Interconnection of devices on the machine		N
	The connections shall be conveniently placed, adequately protected, and shown on the relevant diagrams		N
	Intermediate terminals are adequately protected		N

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	Intermediate terminals are indicated on the wiring diagram		N
	This enables easy access for testing purposes		N
13.4.5	Plug/socket combinations		N
	Where plug/socket combinations are provided, they shall fulfil one or more of the following requirements as applicable:	No plug/socket combinations are provided.	N
	a) When installed correctly in accordance with f), plug/socket combinations shall be of such a type as to prevent unintentional contact with live parts at any time, including during insertion or removal of the connectors. The degree of protection shall be at least IPXXB. PELV circuits are excepted from this requirement.		N
	b) Have a first make last break protective bonding contact (earthing contact) (see also 6.3, 8.2.4) if used in TN- or TT-systems.		N
	c) Plug/socket combinations intended to be connected or disconnected during load conditions shall have sufficient load-breaking capacity. Where the plug/socket combination is rated at 30 A, or greater, it shall be interlocked with a switching device so that the connection and disconnection is possible only when the switching device is in the OFF position		N
	d) Plug/socket combinations that are rated at more than 16 A shall have a retaining means to prevent unintended or accidental disconnection.		N
	e) Where an unintended or accidental disconnection of plug/socket combinations can cause a hazardous situation, they shall have a retaining means.		N
	The installation of plug/socket combinations shall fulfil the following requirements as applicable:		N
	f) The component which remains live after disconnection shall have a degree of protection of at least IP2X or IPXXB, taking into account the required clearance and creepage distances. PELV circuits are excepted from this requirement.		N
	g) Metallic housings of plug/socket combinations shall be connected to the protective bonding circuit. PELV circuits are excepted from this requirement.		N
	h) Plug/socket combinations intended to carry power loads but not to be disconnected during load conditions shall have a retaining means to prevent unintended or accidental disconnection and shall be		N

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	clearly marked that they are not intended to be disconnected under load.		
	i) Where more than one plug/socket combination is provided in the same electrical equipment, the associated combinations shall be clearly identifiable. It is recommended that mechanical coding be used to prevent incorrect insertion.		N
	j) Plug/socket combinations used in control circuits shall fulfil the applicable requirements of IEC 61984. Exception: see item k).		N
	k) Plug/socket combinations intended for household and similar general purposes shall not be used for control circuits. In plug/socket combinations in accordance with IEC 60309-1, only those contacts shall be used for control circuits which are intended for those purposes.		N
13.4.6	Dismantling for shipment		P
	If wiring needs to be disconnected for shipment, terminals or plug/socket combinations are provided at the disconnecting points	Internal wiring is located fully for shipment, and input terminal for power cords provided	P
13.4.7	Additional conductors		N
	Consideration should be given to providing additional conductors for maintenance or repair. Spare conductors shall be connected to spare terminals or isolated to prevent contact with live parts.		N
13.5	Ducts, connection boxes and other boxes		P
13.5.1	General requirements		P
	Min. protection degree for ducts: IP 33	IP 68.	P
	All sharp edges, flash, burrs, rough surfaces or threads which the insulation of conductors may come into contact, removed from ducts and conduits	Edges smooth	P
	In order to avoid confusion between conduits for electrical installation and those for oil, water or air, either physically separated or suitably identified	Physically separated	P
	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	Not for human passage	N
	Ducts provided only for mechanical protection (see		N



EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	cl. 8.2.3)		
	Cable trays which are partially covered, not to serve as cable trays or installation trunking		N
	Conductors and cables suitable for installation in cable trays		N
13.5.2	Percentage fill of ducts		N
	The dimensions and arrangement of the ducts be such as to facilitate the insertion of the conductors and cables		N
13.5.3	Rigid metal conduit and fittings		N
	Shall be of galvanized steel or of a corrosion-resistant material	No rigid metal conduit is used.	N
	Conduits shall be securely held in place and supported at each end	No rigid metal conduit is used.	N
	Fitting shall be threaded	No rigid metal conduit is used.	N
	Where threadless fittings are used, the conduit shall be securely fastened to the equipment	No rigid metal conduit is used.	N
	The conduit shall not be damaged and the internal diameter of the conduit shall not be effectively reduced when it is bent	No rigid metal conduit is used.	N
13.5.4	Flexible metal conduit and fittings		N
	Flexible metallic conduits and fittings consist of flexible metal tubing or wire mesh armour.	Not used flexible metallic conduits	N
	They are suitable for its application and environmental conditions	Not used flexible metallic conduits	N
13.5.5	Flexible non-metal conduit and fittings		N
	Flexible non-metallic conduits are resistant to buckling and with similar characteristics as the sheath of multicore cables		N
	They shall be suitable for its application and environmental conditions		N
	Joints and fittings compatible with conduits and appropriate for its application		N
13.5.6	Cable trunking systems		N
	Shall be rigidly supported and clear of all moving or contaminating portions of the machine	No cable trunking system is used.	
	Covers shall be shaped to overlap the sides; gasket shall be permitted	No cable trunking system is used.	N
	Covers shall be attached to cable trunking systems by hinges or chain and held closed by means of captive screws or other suitable fasteners	No cable trunking system is used.	N

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	On horizontal cable trunking systems, the cover shall not be on the bottom	No cable trunking system is used.	N
	Where the cable trunking system is furnished in sections, the joints between sections shall fit tightly but need not be gasketed	No cable trunking system is used.	N
	The only openings permitted shall be those required for wiring or for drainage	No cable trunking system is used.	N
	Cable trunking systems shall not have opened but unused knockouts	No cable trunking system is used.	N
13.5.7	Machines 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. Conductors run in enclosed compartments and cable trunking systems shall be so secured and arranged that they are not subject to damage.		N
13.5.8	Connection boxes and other boxes		P
	Cable connection boxes and junction boxes use for wiring purposes are readily accessible for maintenance (see cl. 11.3)	Readily 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)	Enclosed metal enclosure used except for hole for external cable connection and openings for vent.	P
	Junction boxes not have openings for cable entries and are designed so, as to avoid ingress of entrained dust, lubricants and coolant	Not used	N
13.5.9	Motor connection boxes		P
	Shall enclose only connections to the motor and motor-mounted devices	They enclose only connections to the motor and motor-mounted devices.	P
14	Electric motors and associated equipment		P
14.1	General requirements		P
	Electric motor should conform to the requirements of IEC 60034-1		P
	Electric motors and associated equipment protected against following risks:		-
	overcurrent (see cl. 7.2)		P

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	thermal overload (see cl. 7.3)		P
	overspeed (see cl. 7.6)		N
	Compliance ensured with the requirements stated (see clauses 5.3, 5.4, 5.5, 7.5, 7.6 and 9.4)		P
	Motor control equipment shall be located and mounted according to clause 11	According to clause 11.	P
14.2	Motor enclosures		P
	Selection of motor enclosure recommended acc. to EN 60034-5	Conform to EN 60034-5	P
	Degree of protection at least IP23	IP68 applied	P
	Incorporated motors mounted such, as to provide adequate protection against mechanical damage		P
14.3	Motor dimensions		p
	Dimensions of motors conform to those given in IEC regulations (see EN 60072-1 and EN 60072-2)	conform to EN 60072-1 and EN 60072-2	P
14.4	Motor mounting and compartments		P
	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		P
	Motors mounted such, as to allow easy access to all terminal boxes		P
	Motors mounted such, as to ensure proper cooling Temperature rise to be within limits of relevant insulation class		P
	Temperature rise within limits of relevant insulation class		P
	If possible, motor compartments stay clean and dry and when required, ventilated directly to the outside of the machine		P
	Motor-vents at an acceptable level and designed such, as to avoid ingress of swarf, dust or water spray		P
	No opening between motor compartment and any other compartment, which does not fulfil the requirement for motor compartments		P
14.5	Criteria for motor selection		P

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	Electric motors selected acc. to service and environmental conditions		P
	Design criteria for evaluation include: type of motor and		P
	type of duty cycle (see IEC 60034-1) and	S1	P
	fixed speed or variable speed operation and	Variable speed operation	P
	mechanical vibrations and	Comply with requirement	P
	type of converter for motor speed control and		P
	influence of the harmonic spectrum of voltage and/or current when supplied from static converter on the temperature rise and		P
	method of starting and possible influence of inrush current		P
	variation of counter torque load with time and speed		P
	influence of loads with large inertia and		P
	influence of constant torque or constant power operation and		P
	possible need of inductive reactors between motor and converter		P
14.6	Protective devices for mechanical brakes		P
	Operation of overload or overcurrent protective devices for mechanical brake-actuators initiate simultaneous de-energisation(release) of associated machine actuators		P
15	Accessories and lightning		N
15.1	Accessories		N
	Where the machine or its associated equipment is provided with socket-outlets for auxiliary equipment, the following will apply:	No provided with socket-outlets	N
	the socket-outlets should conform to IEC 60309-1.		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		N

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	accordance with cl. 7.2 and cl. 7.3 separately from protection of other circuits		
	if power supply to socket-outlets is not disconnected, than requirements of cl.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 according to 8.2.2		N
	The ON-OFF switch shall not be incorporated in the lamp holder or in the flexible connecting cords		N
	Stroboscopic effects from lights shall be avoided		N
	Where fixed lighting is provided in an enclosure, electromagnetic compatibility should be taken into account using the principles outlined in 4.4.2.		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.		N
	Lighting circuits supplied from one of the following sources:		-
	from a dedicated isolating transformer connected to load side, overcurrent protection provided in secondary circuit or		N
	a dedicated isolating transformer connected to line side provided, source permitted for maintenance purpose. lighting circuits placed in control enclosures only, overcurrent protection provided in secondary circuit or		N
	from a machine-circuit with dedicated overcurrent protection or		N
	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
	an externally supplied lighting circuit (for example factory lighting supply).		N
15.2.3	Protection		N
	Local lighting shall be protected according to 7.2.6		N
15.2.4	Fittings		N
	Adjustable lighting fittings shall be suitable for the		N

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	physical environment		
	The lamp holders shall be: According to the relevant IEC publication; Constructed with an insulating material protection the lamp cap so as to prevent unintended contact		N
	Reflectors shall be supported by a bracket and not by the lamp holder		N
16	Marking, warning signs and reference designations		P
16.1	General		P
	Warning signs, nameplates, markings, and identification plates of sufficient durability to withstand the physical environment involved	Comply with requirement	P
16.2	Warning signs		P
16.2.1	Electric shock hazard		P
	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: 		P
	The warning sign shall be plainly visible on the enclosure door or cover	It is plainly visible on the enclosure.	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		P
	a single device with its own enclosure		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		P
	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		P
	preference given to the use of standard symbols	According to standard	P
16.4	Marking of equipment		P

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	Equipment (for example controlgear assemblies) shall be legibly and durably marked in a way that is plainly visible after the equipment is installed.	They have been marked legibly and durably.	P
	A nameplate giving the following information shall be attached to the enclosure adjacent to each incoming supply:		-
	name or trade mark of supplier;	See the nameplate	P
	certification mark, when required;	See the nameplate	P
	serial number, where applicable;		N
	rated voltage, number of phases and frequency (if a.c.), and full-load current for each supply;	See the nameplate	P
	short-circuit rating of the equipment;	See the nameplate	P
	main document number (see IEC 62023).		N
	The full-load current shown on the nameplate shall be not less than the running currents for all motors and other equipment that can be in operation at the same time under normal conditions.	See the nameplate	P
	Where only a single motor controller is used, that information may instead be provided on the machine nameplate where it is plainly visible.		P
16.5	Reference designations	-	
	All enclosures, assemblies, control devices, and components shall be plainly identified with the same reference designations as shown in the technical documentation	See circuit diagram	P
17	Technical documentation		P
17.1	General		P
	The information necessary for installation, operation, and maintenance of the electrical equipment of a machine shall be supplied in the form of drawings, diagrams, charts, tales and instructions	All the information have been provided by many forms in the instruction.	P
	The information shall be in an agreed language	In English.	P
	For very simple equipment, the relevant information may be contained in one document, provided that the document shows all the devices of the electrical equipment and enables the connections to the supply network to be made.		P
17.2	Information to be provided		P
	Information provided with electrical equipment shall include:		-
	a) A main document (parts list or list of documents);		P
	b) Complementary documents including:		-
	1)a clear, comprehensive description of the	See instruction	P

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	equipment, installation and mounting, and the connection to the electrical supply(ies);		
	2) electrical supply(ies) requirements;	See instruction	P
	3) Information about the physical environment	See instruction	
	4) Overview (block) diagram(s)	Provided by manufacturer	P
	5) Circuit / wiring diagram(s)	Provided by manufacturer	P
	6) information about:		
	- programming, as necessary for use of the equipment;	Not used	N
	- Sequence of operation(s)	See instruction	P
	-Frequency of inspection	See instruction	P
	-Frequency and method of functional testing	See instruction	P
	-Guidance on the adjustment, maintenance and repair, particularly of the protective devices and circuits	See instruction	P
	-recommended spare parts list; and	See instruction	P
	-list of tools supplied.	See instruction	P
	7) Description of safeguards, interlocking functions and interlocking of separating safeguards for dangerous movements of co-ordinated operating machines	See instruction	P
	8) Description of safeguards and means provided for applications with to suspend the safeguards	See instruction	P
	9) instructions on the procedures for securing the machine for safe maintenance; (see also 17.8);		P
	10) information on handling, transportation and storage;	See instruction	
	11) information regarding load currents, peak starting currents and permitted voltage drops, as applicable;	See instruction	P
	12) information on the residual risks due to the protection measures adopted, indication of whether any particular training is required and specification of any necessary personal protective equipment.	See instruction	P
17.3	Requirements applicable to all documentation		
	Unless otherwise agreed between manufacturer and user:		-
	the documentation shall be in accordance with	Comply with requirements	P

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	relevant parts of IEC 61082;		
	reference designations shall be in accordance with relevant parts of IEC 61346;	Comply with requirements	P
	instructions/manuals shall be in accordance with IEC 62079.	Comply with requirements	P
	parts lists where provided shall be in accordance with IEC 62027, class B.	Comply with requirements	P
	For referencing of the different documents, the supplier shall select one of the following methods:		-
	-where the documentation consists of a small number of documents (for example less than 5) each of the documents shall carry as a cross-reference the document numbers of all other documents belonging to the electrical equipment; or		N
	-for single level main documents only (see IEC 62023), all documents shall be listed with document numbers and titles in a drawing or document list; or		P
	-all documents of a certain level (see IEC 62023) of the document structure shall be listed, with document numbers and titles, in a parts list belonging to the same level.		N
17.4	Installation documents		P
	The installation documents shall give all information necessary for the preliminary work of setting up the machine (including commissioning). In complex cases, it may be necessary to refer to the assembly drawings for details.	See instruction	P
	The recommended position, type, and cross-sectional areas of the supply cables to be installed on site shall be clearly indicated.	See instruction	P
	The data necessary for choosing the type, characteristics, rated currents, and setting of the overcurrent protective device(s) for the supply conductors to the electrical equipment of the machine shall be stated (see 7.2.2).	See instruction	P
	Where necessary, the size, purpose, and location of any ducts in the foundation that are to be provided by the user shall be detailed (see Annex B).		N
	The size, type, and purpose of ducts, cable trays, or cable supports between the machine and the associated equipment that are to be provided by the user shall be detailed (see Annex B).	See instruction	P
	Where necessary, the diagram shall indicate where space is required for the removal or servicing of the electrical equipment.	See instruction	P
	In addition, where it is appropriate, an	See instruction	P

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	interconnection diagram or table shall be provided. That diagram or table shall give full information about all external connections.		
	Where the electrical equipment is intended to be operated from more than one source of electrical supply, the interconnection diagram or table shall indicate the modifications or interconnections required for the use of each supply.		N
17.5	Overview diagrams and function diagrams		P
	Where it is necessary to facilitate the understanding of the principles of operation, an overview diagram shall be provided.	See instruction	P
	An overview diagram symbolically represents the electrical equipment together with its functional interrelationships without necessarily showing all of the interconnections.	See instruction	P
	Function diagrams may be provided as either part of, or in addition to, the overview diagram.	See instruction	P
17.6	Circuit diagrams		P
	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
17.7	Operating manual	-	

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	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		N
17.8	Maintenance manual	-	
	Technical documentation to contain a maintenance manual, detailing proper procedures for adjustment, servicing or preventive inspection and repair	See instruction	P
	Recommendations regarding maintenance or service records are part of it	See instruction	P
	Methods for the verification of proper operation provided	See instruction	P
17.9	Parts list	-	
	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 part list	P
18	Verification		P
18.1	General		
	This part of IEC 60204 gives general requirements for the electrical equipment of machines.		P
	The extent of verification will be given in the dedicated product standard for a particular machine. Where there is no dedicated product standard for the machine, the verifications shall always include the items a), b) and f) and may include one or more of the items c) to e):		-
	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;		P
	c) insulation resistance test (see 18.3);		P
	d) voltage test (see 18.4);		P
	e) protection against residual voltage (see 18.5);		P
	f) functional tests (see 18.6).		P

EN60204-1:2006+A1:2009+AC:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	When these tests are performed, it is recommended that they follow the sequence listed above.		P
18.2	Verification of conditions for protection by automatic disconnection of supply		P
18.2.1	General		P
	The conditions for automatic disconnection of supply (see 6.3.3) shall be verified by tests.		P
	For TN-systems, those test methods are described in 18.2.2; their application for different conditions of supply are specified in 18.2.3.	Not TN-system	N
	For TT and IT systems, see IEC 60364-6-61.		N
18.2.2	Test methods in TN-systems		N
18.2.3	Application of the test methods for TN-systems		N
18.3	Insulation resistance tests		P
	Insulation resistance measured with 500VDC between power circuit conductors and PE-circuit is to be $\geq 1.0 \text{ M}\Omega$	(See appended table 18.3)	P
	Insulation value must be $\geq 1.0 \text{ M}\Omega$	(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 $50 \text{ k}\Omega$		N
18.4	Voltage tests		P
	Test conditions : at least 1 second - test voltage is twice the rated supply voltage of the equipment or 1000 V, whichever is greater frequency of 50/60 Hz supplied from a transformer with a min. rating of 500 VA shall not breakdown	1000 V , 1min not breakdown.	P
18.5	Protection against residual voltages		N
	Tests shall be performed to ensure compliance with 6.2.4		N
18.6	Functional test		P
	The functions of electrical equipment shall be tested (particularly those related to safety and safeguarding)	(See appended table 18.6)	P
18.7	Retesting		N
	Where a portion of the machine and its associated equipment is changed or modified, that portion shall be verified and retested, as is appropriate		N

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	10	50	0.137	1.0

18.3	TABLE: Insulation resistance tests	P
-------------	---	----------

Location	Voltage(V) d.c	Frequency(Hz)	Time(s)	Measured insulation resistance(MΩ)
Between power circuit conductors and protective bonding circuit	500	---	5	500

18.4	TABLE: Voltage tests	P
-------------	-----------------------------	----------

test voltage applied between:	Test voltage (V) a.c. / d.c.	Breakdown Yes / No
The conductors of all circuits and the protective bonding circuits	1000 a.c., 50Hz, 1s	No

18.6	TABLE: Function tests	P
-------------	------------------------------	----------

S/N	Function	requirement	Result
1	Transmission parts checking	Suitable for intended use, no abnormal noise	OK
2	Speed variety for rotation parts moved by same bearing	<5%	2.5%
3	noise	<70dB	63dB
4	Completed product		OK



Technical Construction File

File No.: TCF(15)-365-4-LVD

Type of Equipment:	SUBMERSIBLE PUMP
Model No.:	DVX 25,DVX 35,DVX 80,DVX 100 , DVX 150M , DVX 150T, DVX 200M ,DVX 300M,DVX 300T, BAFA 150M,BAFA 200M,BAFA 200T, BAFA 300M, BAFA 300T,BKS 150M , BKS 200M,2BKS 100M,2 BKS 150M, 3 BKS 200M , 4 BKS 200M
Issued Date:	2015-06-24
Brand Name/ Trade mark:	NORTEK
Directive(S)	2014/35/EU Low Voltage Directive
standard(s):	EN 60335-1:2012+A11:2014 en 60335-2-41:2003+a1:2004+A2:2010



Presented for

NORTEK POMPA SAN.TİC.LTD.ŞTİ.
1203/7 SOK NO 1-C YENİŞEHİR / İZMİR / TURKEY

Presented by

Shanghai ECO Information Technology Co., Ltd.
Room 721-722, Cimic Plaza,No.800 Shangcheng Road,Pudong New
Zone,Shanghai 200120 P.R.C

TEST REPORT

EN 60335-1:2012+A11:2014

**Household and similar electrical appliances — Safety — Part 1:
General requirements**

EN 60335-2-41:2003+A1:2004+A2:2010

**Household and similar electrical appliances — Safety — Part 2-41:
Particular requirements for pumps**

Report

Report reference No. : No: TCF(15)-365-4-LVD

Tested by(+ signature).....:

Downey Xue

Reviewed by(+ signature).....:

Guo Xingyao

Date of issue : 2015-06-24

Number of pages (Report) : 66

Testing laboratory

Name : Shanghai ECO Information Technology Co., Ltd.

Address : Room 721-722, Cimic Plaza, No.800 Shangcheng Road, Pudong
New Zone, Shanghai 200120 P.R.C

Testing location : GUANZHUANG VILLAGE, RUOHENG TOWN, WENLING CITY,
ZHEJIANG PROVINCE, P.R.CHINA

Client

Name : NORTEK POMPA SAN.TİC.LTD.ŞTİ.

Address : 1203/7 SOK NO 1-C YENİŞEHİR / İZMİR / TURKEY

Manufacturer

Name : TAIZHOU WENGGE PUMPS CO.,LTD

Address : GUANZHUANG VILLAGE, RUOHENG TOWN, WENLING CITY,
ZHEJIANG PROVINCE, P.R.CHINA

Test specification

Standard : EN 60335-1:2012+A11:2014 EN 60335-2-41:2003+A1:2004+A2:2010

Test procedure : CE-LVD

Procedure deviation : N.A.

Non-standard test method : N.A.

General description

This device is ideal for fume and dust purification in industrial processing, welding, cutting and grinding.

Ambient temperature: 22°C humidity: 60% Complete File was conducted on DVX 25

DVX 25, DVX 35, DVX 80, DVX 100, DVX 150M, DVX 150T, DVX 200M, DVX 300M, DVX 300T, BAFA 150M, BAFA 200M, BAFA 200T, BAFA 300M, BAFA 300T, BKS150M, BKS 200M, 2BKS 100M, 2 BKS 150M, 3 BKS 200M, 4 BKS 200M are series products.

They belong to the same circuit type except the difference in power, weight and the dimension.

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
5	GENERAL CONDITIONS FOR THE TESTS		--
	Tests performed according to cl. 5, e.g. nature of supply, sequence of testing, etc.		P
6	CLASSIFICATION		--
6.1	Protection against electric shock: Class I, II, III	Class I appliances	P
6.2	Protection against harmful ingress of water	IP 68	N
7	MARKING AND INSTRUCTIONS		--
7.1	Rated voltage or voltage range (V)	220V	P
	Single-phase appliances to be connected to the supply mains: 230 V covered	220V	P
	Multi-phase appliances to be connected to the supply mains: 400 V covered		N
	Nature of supply	~	P
	Rated frequency (Hz).....	50Hz	P
	Rated power input (W).....	180W	P
	Rated current (A)	1.5A	P
	Manufacturer's or responsible vendor's name, trademark or identification mark	TAIZHOU WENGGE PUMPS CO.,LTD	P
	Model or type reference.....	DVX25	P
	Symbol 5172 of IEC 60417, for Class II appliances	Depend on end product	N
	IP number, other than IPX0	IP68	P
	Symbol IEC 60417-5036, for the enclosure of electrically-operated water valves in external hose-sets for connection of an appliance to the water mains		N

EN 60335-1:2012 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
7.1	Pumps having a rated power input exceeding 50 W shall be marked with (EN 60335-2-41)	180W	P
	-the minimum total head, in metres, if greater than zero; (EN 60335-2-41)	7m	P
	-the maximum operating depth, in metres with a minimum of 1 m (for submersible pumps) (EN 60335-2-41)	7m	P
	- the direction of rotation (for pumps having three-phase motors) (EN 60335-2-41)		P
7.2	Warning for stationary appliances for multiple supply	Only one supply	N
	Warning placed in vicinity of terminal cover		N
7.3	Range of rated values marked with the lower and upper limits separated by a hyphen	220V	P
	Different rated values marked with the values separated by an oblique stroke		N
7.4	Appliances adjustable for different rated voltages, the voltage setting is clearly discernible		N
7.5	Appliances with more than one rated voltage or one or more rated voltage ranges, marked with rated input or rated current for each rated voltage or range, unless		N
	the power input is related to the mean value of the rated voltage range		N
	Relation between marking for upper and lower limits of rated power input or rated current and voltage is clear		N
7.6	Correct symbols used		P
	H_{min} minimum total head (EN 60335-2-41)	7m	P
	$\frac{\nabla}{\dots m}$ maximum operating depth (EN 60335-2-41)	7m	P
7.7	Connection diagram fixed to appliances to be connected to more than two supply conductors and appliances for multiple supply		N
7.8	Except for type Z attachment, terminals for connection to the supply mains indicated as follows:		P
	- marking of terminals exclusively for the neutral conductor (N)		P

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
	- marking of protective earthing terminals (symbol 5019 of IEC 60417)		P
	- marking not placed on removable parts		P
7.9	Marking or placing of switches which may cause a hazard		N
7.10	Indications of switches on stationary appliances and controls on all appliances by use of figures, letters or other visual means.....:		P
	The figure 0 indicates only OFF position, unless no confusion with the OFF position		P
7.11	Indication for direction of adjustment of controls		N
7.12	Instructions for use shall be provided with the appliance so that the appliance can be used safely.	See the instruction	P
	If it is necessary to take precautions during user maintenance, appropriate details shall be given.		P
	The instructions for Class I portable pumps for cleaning and other maintenance of swimming pools shall include the substance of the following (EN 60335-2-41)		P
	The pump must not be used when people are in the water (EN 60335-2-41)		P
	The pump must be supplied through a residual current device having a rated residual operating current not exceeding 30mA (EN 60335-2-41)		P
7.12.1	Sufficient details for installation supplied		P
	The maximum total head, in metres (for pumps having a rated power input exceeding 50W)	See the instruction	P
	Pollution of the liquid could occur due to leakage of lubricants(for submersible pumps and vertical wet pit pumps containing lubricants)	See the instruction	P
	A protective device is to be installed in the fixed wiring and its characteristics are to be specified (for stationary pumps having a three-phase motor not incorporating a protective device).		N
7.12.2	Stationary appliances not fitted with means for disconnection from the supply mains having a contact separation in all poles that provide full disconnection under overvoltage category III, the instructions state that means for disconnection must be incorporated in the fixed wiring in accordance with the wiring rules		N
7.12.3	Insulation of the fixed wiring in contact with parts exceeding 50 K during clause 11; instructions stating that the fixed wiring must be protected		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
7.12.4	Instructions for built-in appliances:		N
	- dimensions of space		N
	- dimensions and position of supporting means		N
	- distances between parts and surrounding structure		N
	- dimensions of ventilation openings and arrangement		N
	- connection to supply mains and interconnection of separate components		N
	- allow disconnection of the appliance after installation, by accessible plug or a switch in the fixed wiring, unless		N
	a switch complying with 24.3		N
7.12.5	Replacement cord instructions, type X attachment with a specially prepared cord		N
	Replacement cord instructions, type Y attachment	Type Y attachment	P
	Replacement cord instructions, type Z attachment		N
7.12.6	Caution in the instructions for heating appliances with a non-self-resetting thermal cut-out		N
7.12.7	Instructions for fixed appliances stating how the appliance is to be fixed		P
7.12.8	Instructions for appliances connected to the water mains:		N
	- max. inlet water pressure (Pa):		N
	- min. inlet water pressure, if necessary (Pa).....:		N
	Instructions concerning new and old hose-sets for appliances connected to the water mains by detachable hose-sets		N
7.13	Instructions and other texts in an official language	English	P
7.14	Marking clearly legible and durable	See marking label	P
7.15	Marking on a main part		P
	Marking clearly discernible from the outside, if necessary after removal of a cover		P
	For portable appliances, cover can be removed or opened without a tool		P

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
	For stationary appliances, name, trademark or identification mark and model or type reference visible after installation		N
	For fixed appliances, name, trademark or identification mark and model or type reference visible after installation according to the instructions		N
	Indications for switches and controls placed on or near the components. Marking not on parts which can be positioned or repositioned in such a way that the marking is misleading		N
7.16	Marking of a possible replaceable thermal link or fuse link clearly visible with regard to replacing the link		P

8	PROTECTION AGAINST ACCESS TO LIVE PARTS		--
8.1	Adequate protection against accidental contact with live parts		P
8.1.1	Requirement applies for all positions, detachable parts removed		P
	Insertion or removal of lamps, protection against contact with live parts of the lamp cap	No lamp	N
	Use of test probe B of IEC 61032: no contact with live parts		P
	It shall not be possible to touch live parts or live parts protected only by lacquer, enamel, ordinary paper, cotton, oxide film, beads, or sealing compound except self-hardening resins, with the probe.		P
8.1.2	Use of test probe 13 of IEC 61032 through openings in class 0 appliances and class II appliances/ constructions: no contact with live parts		P
	Test probe 13 also applied through openings in earthed metal enclosures having a non-conductive coating: no contact with live parts		P
8.1.3	For appliances other than class II, use of test probe 41 of IEC 61032: no contact with live parts of visible glowing heating elements		N
8.1.4	Accessible part not considered live if:		P

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
	- safety extra-low a.c. voltage: peak value not exceeding 42.4 V		P
	- safety extra-low d.c. voltage: not exceeding 42.4 V		P
	- or separated from live parts by protective impedance		N
	If protective impedance: d.c. current not exceeding 2 mA, and		N
	a.c. peak value not exceeding 0.7 mA		N
	- for peak values over 42.4 V up to and including 450 V, capacitance not exceeding 0,1 μ F		N
	- for peak values over 450 V up to and including 15 kV, discharge not exceeding 45 μ C		N
8.1.5	Live parts protected at least by basic insulation before installation or assembly:		N
	- built-in appliances		N
	- fixed appliances		N
	- appliances delivered in separate units		N
8.2	Class II appliances and constructions constructed so that there is adequate protection against accidental contact with basic insulation and metal parts separated from live parts by basic insulation only		N
	Only possible to touch parts separated from live parts by double or reinforced insulation		P

10	POWER INPUT AND CURRENT		--
10.1	Power input at normal operating temperature, rated voltage and normal operation not deviating from rated power input by more than shown in table 1	(see appended table)	P
10.2	Current at normal operating temperature, rated voltage and normal operation not deviating from rated current by more than shown in table 2	(see appended table)	P

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
11	HEATING		--
11.1	No excessive temperatures in normal use		P
11.2	Hand-held appliances are held in their normal position of use.		N
	Built-in appliances are installed in accordance with the instructions.		N
11.3	Temperature rises, other than of windings, determined by thermocouples		P
	Temperature rises of windings determined by resistance method, unless		P
	the windings makes it difficult to make the necessary connections		P
11.4	Heating appliances operated under normal operation at 1.15 times rated power input		N
11.5	Motor-operated appliances operated under normal operation at most unfavourable voltage between 0.94 and 1.06 times rated voltage		N
11.6	Combined appliances operated under normal operation at most unfavourable voltage between 0.94 and 1.06 times rated voltage		P
11.7	Pumps are operated until steady conditions are established, the liquid temperature being 35 °C . However, if a liquid temperature is marked on the pump, the liquid is maintained at this temperature instead, unless the pump is also marked with the maximum period of operation.(EN 60335-2-41)		N
	If the pump is marked with a maximum period of operation, it is also operated for this period followed by the rest period specified in the instruction, the liquid being maintained at the marked temperature. This test is carried out for three cycles of operation.		N
11.8	Temperature rises not exceeding values in table 3	(see appended tables)	P
	Protective devices do not operate, except		P
	components in protective electronic circuits tested for the number of cycles specified in 24.1.4		N
	For pumps marked with a liquid temperature exceeding 35°C, the temperature rise of the external enclosure is not measured.(EN 60335-2-41)		N
	Sealing compound does not flow out		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
13	LEAKAGE CURRENT AND ELECTRIC STRENGTH AT OPERATING TEMPERATURE		--
13.1	Leakage current not excessive and electric strength adequate		P
	Heating appliances operated at 1.15 times rated power input.....:		N
	Motor-operated appliances and combined appliances supplied at 1.06 times rated voltage.....:	233.2V	P
	Protective impedance and radio interference filters disconnected before carrying out the tests		P
13.2	Leakage current measured by means of the circuit described in figure 4 of IEC 60990		P
	Leakage current measurements	(see appended table)	P
13.3	The appliance is disconnected from the supply		P
	Electric strength tests according to table 4	(see appended table)	P
	No breakdown during the tests		P
14	TRANSIENT OVERVOLTAGES		--
	Appliances withstand the transient overvoltages to which they may be subjected		P
	Clearances having a value less than specified in table 16 subjected to an impulse voltage test, the test voltage specified in table 6	(see appended table)	P
	No flashover during the test, unless of functional insulation		P
	In case of flashover of functional insulation, the appliance complies with clause 19 with the clearance short circuited		P
15	MOISTURE RESISTANCE		--
15.1	Enclosure provides the degree of moisture protection according to classification of the appliance	IP68	P
	Compliance checked as specified in 15.1.1, taking into account 15.1.2, followed by the electric strength test of 16.3		P
	No trace of water on insulation which can result in a reduction of clearances and creepage distances below values specified in clause 29		P
15.1.1	Appliances, other than IPX0, subjected to tests as specified in IEC 60529.....:		P

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
	Water valves in external hoses for connection of an appliance to the water mains tested as specified for IPX7 appliances		N
	Shower-boost pumps are subjected to the appropriate test of IEC 60529 both at rest and in operation while supplied at rated voltage.		N
15.1.2	Hand-held appliance turned continuously through the most unfavourable positions during the test		N
	Built-in appliances installed according to the instructions		N
	Appliances placed or used on the floor or table placed on a horizontal unperforated support		N
	Appliances normally fixed to a wall and appliances with pins for insertion into socket-outlets are mounted on a wooden board		N
	For IPX3 appliances, the base of wall mounted appliances is placed at the same level as the pivot axis of the oscillating tube		N
	For IPX4 appliances, the horizontal centre line of the appliance is aligned with the pivot axis of the oscillating tube		N
	However, for appliances normally used on the floor or table, the movement is limited to two times 90° for a period of 5 min, the support being placed at the level of the pivot axis of the oscillating tube		N
	Appliances normally fixed to a ceiling are mounted underneath a horizontal unperforated support, the pivot axis of the oscillating tube located at the level of the underside of the support		N
	For IPX4 appliances, the movement of the tube is limited to two times 90° from the vertical for a period of 5 min		N
	Wall-mounted appliances, take into account the distance to the floor stated in the instructions		N
	Appliances with type X attachment fitted with a flexible cord as described		N
	Detachable parts tested as specified		N
15.2	Spillage of liquid does not affect the electrical insulation		P
	Appliances with type X attachment fitted with a flexible cord as described		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
	Appliances incorporating an appliance inlet tested with or without an connector, whichever is most unfavourable		N
	Detachable parts removed		P
	Overfilling test with additional amount of water, over a period of 1 min (l).....:		N
	The appliance withstands the electric strength test of 16.3		N
	No trace of water on insulation that can result in a reduction of clearances and creepage distances below values specified in clause 29		N
	Before the test, the temperature of the pump is raised to within 5 K of the water temperature		N
	Submersible pumps are immersed for 24 h in water containing approximately 1 % NaCl and having a temperature of $30\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$. The water pressure on		P
	-1.5 times the pressure occurring at the maximum operating depth , when this depth does not exceed 10m		N
	-1.3 times the pressure occurring at		N
	the maximum operating depth		N
	15 m, if this is higher		N
15.3	Appliances proof against humid conditions		N
	Humidity test for 48 h in a humidity cabinet		N
	The appliance withstands the tests of clause 16		N
	Submersible pumps are not subjected to the test		N
16	LEAKAGE CURRENT AND ELECTRIC STRENGTH		--
16.1	Leakage current not excessive and electric strength adequate		P
	Protective impedance disconnected from live parts before carrying out the tests		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
16.2	Single-phase appliances: test voltage 1.06 times rated voltage.....:	233.2V	P
	Three-phase appliances: test voltage 1.06 times rated voltage divided by $\sqrt{3}$:		N
	Leakage current measurements	(see appended table)	P
16.3	Electric strength tests according to table 7	(see appended table)	P
	No breakdown during the tests		P
17	OVERLOAD PROTECTION OF TRANSFORMERS AND ASSOCIATED CIRCUITS		--
	No excessive temperatures in transformer or associated circuits in event of short-circuits likely to occur in normal use	(see appended table)	P
	Appliance supplied with 1.06 or 0.94 times rated voltage and the most unfavourable short-circuit or overload likely to occur in normal use applied	1.06X220=233.2V	P
	Temperature rise of insulation of the conductors of safety extra-low voltage circuits not exceeding the relevant value specified in table 3 by more than 15 K		N
	Temperature of the winding not exceeding the value specified in table 8,		N
	however limits do not apply to fail-safe transformers complying with sub-clause 15.5 of IEC 61558-1		P
18	ENDURANCE		--
	Requirements and tests are specified in part 2 when necessary		N
19	ABNORMAL OPERATION		--
19.1	The risk of fire or mechanical damage under abnormal or careless operation obviated		P
	Electronic circuits so designed and applied that a fault will not render the appliance unsafe		P
	Pumps are also subjected to the tests of 19.101 and 19.102.(EN 60335-2-41)		P
19.2	Test of appliance with heating elements with restricted heat dissipation; test voltage (V): power input of 0.85 times rated power input		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
19.3	Test of 19.2 repeated; test voltage (V): power input of 1.24 times rated power input	272.8V	P
19.4	Test conditions as in cl. 11, any control limiting the temperature during tests of cl. 11 short-circuited		P
19.5	Test of 19.4 repeated on Class 0I and I appliances with tubular sheathed or embedded heating elements. No short-circuiting, but one end of the element connected to the elements sheath		P
	The test repeated with reversed polarity and the other end of the heating element connected to the sheath		P
	The test is not carried out on appliances intended to be permanently connected to fixed wiring and on appliances where an all-pole disconnection occurs during the test of 19.4		N
19.6	Appliances with PTC heating elements tested at rated voltage, establishing steady conditions	No PTC heating	N
	The working voltage of the PTC heating element is increased by 5% and the appliance is operated until steady conditions are re-established. The voltage is then increased in similar steps until 1.5 times working voltage or until the PTC heating element ruptures		N
19.7	Stalling test by locking the rotor if the locked rotor torque is smaller than the full load torque or locking moving parts of other appliances		P
	Locked rotor, motor capacitors open-circuited or short-circuited, if required		P
	Locked rotor, capacitors open-circuited one at a time		N
	Test repeated with capacitors short-circuited one at a time, if required		N
	Appliances with timer or programmer supplied with rated voltage for each of the tests, for a period equal to the maximum period allowed		P
	Other appliances supplied with rated voltage for a period as specified		N
	Winding temperatures not exceeding values specified in table 8		P

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
19.8	Three-phase motors operated at rated voltage with one phase disconnected		N
19.9	Running overload test on appliances incorporating motors intended to be remotely or automatically controlled or liable to be operated continuously		N
	Winding temperatures not exceeding values as specified		N
19.10	Series motor operated at 1.3 times rated voltage for 1 min.....:		N
	During the test, parts not being ejected from the appliance		N
19.11	Electronic circuits, compliance checked by evaluation of the fault conditions specified in 19.11.2 for all circuits or parts of circuits, unless they comply with the conditions specified in 19.11.1		P
	Appliances incorporating a protective electronic circuit subjected to the tests of 19.11.3 and 19.11.4		P
	Appliances having a switch with an off position obtained by electronic disconnection, or a switch placing the appliance in a stand-by mode, subjected to the tests of 19.11.4		P
19.11.1	Before applying the fault conditions a) to f) in 19.11.2, it is checked if circuits or parts of circuit meet both of the following conditions:		N
	- the electronic circuit is a low-power circuit, that is, the maximum power at low-power points does not exceed 15 W according to the tests specified		N
	- the protection against electric shock, fire hazard, mechanical hazard or dangerous malfunction in other parts of the appliance does not rely on the correct functioning of the electronic circuit		N
19.11.2	Fault conditions applied one at a time, the appliance operated under conditions specified in cl. 11, but supplied at rated voltage, the duration of the tests as specified:		P
	a) short circuit of functional insulation if clearances or creepage distances are less than the values specified in 29		P
	b) open circuit at the terminals of any component		P
	c) short circuit of capacitors, unless they comply with IEC 60384-14		P

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
	d) short circuit of any two terminals of an electronic component, other than integrated circuits. This fault condition is not applied between the two circuits of an optocoupler		P
	e) failure of triacs in the diode mode		P
	f) failure of an integrated circuit		N
19.11.3	If the appliance incorporates a protective electronic circuit which operates to ensure compliance with clause 19, the relevant test is repeated with a single fault simulated, as indicated in a) to f) of 19.11.2		P
	During and after each test the following is checked:		P
	- the temperature rise of the windings do not exceed the values specified in table 8		P
	- the appliance complies with the conditions specified in 19.13		P
	- any current flowing through protective impedance not exceeding the limits specified in 8.1.4		N
	If a conductor of a printed board becomes open-circuited, the appliance is considered to have withstood the particular test, provided all three of the following conditions are met:		N
	- the material of the printed circuit board withstands the burning test of annex E		N
	- any loosened conductor does not reduce the clearances or creepage distances between live parts and accessible metal parts below the values specified in cl. 29		N
	- the appliance withstands the tests of 19.11.2 with open-circuited conductor bridged		N
19.11.4	Appliances having a switch with an off position obtained by electronic disconnection, or		N
	a switch that can be placed in the stand-by mode,		N
	subjected to the tests of 19.11.4.1 to 19.11.4.7		N
	Appliances incorporating a protective electronic circuit subjected to the tests of 19.11.4.1 to 19.11.4.7, except that		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
	appliances operated for 30 s or 5 min during the test of 19.7 are not subjected to the tests for electromagnetic phenomena.		N
19.11.4.1	The appliance is subjected to electrostatic discharges in accordance with IEC 61000-4-2, test level 4		N
19.11.4.2	The appliance is subjected to radiated fields in accordance with IEC 61000-4-3, test level 3		N
19.11.4.3	The appliance is subjected to fast transient bursts in accordance with IEC 61000-4-4, test level 3 or 4 as specified		N
19.11.4.4	The power supply terminals of the appliance subjected to voltage surges in accordance with IEC 61000-4-5, test level 3 or 4 as specified		N
	Earthed heating elements in class I appliances disconnected		N
19.11.4.5	The appliance is subjected to injected currents in accordance with IEC 61000-4-6, test level 3		N
19.11.4.6	The appliance is subjected to voltage dips and interruptions in accordance with IEC 61000-4-11		N
19.11.4.7	The appliance is subjected to mains signals in accordance with IEC 61000-4-13, test level class 2		N
19.12	If the safety of the appliance for any of the fault conditions specified in 19.11.2 depends on the operation of a miniature fuse-link complying with IEC 60127, the test is repeated, measuring the current flowing through the fuse-link; measured current (A); rated current of the fuse-link (A).....:		P
19.13	During the tests the appliance does not emit flames, molten metal, poisonous or ignitable gas in hazardous amounts		P
	Temperature rises not exceeding the values shown in table 9	(see appended table)	P
	Enclosures not deformed to such an extent that compliance with cl. 8 is impaired		P
	If the appliance can still be operated it complies with 20.2		P
	Insulation, other than of class III appliance, withstand the electric strength test of 16.3, the test voltage specified in table 4:		P
	- basic insulation		P
	- supplementary insulation.....		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
	- reinforced insulation.....:		P
	The appliance does not undergo a dangerous malfunction, and		P
	no failure of protective electronic circuits, if the appliance is still operable		P
	Appliances tested with an electronic switch in the off position or in the stand-by mode, do not become operational		P
19.101	Pumps are supplied at rated voltage and operated at approximately half the maximum total head for 5 min, after which the inlet is removed from the liquid and the operation continued for 7h. Pumps are then operated again for 5 min at approximately half the maximum total head. (EN 60335-2-41)		P
	If the pump becomes inoperable during the test, it is disconnected from the supply and filled with water. (EN 60335-2-41)		N
19.102	The pumps marked with a maximum period of operation are supplied at rated voltage and operated under normal operation until steady conditions are established. (EN 60335-2-41)		P
20	STABILITY AND MECHANICAL HAZARDS		--
20.1	Adequate stability		P
	Tilting test through an angle of 10° (appliance placed on an inclined plane/horizontal plane); appliance does not overturn	10°, not overturn	P
	Tilting test repeated on appliances with heating elements, angle of inclination increased to 15°		N
	Possible heating test in overturned position; temperature rise does not exceed values shown in table 9		N
	Submersible pumps are not subjected to the test. (EN 60335-2-41)		N
20.2	Moving parts adequately arranged or enclosed as to provide protection against personal injury		P
	Protective enclosures, guards and similar parts are non-detachable		P
	Adequate mechanical strength and fixing of protective enclosures		P

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
	Self-resetting thermal cut-outs and overcurrent protective devices not causing a hazard, by unexpected reclosure		N
	Not possible to touch dangerous moving parts with test probe		P
21	MECHANICAL STRENGTH		--
21.1	Appliance has adequate mechanical strength and is constructed as to withstand rough handling		P
	Checked by applying blows to the appliance in accordance with test Ehb of IEC 60068-2-75, spring hammer test, impact energy 0,5 J		P
	The impact energy is increased to 1.0J. (EN 60335-2-41)		P
	If necessary, supplementary or reinforced insulation subjected to the electric strength test of 16.3		P
	If necessary, repetition of groups of three blows on a new sample		N
21.2	Accessible parts of solid insulation having strength to prevent penetration by sharp implements		P
	The insulation is tested as specified, unless		P
	the thickness of supplementary insulation is at least 1 mm and reinforced insulation is at least 2 mm		P
22	CONSTRUCTION		--
22.1	Appliance marked with the first numeral of the IP system, relevant requirements of IEC 60529 are fulfilled		P
22.2	Stationary appliance: means to provide all-pole disconnection from the supply provided, the following means being available:		N
	- a supply cord fitted with a plug		N
	- a switch complying with 24.3		N
	- a statement in the instruction sheet that a disconnection incorporated in the fixed wiring is to be provided		N
	- an appliance inlet		N
	Singe-pole switches and single-pole protective devices for the disconnection of heating elements in single-phase permanently connected class I appliances, connected in the phase conductor		N
22.3	Appliance provided with pins: no undue strain on socket-outlets		N
	Applied torque not exceeding 0.25 Nm		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
	Pull force of 50N to each pin after the appliance has being placed in the heating cabinet; when cooled to room temperature the pins are not displaced by more than 1mm		N
	Each pin subjected to a torque of 0.4Nm; the pins are not rotating unless rotating does not impair compliance with the standard		N
22.4	Appliance for heating liquids and appliance causing undue vibration not provided with pins for insertion into socket-outlets		N
22.5	No risk of electric shock when touching the pins of the plug, the appliance being disconnected from the supply at the instant of voltage peak.		P
22.6	Electrical insulation not affected by condensing water or leaking liquid		N
	Electrical insulation of Class II appliances not affected in case of a hose rupture or seal leak		N
	Shower-boost pumps having a separate enclosure shall have a drain hole in the enclosure positioned so that the water can drain out without impairing electrical insulation, unless water cannot accumulate within the enclosure in normal use. The hole shall be at least 5 mm in diameter or 20mm² in area with a width of least 2 mm		N
	The seal is removed from the shaft of class II pumps. The pump is supplied at rated voltage and operated for 10 min with the maximum head that can be achieved. (EN 60335-2-41)		N
	If a static pressure can occur, the test is repeated at a pressure corresponding to the maximum total head. The pump shall then withstand the electric strength test of 16.3. (EN 60335-2-41)		N
22.7	Adequate safeguards against the risk of excessive pressure in appliances provided with steam-producing devices		N
22.8	Electrical connections not subject to pulling during cleaning of compartments to which access can be gained without the aid of a tool, and that are likely to be cleaned in normal use		N
22.9	Insulation, internal wiring, windings, commutators and slip rings not exposed to oil, grease or similar substances		N
	Adequate insulating properties of oil or grease to which insulation is exposed		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
22.10	Not possible to reset voltage-maintained non-self-resetting thermal cut-outs by the operation of an automatic switching device incorporated within the appliance		N
	Non-self resetting thermal motor protectors have a trip-free action, unless		N
	they are voltage maintained		N
	Location or protection of reset buttons of non-self-resetting controls is so that accidental resetting is unlikely		N
22.11	Reliable fixing of non-detachable parts that provide the necessary degree of protection against electric shock, moisture or contact with moving parts		P
	Obvious locked position of snap-in devices used for fixing such parts		P
	No deterioration of the fixing properties of snap-in devices used in parts that are likely to be removed during installation or servicing		P
	Tests as described		P
22.12	Handles, knobs etc. fixed in a reliable manner		P
	Fixing in wrong position of handles, knobs etc. indicating position of switches or similar components not possible		P
	Axial force 15 N applied to parts, the shape being so that an axial pull is unlikely to be applied		N
	Axial force 30 N applied to parts, the shape being so that an axial pull is likely to be applied		P
22.13	Unlikely that handles, when gripped as in normal use, make the operators hand touch parts having a temperature rise exceeding the value specified for handles which are held for short periods only		P
22.14	No ragged or sharp edges creating a hazard for the user in normal use, or during user maintenance		P
	No exposed pointed ends of self tapping screws etc., liable to be touched by the user in normal use or during user maintenance		P
22.15	Storage hooks and the like for flexible cords smooth and well rounded		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
22.16	Automatic cord reels cause no undue abrasion or damage to the sheath of the flexible cord, no breakage of conductors strands, no undue wear of contacts		N
	Cord reel tested with 6000 operations, as specified		N
	Electric strength test of 16.3, voltage of 1000 V applied		N
22.17	Spacers not removable from the outside by hand or by means of a screwdriver or a spanner		N
22.18	Current-carrying parts and other metal parts resistant to corrosion under normal conditions of use		P
22.19	Driving belts not used as electrical insulation		P
22.20	Direct contact between live parts and thermal insulation effectively prevented, unless material used is non-corrosive, non-hygroscopic and non-combustible		N
	Compliance is checked by inspection and, if necessary, by appropriate test		N
22.21	Wood, cotton, silk, ordinary paper and fibrous or hygroscopic material not used as insulation, unless impregnated		N
22.22	Appliances not containing asbestos		P
22.23	Oils containing polychlorinated biphenyl (PCB) not used		P
22.24	Bare heating elements adequately supported		N
	In case of rupture, the heating conductor is unlikely to come in contact with accessible metal parts		N
22.25	Sagging heating conductors cannot come into contact with accessible metal parts		N
22.26	The insulation between parts operating at safety extra-low voltage and other live parts complies with the requirements for double or reinforced insulation		P
22.27	Parts connected by protective impedance separated by double or reinforced insulation		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
22.28	Metal parts of Class II appliances conductively connected to gas pipes or in contact with water: separated from live parts by double or reinforced insulation		N
22.29	Class II appliances permanently connected to fixed wiring so constructed that the required degree of access to live parts is maintained after installation		N
22.30	Parts serving as supplementary or reinforced insulation fixed so that they cannot be removed without being seriously damaged, or		P
	so constructed that they cannot be replaced in an incorrect position, and so that if they are omitted, the appliance is rendered inoperable or manifestly incomplete		P
22.31	Clearances and creepage distances over supplementary and reinforced insulation not reduced below values specified in clause 29 as a result of wear		P
	Clearances and creepage distances between live parts and accessible parts not reduced below values for supplementary insulation, if wires, screws etc. become loose		P
22.32	Supplementary and reinforced insulation designed or protected against deposition of dirt or dust		P
	Supplementary insulation of natural or synthetic rubber resistant to ageing, or arranged and dimensioned so that creepage distances are not reduced below values specified in 29.2		N
	Ceramic material not tightly sintered, similar material or beads alone not used as supplementary or reinforced insulation		N
	Oxygen bomb test at 70 °C for 96 h and 16 h at room temperature		N
22.33	Conductive liquids that are or may become accessible in normal use are not in direct contact with live parts		P
	Electrodes not used for heating liquids		P
	For class II constructions, conductive liquids that are or may become accessible in normal use, not in direct contact with basic or reinforced insulation		P

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
	For class II constructions, conductive liquids which are in contact with live parts, not in direct contact with reinforced insulation		P
22.34	Shafts of operating knobs, handles, levers etc. not live, unless the shaft is not accessible when the part is removed		N
22.35	Handles, levers and knobs, held or actuated in normal use, not becoming live in the event of an insulation fault		N
	Such parts being of metal, and their shafts or fixings are likely to become live in the event of an insulation fault, they are either adequately covered by insulation material, or their accessible parts are separated from their shafts or fixings by supplementary insulation		N
	This requirement does not apply to handles, levers and knobs on stationary appliances other than those of electrical components, provided they are either reliably connected to an earthing terminal or earthing contact, or separated from live parts by earthed metal		N
22.36	Handles continuously held in the hand in normal use are so constructed that when gripped as in normal use, the operators hand is not likely to touch metal parts, unless they are separated from live parts by double or reinforced insulation		N
22.37	Capacitors in Class II appliances not connected to accessible metal parts, unless complying with 22.42		N
	Metal casings of capacitors in Class II appliances separated from accessible metal parts by supplementary insulation, unless complying with 22.42		N
22.38	Capacitors not connected between the contacts of a thermal cut-out		P
22.39	Lamp holders used only for the connection of lamps	No lamp	N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
22.40	Motor-operated appliances and combined appliances intended to be moved while in operation, or having accessible moving parts, fitted with a switch to control the motor. The actuating member of the switch being easily visible and accessible The requirement is not applicable to submersible pumps and vertical wet pit pumps.		N
	The requirement is not applicable to submersible pumps and vertical wet pit pumps.(EN 60335-2-41)		P
22.41	No components, other than lamps, containing mercury		P
22.42	Protective impedance consisting of at least two separate components		N
	Values specified in 8.1.4 not exceeded if any one of the components are short-circuited or open-circuited		N
22.43	Appliances adjustable for different voltages, accidental changing of the setting of the voltage unlikely to occur		N
22.44	Appliances are not allowed to have an enclosure that is shaped and decorated so that the appliance is likely to be treated as a toy by children		P
22.45	When air is used as reinforced insulation, clearances not reduced below the values specified in 29.1.4 due to deformation as a result of an external force applied to the enclosure		P
22.46	Software used in protective electronic circuits is software class B or C		N
22.47	Appliances connected to the water mains withstand the water pressure expected in normal use		N
	No leakage from any part, including any inlet water hose		N
22.48	Appliances connected to the water mains constructed to prevent backsiphonage of non-potable water		
22.101	Pumps shall withstand the static pressure occurring in normal use (EN 60335-2-41)		N
	The pump is filled with water, ensuring that all air is removed. The pressure is raised hydraulically to 1,2 times the pressure occurring at maximum total head and is maintained for 1 min (EN 60335-2-41)		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
	Submersible pumps and vertical wet pit pumps are not subjected to this test (EN 60335-2-41)		N
22.102	The material of the pump shall not be affected by the liquid for which the pump is intended if a hazard could result (EN 60335-2-41)		P
22.103	Submersible pumps and vertical wet pit pumps shall be constructed so that pollution of the liquid by lubricants is prevented as far as possible (EN 60335-2-41)		N
22.104	Submersible pumps, and vertical wet pit pumps, having a mass exceeding 3 kg shall be constructed so that means for hoisting can be attached (EN 60335-2-41)		N
22.105	Class I submersible pumps having a plastic enclosure shall be constructed so that leakage of liquid into the motor does not result in a hazard (EN 60335-2-41)		P
23	INTERNAL WIRING		--
23.1	Wireways smooth and free from sharp edges		P
	Wires protected against contact with burrs, cooling fins etc.		P
	Wire holes in metal well rounded or provided with bushings		P
	Wiring effectively prevented from coming into contact with moving parts		P
23.2	Beads etc. on live wires cannot change their position, and are not resting on sharp edges or corners		N
	Beads inside flexible metal conduits contained within an insulating sleeve		N
23.3	Electrical connections and internal conductors movable relatively to each other not exposed to undue stress		N
	Flexible metallic tubes not causing damage to insulation of conductors		N
	Open-coil springs not used		N
	Adequate insulating lining provided inside a coiled spring, the turns of which touch one another		N
	No damage after 10 000 flexings for conductors flexed during normal use or 100 flexings for conductors flexed during user maintenance		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
	Electric strength test, 1000 V between live parts and accessible metal parts		N
23.4	Bare internal wiring sufficiently rigid and fixed		N
23.5	The insulation of internal wiring withstanding the electrical stress likely to occur in normal use		P
	No breakdown when a voltage of 2000 V is applied for 15 min between the conductor and metal foil wrapped around the insulation		P
23.6	Sleeving used as supplementary insulation on internal wiring retained in position by positive means		P
23.7	The colour combination green/yellow used only for earthing conductors		P
23.8	Aluminium wires not used for internal wiring		P
23.9	No lead-tin soldering of stranded conductors where they are subject to contact pressure, unless		P
	clamping means so constructed that there is no risk of bad contact due to cold flow of the solder		P
23.10	The insulation and sheath of internal wiring, incorporated in external hoses for the connection of an appliance to the water mains, at least equivalent to that of light polyvinyl chloride sheathed flexible cord (60227 IEC 52)		N
24	COMPONENTS		--
24.1	Components comply with safety requirements in relevant IEC standards		P
	List of components	(see appended table)	P
	Components not tested and found to comply with relevant IEC standard for the number of cycles specified are tested in accordance with 24.1.1 to 24.1.6		N
	Components not tested and found to comply with relevant IEC standard, components not marked or not used in accordance with its marking, tested under the conditions occurring in the appliance		P

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
24.1.1	Capacitors likely to be permanently subjected to the supply voltage and used for radio interference suppression or for voltage dividing, complying with IEC 60384-14, or		N
	tested according to annex F		N
24.1.2	Safety isolating transformers complying with IEC 61558-2-6, or		P
	tested according to annex G		P
24.1.3	Switches complying with IEC 61058-1, the number of cycles of operation being at least 10 000, or		P
	tested according to annex H		N
	If the switch operates a relay or contactor, the complete switching system is subjected to the test		N
	Level switches are subjected to 50000 cycles of operation (EN 60335-2-41)	No level switch	N
24.1.4	Automatic controls complying with IEC 60730-1 with relevant part 2. The number of cycles of operation being:		N
	- thermostats: 10 000		N
	- temperature limiters: 1 000		N
	- self-resetting thermal cut-outs: 300		N
	- voltage maintained non-self-resetting thermal cut-outs: 1000		N
	- other non-self-resetting thermal cut-outs: 30		N
	- timers: 3 000		N
	- energy regulators: 10 000		N
	Thermal motor protectors are tested in combination with their motor under the conditions specified in Annex D		N
	For water valves containing live parts and that are incorporated in external hoses for connection of an appliance to the water mains, the degree of protection declared for subclause 6.5.2 of IEC 60730-2-8 is IPX7		N
24.1.5	Appliance couplers complying with IEC 60320-1		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
	However, appliances classified higher than IPX0, the appliance couplers complying with IEC 60320-2-3		N
	Interconnection couplers complying with IEC 60320-2-2		N
24.1.6	Small lamp holders similar to E10 lampholders complying with IEC 60238, the requirements for E10 lampholders being applicable		N
24.2	No switches or automatic controls in flexible cords		P
	No devices causing the protective device in the fixed wiring to operate in the event of a fault in the appliance		P
	No thermal cut-outs that can be reset by soldering		P
	Level switches may be incorporated in interconnection cords (EN 60335-2-41)		N
24.3	Switches intended for all-pole disconnection of stationary appliances are directly connected to the supply terminals and having a contact separation in all poles, providing full disconnection under overvoltage category III conditions		N
24.4	Plugs and socket-outlets for extra-low voltage circuits and heating elements, not interchangeable with plugs and socket-outlets listed in IEC 60083 or IEC 60906-1 or with connectors and appliance inlets complying with the standard sheets of IEC 60320-1		N
24.5	Capacitors in auxiliary windings of motors marked with their rated voltage and capacitance and used accordingly		N
	Voltage across capacitors in series with a motor winding does not exceed 1,1 times rated voltage, when the appliance is supplied at 1,1 times rated voltage under minimum load		N
24.6	Working voltage of motors connected to the supply mains and having basic insulation that is inadequate for the rated voltage of the appliance, not exceeding 42V.		N
	In addition, the motors are complying with the requirements of Annex I		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
24.7	Hose-sets for connection of appliances to the water mains, complying with IEC 61770 and supplied with the appliance		N
25	SUPPLY CONNECTION AND EXTERNAL FLEXIBLE CORDS		P
25.1	Appliance not intended for permanent connection to fixed wiring, means for connection to the supply:		N
	- supply cord fitted with a plug		N
	- an appliance inlet having at least the same degree of protection against moisture as required for the appliance		N
	- pins for insertion into socket-outlets		N
	Submersible pumps, other than class III pumps, shall be provided with a supply cord fitted with a plug. (EN 60335-2-41)		N
25.2	Appliance not provided with more than one means of connection to the supply mains		P
	Stationary appliance for multiple supply may be provided with more than one means of connection, provided electric strength test of 1250 V for 1 min between each means of connection causes no breakdown		N
25.3	Connection of supply conductors for appliance intended to be permanently connected to fixed wiring possible after the appliance has been fixed to its support		N
	Appliance provided with a set of terminals for the connection of cables or fixed wiring, cross-sectional areas specified in 26.6		N
	Appliance provided with a set of terminals allowing the connection of a flexible cord		N
	Appliance provided with a set of supply leads accommodated in a suitable compartment		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
	Appliance provided with a set of terminals and cable entries, conduit entries, knock-outs or glands, allowing connection of appropriate type of cable or conduit		N
	Submersible pumps, other than class III pumps, shall be provided with a flexible cord (EN 60335-2-41)		N
25.4	Cable and conduit entries, rated current of appliance not exceeding 16 A, dimensions according to table 10		N
	Introduction of conduit or cable does not reduce clearances or creepage distances below values specified in 29		N
25.5	Method for assemble supply cord with the appliance:		P
	- type X attachment		N
	- type Y attachment		P
	- type Z attachment, if allowed in part 2		N
	Type X attachment, other than those with a specially prepared cord, not used for flat twin tinsel cords		N
	Type X attachment is not allowed for submersible pumps (EN 60335-2-41)		P
	Type Z attachment is allowed for (EN 60335-2-41)		N
	-Pumps having a rated power input not exceeding 100W		N
	-Pumps for garden ponds		N
25.6	Plugs fitted with only one flexible cord		N
	Supply cords of single-phase portable appliances having a rated current not exceeding 16 A, fitted with a plug complying with the following standard sheets of IEC 60083:1975:		N
	- for Class I appliances: standard sheet C2b, C3b or C4		N
	- for Class II appliances: standard sheet C5 or C6 .:		N
25.7	Supply cord not lighter than:		N
	- braided cord (60245 IEC 51)		N
	- ordinary tough rubber sheathed cord (60245 IEC 53)		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
	- ordinary polychloroprene sheathed flexible cord (60245 IEC 57)		N
	- flat twin tinsel cord (60227 IEC 41)		N
	- light polyvinyl chloride sheathed cord (60227 IEC 52), appliance not exceeding 3 kg		N
	- ordinary polyvinyl chloride sheathed cord (60227 IEC 53), appliance exceeding 3 kg		N
	Supply cords having high flexibility, not lighter than:		N
	- rubber insulated and sheathed cord (60245 IEC 86)		N
	- rubber insulated, crosslinked PVC sheathed cord (60245 IEC 87)		N
	- crosslinked PVC insulated and sheathed cord (60245 IEC 88)		N
	Temperature rise of external metal parts exceeding 75 K, PVC cord not used, unless		N
	appliance so constructed that the supply cord is not likely to touch external metal parts in normal use, or		N
	the supply cord is appropriate for higher temperatures, type Y or type Z attachment used		N
	For pumps intended for indoor use, except table fountain pumps, aquarium pumps, shower-boost pumps and class III pumps, the supply cord shall be polychloroprene sheathed or equivalent synthetic elastomer and not be lighter than ordinary polychloroprene sheathed cord		N
	For pumps intended for outdoor use and pumps intended for use in swimming pools, the supply cord shall be polychloroprene sheathed or equivalent synthetic elastomer and not be lighter than heavy polychloroprene sheathed. (EN 60335-2-41)		N
	portable pumps having a mass not exceeding 5 kg may be fitted with ordinary polychloroprene sheathed cord (code designation 60245 IEC 57). (EN 60335-2-41)		N
25.8	Nominal cross-sectional area of supply cords according to table 11; rated current (A); cross-sectional area (mm ²)		P
	The supply cord of submersible pumps intended for outdoor use other than class III pumps ,shall have a length of at least 10m (EN 60335-2-41)		N
25.9	Supply cord not in contact with sharp points or edges		P
25.10	Green/yellow core for earthing purposes in Class I appliance		P

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
25.11	Conductors of supply cords not consolidated by lead-tin soldering where they are subject to contact pressure, unless		N
	clamping means so constructed that there is no risk of bad contacts due to cold flow of the solder		N
25.12	Moulding the cord to part of the enclosure does not damage the insulation of the supply cord		N
25.13	Inlet opening so shaped as to prevent damage to the supply cord		N
	Unless the enclosure at the inlet opening is of insulation material, a non-detachable lining or bushing complying with 29.3 for supplementary insulation provided		N
	If unsheathed supply cord, a similar additional bushing or lining is required, unless		N
	the appliance is class 0		N
25.14	Supply cords adequately protected against excessive flexing		N
	Flexing test:		N
	- applied force (N)		N
	- number of flexings		N
	The test does not result in:		N
	- short circuit between the conductors		N
	- breakage of more than 10% of the strands of any conductor		N
	- separation of the conductor from its terminal		N
	- loosening of any cord guard		N
	- damage, within the meaning of the standard, to the cord or the cord guard		N
	- broken strands piercing the insulation and becoming accessible		N
	Portable pumps, except table fountain pumps and aquarium pumps, are subjected to the test (EN 60335-2-41)		N
25.15	Conductors of the supply cord relieved from strain, twisting and abrasion by use of cord anchorage		P

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
	The cord cannot be pushed into the appliance to such an extent that the cord or internal parts of the appliance can be damaged		P
	Pull and torque test of supply cord, values shown in table 10: pull (N); torque (not on automatic cord reel) (Nm).....:		P
	Max. 2 mm displacement of the cord, and conductors not moved more than 1 mm in the terminals		P
	Creepage distances and clearances not reduced below values specified in 29.1		P
25.16	Cord anchorages for type X attachments constructed and located so that:		N
	- replacement of the cord is easily possible		N
	- it is clear how the relief from strain and the prevention of twisting are obtained		N
	- they are suitable for different types of cord		N
	- cord cannot touch the clamping screws of cord anchorage if these screws are accessible, unless separated from accessible metal parts by supplementary insulation		N
	- the cord is not clamped by a metal screw which bears directly on the cord		N
	- at least one part of the cord anchorage securely fixed to the appliance, unless part of a specially prepared cord		N
	- screws which have to be operated when replacing the cord do not fix any other component, if applicable		N
	- if labyrinths can be bypassed the test of 25.15 is nevertheless withstood		N
	- for Class 0, 0I and I appliances: they are of insulating material or are provided with an insulating lining, unless a failure of the insulation of the cord does not make accessible metal parts live		N
	- for Class II appliances: they are of insulating material, or if of metal, they are insulated from accessible metal parts by supplementary insulation		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
25.17	Adequate cord anchorages for type Y and Z attachment		P
25.18	Cord anchorages only accessible with the aid of a tool, or		P
	so constructed that the cord can only be fitted with the aid of a tool		P
25.19	Type X attachment, glands not used as cord anchorage in portable appliances		N
	Tying the cord into a knot or tying the cord with string not used		N
25.20	Conductors of the supply cord for type Y and Z attachment adequately additionally insulated		P
25.21	Space for supply cord for type X attachment or for connection of fixed wiring constructed to permit checking of conductors with respect to correct positioning and connection before fitting any cover, no risk of damage to the conductors when fitting the cover, no contact with accessible metal parts if a conductor becomes loose, etc.		N
	For portable appliances, the uninsulated end of a conductor prevented from any contact with accessible metal parts, unless the end of the cord is such that the conductors are unlikely to slip free		N
25.22	Appliance inlet:		N
	- live parts not accessible during insertion or removal		N
	- connector can be inserted without difficulty		N
	- the appliance is not supported by the connector		N
	- is not for cold conditions if temp. rise of external metal parts exceeds 75 K, unless the supply cord is not likely to touch such metal parts		N
25.23	Interconnection cords comply with the requirements for the supply cord, except as specified		N
	If necessary, electric strength test of 16.3		N
25.24	Interconnection cords not detachable without the aid of a tool if compliance with the standard is impaired when they are disconnected		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
25.25	Dimensions of pins compatible with the dimensions of the relevant socket-outlet. Dimensions of pins and engagement face in accordance with the relevant plug in IEC 60083		N
26	TERMINALS FOR EXTERNAL CONDUCTORS		--
26.1	Appliances provided with terminals or equally effective devices for connection of external conductors		P
	Terminals only accessible after removal of a non-detachable cover		P
	However, earthing terminals may be accessible if a tool is required to make the connections and means are provided to clamp the wire independently from its connection		P
26.2	Appliances with type X attachment and appliances for connection to fixed wiring provided with terminals in which connections are made by means of screws, nuts or similar devices, unless the connections are soldered		N
	Screws and nuts serve only to clamp supply conductors, except		N
	internal conductors, if so arranged that they are unlikely to be displaced when fitting the supply conductors		N
	If soldered connections used, the conductor so positioned or fixed that reliance is not placed on soldering alone		N
	Soldering alone used, barriers provided, clearances and creepage distances satisfactory if the conductor becomes free at the soldered joint		N
26.3	Terminals for type X attachment and for connection to fixed wiring so constructed that the conductor is clamped between metal surfaces with sufficient contact pressure and without damaging the conductor		N
	Terminals for type X attachment and those for connection to fixed wiring so fixed that when tightening or loosening the clamping means:		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
	- the terminal does not loosen		N
	- internal wiring is not subjected to stress		N
	- clearances and creepage distances are not reduced below the values in 29		N
	Compliance checked by inspection and by the test of subclause 8.6 of IEC 60999-1, the torque applied being equal to two-thirds of the torque specified. Nominal diameter of thread (mm); screw category; torque (Nm)		N
26.4	Terminals for type X attachment, except those with a specially prepared cord, and those for connection to fixed wiring, no special preparation of conductors required, and so constructed or placed that conductors prevented from slipping out		N
26.5	Terminals for type X attachment so located or shielded that if a wire of a stranded conductor escapes, no risk of accidental connection to other parts that result in a hazard		N
	Stranded conductor test, 8 mm insulation removed		N
	No contact between live parts and accessible metal parts and, for class II constructions, between live parts and metal parts separated from accessible metal parts by supplementary insulation only		N
26.6	Terminals for type X attachment and for connection to fixed wiring suitable for connection of conductors with required cross-sectional area according to table 13; rated current (A); nominal cross-sectional area (mm ²).....		N
	Terminals only suitable for a specially prepared cord		N
26.7	Terminals for type X attachment accessible after removal of a cover or part of the enclosure		N
26.8	Terminals for the connection to fixed wiring, including the earthing terminal, located close to each other		N
26.9	Terminals of the pillar type constructed and located as specified		N
26.10	Terminals with screw clamping and screwless terminals not used for flat twin tinsel cords, unless conductors ends fitted with a device suitable for screw terminals		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
	Pull test of 5 N to the connection		N
26.11	For type Y and Z attachment: soldered, welded, crimped and similar connections may be used		P
	For Class II appliances: the conductor so positioned or fixed that reliance is not placed on soldering, welding or crimping alone		N
	For Class II appliances: soldering, welding or crimping alone used, barriers provided, clearances and creepage distances satisfactory if the conductor becomes free		N
27	PROVISION FOR EARTHING		P
27.1	Accessible metal parts of Class 0I and I appliances, permanently and reliably connected to an earthing terminal or contact of the appliance inlet		P
	Earthing terminals not connected to neutral terminal		P
	Class 0, II and III appliance have no provision for earthing		N
	Safety extra-low voltage circuits not earthed, unless protective extra-low voltage circuits		P
27.2	Clamping means adequately secured against accidental loosening		P
	Terminals used for the connection of external equipotential bonding conductors allow connection of conductors of 2.5 to 6 mm ² , and		P
	do not provide earthing continuity between different parts of the appliance		P
	Conductors cannot be loosened without the aid of a tool		P
27.3	For detachable parts that are plugged into another part of the appliance, and having an earth connection, the earth connection made before and separated after current-carrying connections when removing the part		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
	For appliances with supply cord, current-carrying conductors become taut before earthing conductor, if the cord slips out of the cord anchorage		P
27.4	No risk of corrosion resulting from contact between metal of earthing terminal and other metal		P
	Adequate resistance to corrosion of coated or uncoated parts providing earthing continuity, other than parts of a metal frame or enclosure		P
	Parts of steel providing earthing continuity provided at the essential areas with an electroplated coating, thickness at least 5 µm		P
	Adequate protection against rusting of parts of coated or uncoated steel, only intended to provide or transmit contact pressure		P
	In case of aluminium alloys precautions taken to avoid risk of corrosion		N
27.5	Low resistance of connection between earthing terminal and earthed metal parts		P
	This requirement does not apply to connections providing earthing continuity in the protective extra-low voltage circuit, provided that clearances of basic insulation are based on the rated voltage of the appliance		P
	Resistance not exceeding 0,1 Ω at the specified low-resistance test	0.06 Ω	P
27.6	The printed conductors of printed circuit boards not used to provide earthing continuity in hand held appliances		N
	They may be used in other appliances if:		N
	- at least two tracks are used with independent soldering points and the appliance complies with requirements of 27.5 for each circuit		N
	- the material of the printed circuit board complies with IEC 60249-2-4 or IEC 60249-2-5		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
28	SCREWS AND CONNECTIONS		--
28.1	Fixings, electrical connections and connections providing earthing continuity withstand mechanical stresses		P
	Screws not of soft metal liable to creep, such as zinc or aluminium		P
	Diameter of screws of insulating material min. 3 mm		N
	Screws of insulating material not used for any electrical connection or connections providing earthing continuity		P
	Screws used for electrical connections or connections providing earthing continuity screw into metal		N
	Screws not of insulating material if their replacement by a metal screw can impair supplementary or reinforced insulation		N
	Type X attachment, screws to be removed for replacement of supply cord or for user maintenance, not of insulating material if their replacement by a metal screw can impair basic insulation		N
	For screws and nuts; test as specified	(see appended table)	P
28.2	Electrical connections and connections providing earthing continuity constructed so that contact pressure not transmitted through insulating material liable to shrink or distort, unless shrinkage or distortion compensated		P
	This requirement does not apply to electrical connections in circuits carrying a current not exceeding 0.5A		N
28.3	Space-threaded (sheet metal) screws only used for electrical connections if they clamp the parts together		N
	Thread-cutting (self-tapping) screws only used for electrical connections if they generate a full form standard machine screw thread		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
	Such screws not used if they are likely to be operated by the user or installer unless the thread is formed by a swaging action		N
	Thread-cutting and space-threaded screws may be used in connections providing earthing continuity, provided unnecessary to disturb the connection and at least two screws are used for each connection		N
28.4	Screws and nuts that make mechanical connection secured against loosening if they also make electrical connections or connections providing earthing continuity		P
	Rivets for electrical connections or connections providing earthing continuity secured against loosening if subjected to torsion		N
29	CLEARANCES, CREEPAGE DISTANCES AND SOLID INSULATION		--
	Clearances, creepage distances and solid insulation withstand electrical stress		P
	For coatings used on printed circuits boards to protect the microenvironment (Type A) or to provide basic insulation (Type B), annex J applies.....:		N
	The microenvironment is pollution degree 1 under Type A coating		N
	No creepage distance or clearance requirements under Type B coating		N
29.1	Clearances not less than the values specified in table 16, taking into account the rated impulse voltage for the overvoltage categories of table 15, unless		P
	for basic insulation and functional insulation they comply with the impulse voltage test of clause 14		P
	However, if the construction is affected by wear, distortion, movement of the parts or during assembly, the clearances for rated impulse voltages of 1500V and above are increased by 0,5 mm and the impulse voltage test is not applicable		N
	Impulse voltage test not applicable:		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
	- when the microenvironment is pollution degree 3		N
	- for basic insulation of class 0 and class 01 appliances		N
	Appliances are in overvoltage category II		P
	Clearances less than specified in table 16 not allowed for basic insulation of class 0 and class 01 appliances,		N
	or if pollution degree 3 is applicable		N
	Compliance is checked by inspection and measurements as specified		N
29.1.1	Clearances of basic insulation withstand the overvoltages, taking into account the rated impulse voltage		N
	Clearance at the terminals of tubular sheathed heating elements may be reduced to 1mm if the microenvironment is pollution degree 1		N
	Lacquered conductors of windings considered to be bare conductors		N
29.1.2	Clearances of supplementary insulation not less than those specified for basic insulation in table 16		P
29.1.3	Clearances of reinforced insulation not less than those specified for basic insulation in table 16, but using the next higher step for rated impulse voltage		P
29.1.4	For functional insulation, the values of table 16 are applicable, unless		P
	the appliance complies with clause 19 with the functional insulation short-circuited		P
	Lacquered conductors of windings considered to be bare conductors		P
	However, clearances at crossover points are not measured		N
	Clearance between surfaces of PTC heating elements may be reduced to 1mm		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
29.1.5	Appliances having higher working voltage than rated voltage, the voltage used for determining clearances from table 16 is the sum of the rated impulse voltage and the difference between the peak value of the working voltage and the peak value of the rated voltage		P
	If the secondary winding of a step-down transformer is earthed, or if there is an earthed screen between the primary and secondary windings, clearances of basic insulation on the secondary side not less than those specified in table 16, but using the next lower step for rated impulse voltage		P
	Circuits supplied with a voltage lower than rated voltage, clearances of functional insulation based on the working voltage used as the rated voltage in table 15		N
29.2	Creepage distances not less than those appropriate for the working voltage, taking into account the material group and the pollution degree		P
	Pollution degree 2 applies, unless		P
	precautions taken to protect the insulation; pollution degree 1		N
	insulation subjected to conductive pollution; pollution degree 3		N
	Compliance is checked by inspection and measurements as specified		P
29.2.1	Creepage distances of basic insulation not less than specified in table 17		P
	For pollution degree 1, creepage distance not less than the minimum specified for the clearance in table 16, if the clearance has been checked according to the test of clause 14		N
29.2.2	Creepage distances of supplementary insulation at least as specified for basic insulation in table 17		P
29.2.3	Creepage distances of reinforced insulation at least double as specified for basic insulation in table 17		P
29.2.4	Creepage distances of functional insulation not less than specified in table 18		P

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
	Creepage distances may be reduced if the appliance complies with clause 19 with the functional insulation short-circuited		N
29.3	Supplementary and reinforced insulation having adequate thickness, or a sufficient number of layers, to withstand the electrical stresses		P
	Compliance checked by:		--
	- measurement, in accordance with 29.3.1, or		P
	- an electric strength test in accordance with 29.3.2, or		P
	- an assessment of the thermal quality of the material combined with an electric strength test, in accordance with 29.3.3		P
29.3.1	Supplementary insulation having a thickness of at least 1 mm		P
	Reinforced insulation having a thickness of at least 2 mm		P
29.3.2	Each layer of material withstand the electric strength test of 16.3 for supplementary insulation		P
	Supplementary insulation consisting of at least 2 layers		P
	Reinforced insulation consisting of at least 3 layers		P
29.3.3	The insulation is subjected to the dry heat test Bb of IEC 60068-2-2, followed by		N
	the electric strength test of 16.3		N
	If the temperature rise during the tests of Clause 19 does not exceed the value specified in Table 3, the test of IEC 60068-2-2 is not carried out		N
30	RESISTANCE TO HEAT AND FIRE		--
30.1	External parts of non-metallic material,		P
	parts supporting live parts, and		P
	thermoplastic material providing supplementary or reinforced insulation,		P

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
	sufficiently resistant to heat		P
	Ball-pressure test according to IEC 60695-10-2		P
	External parts: at 40 °C plus the maximum temperature rise determined during the test of clause 11, or at 75 °C, whichever is the higher; temperature (°C)		P
	Parts supporting live parts: at 40°C plus the maximum temperature rise determined during the test of clause 11, or at 125°C, whichever is the higher; temperature (°C)		P
	Parts of thermoplastic material providing supplementary or reinforced insulation, 25°C plus the maximum temperature rise determined during clause 19, if higher; temperature (°C)		P
30.2	Relevant parts of non-metallic material adequately resistant to ignition and spread of fire		P
30.2.1	Glow-wire test of IEC 60695-2-11 at 550 °C, unless		P
	the material is classified at least HB40 according to IEC 60695-11-10		N
	Parts for which the glow-wire test cannot be carried out meet the requirements in ISO9772 for category HBF material		N
30.2.3	Appliances operated while unattended, tested as specified in 30.2.3.1 and 30.2.3.2		N
	Test not applicable to conditions as specified		N
	A rated residual operating current not exceeding 30mA		P
30.2.3.1	Parts of insulating material supporting connections carrying a current exceeding 0.2A during normal operation, and		N
	parts of insulating material within a distance of 3mm,		N
	having a glow-wire flammability index of at least 850°C according to IEC 60695-2-12		N
30.2.3.2	Parts of insulating material supporting current-carrying connections, and		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
	parts of insulating material within a distance of 3mm,		N
	subjected to glow-wire test of IEC 60695-2-11		N
	Test not carried out on material having a glow-wire ignition temperature according to IEC 60695-2-13 as specified		N
	Glow-wire test of IEC 60695-2-11, the temperature being:		--
	-750°C, for connections carrying a current exceeding 0,2A during normal operation		N
	-650°C, for other connections		N
	Parts that during the test produce a flame persisting longer than 2 s, tested as specified		N
	If a flame persists longer than 2 s during the test, parts above the connection, as specified, subjected to the needle-flame test of annex E, unless		N
	the material is classified as V-0 or V-1 according to IEC 60695-11-10		N
30.2.4	Base material of printed circuit boards subjected to needle-flame test of annex E		N
	Test not applicable to conditions as specified		N
31	RESISTANCE TO RUSTING		--
	Relevant ferrous parts adequately protected against rusting		P
32	RADIATION, TOXICITY AND SIMILAR HAZARDS		--
	Appliance does not emit harmful radiation		P
	Appliance does not present a toxic or similar hazard		P
A	ANNEX A (INFORMATIVE) ROUTINE TESTS		--
	Description of routine tests to be carried out by the manufacturer		P
B	ANNEX B (NORMATIVE) APPLIANCES POWERED BY RECHARGEABLE BATTERIES		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
	The following modifications to this standard are applicable for appliances powered by batteries that are recharged in the appliance		N
	This annex does not apply to battery chargers		N
3.1.9	Appliance operated under the following conditions:		N
	-the appliance, supplied by its fully charged battery, operated as specified in relevant part 2		N
	-the battery is charged, the battery being initially discharged to such an extent that the appliance cannot operate		N
	-if possible, the appliance is supplied from the supply mains through its battery charger, the battery being initially discharged to such an extent that the appliance cannot operate. The appliance is operated as specified in relevant part 2		N
	If the appliance incorporates inductive coupling between two parts that are detachable from each other, the appliance is supplied from the supply mains with the detachable part removed		N
3.6.2	Part to be removed in order to discard the battery is not considered to be detachable		N
5.101	Appliances supplied from the supply mains tested as specified for motor-operated appliances		N
7.1	Battery compartment for batteries intended to be replaced by the user, marked with battery voltage and polarity of the terminals		N
7.12	The instructions for appliances incorporating batteries intended to be replaced by the user includes required information		N
	Details about how to remove batteries containing materials hazardous to the environment given		N
7.15	Markings placed on the part of the appliance connected to the supply mains		N
8.2	Appliances having batteries that according to the instruction may be replaced by the user need only have basic insulation between live parts and the inner surface of the battery compartment		N
	If the appliance can be operated without batteries, double or reinforced insulation required		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
11.7	The battery is charged for the period described		N
19.1	Appliances subjected to tests of 19.101, 19.102 and 19.103		N
19.101	Appliances supplied at rated voltage for 168 h, the battery being continually charged		N
19.102	Short-circuiting of the terminals of the battery, being fully charged, for appliances having batteries that can be removed without the aid of a tool		N
19.103	Appliances having batteries replaceable by the user supplied at rated voltage under normal operation with the battery removed or in any position allowed by the construction		N
21.101	Appliances having pins for insertion into socket-outlets have adequate mechanical strength, checked according to procedure 2 of IEC 68-2-32		N
	Part of the appliance incorporating the pins subjected to the free fall test, procedure 2, of IEC 60068-2-32, the number of falls being:		N
	- 100, the mass of part does not exceed 250 g		N
	- 50, the mass of part exceeds 250 g		N
	After the test, the requirements of 8.1, 15.1.1, 16.3 and clause 29 are met		N
22.3	Appliances having pins for insertion into socket-outlets tested as fully assembled as possible		N
25.13	An additional lining or bushing not required for interconnection cords operating at safety extra-low voltage		N
30.2	For parts of the appliance connected to the supply mains during the charging period, 30.2.3 applies		N
	For other parts, 30.2.2 applies		N
C	ANNEX C (NORMATIVE) AGEING TEST ON MOTORS		--
	Tests, as described, carried out when doubt with regard to the temperature classification of the insulation of a motor winding		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
D	ANNEX D (NORMATIVE) THERMAL MOTOR PROTECTORS		--
	Applicable to appliances having motors that incorporate thermal motor protectors		N
E	ANNEX E (NORMATIVE) NEEDLE-FLAME TEST		--
	Needle-flame test carried out in accordance with IEC 60695-2-2, with the following modifications:		N
5	Severities		N
	The duration of application of the test flame is 30 s \pm 1 s		N
8	Test procedure		N
8.2	The specimen so arranged that the flame can be applied to a vertical or horizontal edge as shown in the examples of figure 1		N
8.4	The first paragraph does not apply		N
	If possible, the flame is applied at least 10 mm from a corner		N
8.5	The test is carried out on one specimen		N
	If the specimen does not withstand the test, the test may be repeated on two further specimens, both withstanding the test		N
10	Evaluation of test results		N
	The duration of burning not exceeding 30 s		N
	However, for printed circuit boards, the duration of burning not exceeding 15 s		N
F	ANNEX F (NORMATIVE) CAPACITORS		N
	Capacitors likely to be permanently subjected to the supply voltage, and used for radio interference suppression or voltage dividing, comply with the following clauses of IEC 60384-14, with the following modifications:		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
1.5	Terminology		N
1.5.3	Class X capacitors tested according to subclass X2		N
1.5.4	This subclause is applicable		N
1.6	Marking		N
	Items a) and b) are applicable		N
3.4	Approval testing		N
3.4.3.2	Table II is applicable as described		N
4.1	Visual examination and check of dimensions		N
	This subclause is applicable		N
4.2	Electrical tests		N
4.2.1	This subclause is applicable		N
4.2.5	This subclause is applicable		N
4.2.5.2	Only table IX is applicable		N
	Values for test A apply		N
	However, for capacitors in heating appliances the values for test B or C apply		N
4.12	Damp heat, steady state		N
	This subclause is applicable		N
	Only insulation resistance and voltage proof are checked		N
4.13	Impulse voltage		N
	This subclause is applicable		N
4.14	Endurance		N
	Subclauses 4.14.1, 4.14.3, 4.14.4 and 4.14.7 applicable		N
4.14.7	Only insulation resistance and voltage proof are checked		N
	Visual examination, no visible damage		N
4.17	Passive flammability test		N
	This subclause is applicable		N
4.18	Active flammability test		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
	This subclause is applicable		N
G	ANNEX G (NORMATIVE) SAFETY ISOLATING TRANSFORMERS		--
	The following modifications to this standard are applicable for safety isolating transformers:		P
7	Marking and instructions		P
7.1	Transformers for specific use marked with:		P
	-name, trademark or identification mark of the manufacturer or responsible vendor		P
	-model or type reference		P
17	Overload protection of transformers and associated circuits		P
	Fail-safe transformers comply with subclause 15.5 of IEC 61558-1		P
22	Construction		P
	Subclauses 19.1 and 19.1.2 of IEC 61558-2-6 are applicable		P
29	Clearances, creepage distances and solid insulation		P
29.1, 29.2 and 29.3	The distances specified in items 2a, 2c and 3 in table 13 of IEC 61558-1 apply		P
H	ANNEX H (NORMATIVE) SWITCHES		--
	Switches comply with the following clauses of IEC 61058-1, as modified:		N
	-The tests of IEC 61058-1 carried out under the conditions occurring in the appliance		N
	-Before being tested, switches are operated 20 times without load		N
8	Marking and documentation		N
	Switches are not required to be marked		N
	However, switches that can be tested separately from the appliance marked with the manufacturer's name or trade mark and the type reference		N
13	Mechanism		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
	The tests may be carried out on a separate sample		N
15	Insulation resistance and dielectric strength		N
15.1	Not applicable		N
15.2	Not applicable		N
15.3	Applicable for full disconnection and micro-disconnection		N
17	Endurance		N
	Compliance is checked on three separate appliances or switches		N
	For 17.2.4.4, the number of cycles is 10 000, unless otherwise specified in 24.1.3 of the relevant part 2 of IEC 60335		N
	Switches for operation under no load and which can be operated only by a tool and switches operated by hand that are interlocked so that they cannot be operated under load, are not subjected to the tests		N
	Subclauses 17.2.2 and 17.2.5.2 not applicable		N
	The ambient temperature during the test is that occurring in the appliance during the test of Clause 11 in IEC 60335-1		N
	Temperature rise of the terminals not more than 30 K above the temperature rise measured in clause 11 of IEC 60335-1		N
20	Clearances, creepage distances, solid insulation and coatings of rigid printed board assemblies		N
	This clause is applicable to clearances and creepage distances for functional insulation, across full disconnection and micro-disconnection, as stated in table 24		N
I	ANNEX I (NORMATIVE) MOTORS HAVING BASIC INSULATION THAT IS INADEQUATE FOR THE RATED VOLTAGE OF THE APPLIANCE		--
	The following modifications to this standard are applicable for motors having basic insulation that is inadequate for the rated voltage of the appliance:		N
8	Protection against access to live parts		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
8.1	Metal parts of the motor are considered to be bare live parts		N
11	Heating		N
11.3	Temperature rise of the body of the motor is determined instead of the temperature rise of the windings		N
11.8	Temperature rise of the body of the motor, where in contact with insulating material, not exceeding values in table 3 for the relevant insulating material		N
16	Leakage current and electric strength		N
16.3	Insulation between live parts of the motor and its other metal parts not subjected to the test		N
19	Abnormal operation		N
19.1	The tests of 19.7 to 19.9 not carried out		N
19.101	Appliance operated at rated voltage with each of the following fault conditions:		N
	- short circuit of the terminals of the motor, including any capacitor incorporated in the motor circuit		N
	- short circuit of each diode of the rectifier		N
	- open circuit of the supply to the motor		N
	- open circuit of any parallel resistor, the motor being in operation		N
	Only one fault simulated at a time, the tests carried out consecutively		N
22	Construction		N
22.101	For class I appliances incorporating a motor supplied by a rectifier circuit, the d.c. circuit being insulated from accessible parts of the appliance by double or reinforced insulation		N
	Compliance checked by the tests specified for double and reinforced insulation		N
J	ANNEX J (NORMATIVE) COATED PRINTED CIRCUIT BOARDS		--

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
	Testing of protective coatings of printed circuit boards carried out in accordance with IEC 60664-3 with the following modifications:		N
6.6	Climatic sequence		N
	When production samples are used, three samples of the printed circuit board are tested		N
6.6.1	Cold		N
	The test is carried out at -25°C		N
6.6.3	Rapid change of temperature		N
	Severity 1 is specified		N
6.8.6	Partial discharge extinction voltage		N
	Type A coatings not subjected to a partial discharge test		N
6.9	Additional tests		N
	This subclause is not applicable		N
K	ANNEX K (NORMATIVE) OVERVOLTAGE CATEGORIES		--
	The information on overvoltage categories is extracted from IEC 60664-1		N
	Overvoltage category is a numeral defining a transient overvoltage condition		N
	Equipment of overvoltage category IV is for use at the origin of the installation		N
	Equipment of overvoltage category III is equipment in fixed installations and for cases where the reliability and the availability of the equipment is subject to special requirements		N
	Equipment of overvoltage category II is energy consuming equipment to be supplied from the fixed installation		N
	If such equipment is subjected to special requirements with regard to reliability and availability, overvoltage category III applies		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
	Equipment of overvoltage category I is equipment for connection to circuits in which measures are taken to limit transient overvoltages to an appropriate low level		N
L	ANNEX L (INFORMATIVE) GUIDANCE FOR THE MEASUREMENT OF CLEARANCES AND CREEPAGE DISTANCES		--
	Sequences for the determination of clearances and creepage distances		P
M	ANNEX M (NORMATIVE) POLLUTION DEGREE		--
	The information on pollution degrees is extracted from IEC 60664-1		P
	Pollution		P
	The microenvironment determines the effect of pollution on the insulation, taking into account the microenvironment		P
	Means may be provided to reduce pollution at the insulation by effective enclosures or similar		P
	Minimum clearances specified where pollution may be present in the microenvironment		P
	Degrees of pollution in the microenvironment		P
	For evaluating creepage distances, the following degrees of pollution in the microenvironment are established:		P
	- pollution degree 1: no pollution or only dry, non-conductive pollution occurs. The pollution has no influence		N
	- pollution degree 2: only non-conductive pollution occurs, except that occasionally a temporary conductivity caused by condensation is to be expected		P
	- pollution degree 3: conductive pollution occurs or dry non-conductive pollution occurs that becomes conductive due to condensation that is to be expected		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
	- pollution degree 4: the pollution generates persistent conductivity caused by conductive dust or by rain or snow		N
N	ANNEX N (NORMATIVE) PROOF TRACKING TEST		--
	The proof tracking test is carried out in accordance with IEC 60112 with the following modifications:		N
7	Test apparatus		N
7.3	Test solutions		N
	Test solution A is used		N
10	Determination of proof tracking index (PTI)		N
10.1	Procedure		N
	The proof voltage is 100V, 175V, 400V or 600V:		N
	The last paragraph of Clause 3 applies		N
	The test is carried out on five specimens		N
	In case of doubt, additional test with proof voltage reduced by 25V, the number of drops increased to 100		N
10.2	Report		N
	The report stating if the PTI value was based on a test using 100 drops with a test voltage of (PTI-25) V		N
O	ANNEX O (INFORMATIVE) SELECTION AND SEQUENCE OF THE TESTS OF CLAUSE 30		--
	Description of tests for determination of resistance to heat and fire		N
P	ANNEX P (INFORMATIVE) GUIDANCE FOR THE APPLICATION OF THIS STANDARD TO APPLIANCES USED IN WARM DAMP EQUABLE CLIMATES		--
	Modifications applicable for class 0 and 01 appliances having a rated voltage exceeding 150V, intended to be used in countries having a warm damp equable climate and that are marked WDaE		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
	Modifications may also be applied to class 1 appliances having a rated voltage exceeding 150V, intended to be used in countries having a warm damp equable climate and that are marked WdaE, if liable to be connected to a supply mains that excludes the protective earthing conductor		N
5	General conditions for the tests		N
5.7	The ambient temperature for the tests of Clauses 11 and 13 is 40^{+3}_{-0}		N
7	Marking and instructions		N
7.1	The appliance marked with the letters WDaE		N
7.12	The instructions state that the appliance is to be supplied through a RCD having a rated residual operating current not exceeding 30 mA		N
	The instructions state that the appliance is considered to be suitable for use in countries having a warm damp equable climate, but may also be used in other countries		N
11	Heating		N
11.8	The values of Table 3 are reduced by 15 K		N
13	Leakage current and electric strength at operating temperature		N
13.2	The leakage current for class I appliances not exceeding 0,5 mA		N
15	Moisture resistance		N
15.3	The value of t is 37 °C		N
16	Leakage current and electric strength		N
16.2	The leakage current for class I appliances not exceeding 0,5 mA		N
19	Abnormal operation		N
19.13	The leakage current test of 16.2 is applied in addition to the electric strength test of 16.3		N
Q	ANNEX Q (INFORMATIVE) SEQUENCE OF TESTS FOR THE EVALUATION OF ELECTRONIC CIRCUITS		--
	Description of tests for appliances incorporating electronic circuits		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
R	ANNEX R (NORMATIVE) SOFTWARE EVALUATION		N
	Software evaluated in accordance with the following clauses of Annex H of IEC 60730-1, as modified		N
H.2	Definitions		N
	Only definitions H.2.16 to H.2.20 applicable		N
H.7	Information		N
	Only footnotes 12) to 18) of Table 7.2, as modified, applicable		N
H.11.12	Controls using software		N
	All the subclauses of H.11.12, as modified, except H.11.12.6 and H.11.12.6.1, applicable		N
H.11.12.7	Delete text		N
H.11.12.7.1	For appliances using software class C having a single channel with self-test and monitoring structure, the manufacturer provides the measures necessary to address the fault/errors in safety related segments and data		N
H.11.12.8	Software fault/error detection occurs before compliance with 19.13 of IEC 60335-1 is impaired		N
H.11.12.8.1	Replace text		N
H.11.12.13	Software and safety related hardware under its control initializes and terminates before compliance with 19.13 of IEC 60335-1 is impaired		N
ZA	ANNEX ZA (NORMATIVE) SPECIAL NATIONAL CONDITIONS		N
7.12	DENMARK: Requirements regarding marking tag of power supply cord and connection of earthing wire for class I appliances delivered without a plug		N
19.5	NORWAY: The test is also applicable to appliances intended to be permanently connected to fixed wiring		N
22.2	FRANCE, NORWAY: The second paragraph of this subclause, dealing with single-phase, permanently connected class I appliances having heating elements, is not applicable due to the supply system		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
25.6	BELGIUM, FRANCE, SPAIN, UNITED KINGDOM: Plugs according to standard sheet C2b not allowed		N
	AUSTRIA, FINLAND, GERMANY, ICELAND, IRELAND, ITALY, LUXEMBOURG, NETHERLANDS, NORWAY, PORTUGAL, SPAIN, SWEDEN, SWITZERLAND, UNITED KINGDOM: Plugs according to standard sheet C3b not allowed		N
	DENMARK: Supply cords of single-phase portable appliances having a rated current not exceeding 13 A provided with a plug according to the following:		N
	Class I appliances: Section 107-2-D1, ed.3 1998, Standard Sheet DK 2-1a		N
	For appliances covered by a Part 2 of EN 60335, also plugs in accordance with Section 107-2-D1, ed. 3, 1998, Standard Sheet C2b, C3b or C4 are allowed		N
	Class II appliances: Section 107-2-D1, ed.3 1998, Standard Sheet C1b, C5, C6, DKA 2-1a and DKA 2-4		N
	Stationary single-phase appliances, having a rated current not exceeding 13 A, and provided with a supply cord and a plug, the plug is in accordance with the requirements above		N
	Multi-phase appliances and single-phase appliances having a rated current exceeding 13 A, and provided with a supply cord and a plug, the plug is in accordance with the requirements below:		N
	Class I appliances: Section 107-2-D1, Standard Sheet DK 6-1a / EN 60309-2, Standard Sheet 2-II, 2-IV		N
	Class II appliances: Section 107-2-D1, Standard Sheet DK 6-1a / EN 60309-2, Standard Sheet 2-II, 2-IV, the earthing contact not being connected		N
	The current for the plug not exceeding the values specified; standard sheet (no.); current (A) :		N
	IRELAND: Only plugs according to Standard Sheets B2 and C5 allowed (see also Annex ZB)		N
	ITALY: Only plugs listed in CENELEC Report R0BT- 005:2001 allowed		N
	SPAIN: For appliances for household use, only the following plugs are allowed:		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
	according to UNE 20315: ESC 10-1b, C2b, C4, C6 or ESB 25-5b		N
	according to UNE-EN 50075		N
	SWITZERLAND: supply cords of portable household and similar electrical appliances having a rated current not exceeding 10 A, provided with a plug complying with SEV 1011 or IEC 60884-1 and one of the following dimension sheets:		N
	SEV 6532-2.1991, plug type 15, 3P+N+PE, 250/400 V, 10 A		N
	SEV 6533-2.1991, plug type 11, L+N, 250 V, 10 A		N
	SEV 6534-2.1991 plug type 12, L+N+PE, 250 V, 10 A		N
	UNITED KINGDOM: Only plugs according to Standard Sheets B2 and C5 allowed (see also Annex ZB)		N
25.8	IRELAND, UNITED KINGDOM: replacement of figures (rated current/cross-sectional area) in the table		N
ZB	ANNEX ZB (INFORMATIVE) A-DEVIATIONS		N
4	SWITZERLAND: Information about batteries with carbon-zinc and alkali-manganese		N
7.1	ITALY: The voltage is 12VDC		N
25.6	IRELAND: These regulations apply to all plugs for domestic use at a voltage of not less than 200 V and allow only plugs complying with I.S. 401:1997, or equivalent, to be fitted to domestic appliances.		N
	UNITED KINGDOM: These regulations apply to all plugs for domestic use at a voltage of not less than 200 V and allow only plugs to BS 1363 to be fitted to domestic appliances. It also allows plugs to BS 4573 and standard sheet C5 to be fitted to shavers and toothbrushes.		N
29.3	GERMANY: Third dashed item not applicable for appliances where the insulation is accessible. Additional measures, such as a multi-layered insulation or adequate thickness, taken.		N

EN 60335-1:2012+A11:2014 & EN 60335-2-41:2003+A1:2004+A2:2010			
Clause	Requirement	Result - Remark	Verdict
ZC	ANNEX ZC (NORMATIVE) NORMATIVE REFERENCES TO INTERNATIONAL PUBLICATIONS WITH THEIR CORRESPONDING EUROPEAN PUBLICATIONS		--
	This Standard incorporates provisions from the publications listed		N
ZD	ANNEX ZD (INFORMATIVE) IEC and CENELEC CODE DESIGNATIONS FOR FLEXIBLE CORDS		--
	A list of code designations for different types of flexible cords		N
Annex	EMF		--
	The tested product also complies to the requirements of EN 62233: 2008		N
	Limit.....100%	Measured Max. value8.147%...	N

Appendix
Tables of Testing Data

10.1	TABLE: Power input deviation					P
Input deviation of/at:		P rated (W)	P measured (W)	dP	Required dP	Remark
+3%		180	182.8	1.55%	+20%	DVX25

10.2	TABLE: Current deviation					P
Current deviation of/at:		I rated (A)	I measured (A)	dI	Required dI	Remark
+3%		1.5	1.48	1.33%	+20%	DVX25

11.8	TABLE: Heating test, thermocouples		P
	Test voltage (V).....:	220	
	Ambient (°C)	25	
Thermocouple locations		dT (K)	Max. dT (K)
Enclosure outside		5	60
Power cord		12	50
Pump 1		13.4	65
Winding of T1		27.2	85

11.8	TABLE: Heating test, resistance method					P
	Test voltage (V).....:		220			
	Ambient, t ₁ (°C).....:		25.6			
	Ambient, t ₂ (°C).....:		24.9			
Temperature rise of winding		R ₁ (Ω)	R ₂ (Ω)	dT (K)	Max. dT (K)	Insulation class
Pri winding of transformer		102.38	114.02	32.2	95	Class B
Sec winding of transformer		2.11	3.39	31.0	95	Class B

13.2	TABLE: Leakage current		P
	Heating appliances: 1.15 x rated input..... :	--	
	Motor-operated and combined appliances: 1.06 x rated voltage :	233.2V	
Leakage current between		I (mA)	Max. allowed I (mA)
Live parts to enclosure wrpe metal foil		< 0.12	0.25
Live parts to control panel wrpe metal foil		< 0.11	0.25

13.3	TABLE: Electric strength			P
Test voltage applied between:		Voltage (V)	Breakdown (Yes/No)	
Live parts to enclosure wrpe metal foil		1200	No	
Live parts to earthing		1200	No	

16.2	TABLE: Leakage current			P
	Single phase appliances: 1.06 x rated voltage	--		
	Three phase appliances 1.06 x rated voltage divided by $\sqrt{3}$:.....	233.2V		
Leakage current between		I (mA)	Max. allowed I (mA)	
Live parts to enclosure wrpe metal foil		< 0.005	0.25	
Live parts to control panel wrpe metal foil		< 0.005	0.25	

16.3	TABLE: Electric strength			P
Test voltage applied between:		Voltage (V)	Breakdown (Yes/No)	
Live parts to enclosure wrpe metal foil		1400	No	
Live parts to earthing		1400	No	

17	TABLE: Overload protection, temperature rise			P
Temperature rise of part/at:		dT (K)	Max. dT (K)	
Pri winding of transformer		135.3	225	
Sec winding of transformer		131.1	225	

19.7	TABLE: Abnormal operation, locked rotor/moving parts					P
	Test voltage (V).....:		240			
	Ambient, t ₁ (°C).....:		24.8			
	Ambient, t ₂ (°C).....:		25.1			
Temperature of winding		R ₁ (Ω)	R ₂ (Ω)	dT (K)	T (°C)	Max. T (°C)
Transfer motor		--	--	--	56	150
Fan		--	--	--	45	150

29.1	TABLE: Clearances					N
	Overvoltage category ... :	II				
		Type of insulation:				
Rated impulse voltage (V):	Min. cl (mm)	Basic	Functional	Supplementary	Reinforced	Verdict / Remark
330	0,5*	--	--	--		--
500	0,5*	--	--	--		--
800	0,5*	--	--	--		--
1 500	0,5*/**	--	--	--		--
2 500	1,5**	> 2	--	> 2	> 3	--
4 000	3,0**	--	--	--	--	--
6 000	5,5**	--	--	--	--	--
8 000	8,0**	--	--	--	--	--
10 000	11,0**	--	--	--	--	--
<p>*) The value is increased to 0,8mm for pollution degree 3</p> <p>*) If the construction is affected by wear, distortion, movement of the parts or during assembly, the value is increased by 0,5 mm</p>						

29.2	TABLE: Creepage distances, basic, supplementary and reinforced insulation										P
Working voltage (V)	Creepage distance (mm) Pollution degree										
	1	2			3			Type of insulation			
		Material group			Material group			II			
		I	II	IIIa/IIIb	I	II	IIIa/IIIb	B ^{*)}	S ^{*)}	R ^{*)}	Verdict
≤50	0,2	0,6	0,9	1,2	1,5	1,7	1,9				
≤50	0,2	0,6	0,9	1,2	1,5	1,7	1,9				
≤50	0,4	1,2	1,8	2,4	3,0	3,4	3,8				
>50 and ≤125	0,3	0,8	1,1	1,5	1,9	2,1	2,4				
>50 and ≤125	0,3	0,8	1,1	1,5	1,9	2,1	2,4				
>50 and ≤125	0,6	1,6	2,2	3,0	3,8	4,2	4,8				
>125 and ≤250	0,6	1,3	1,8	2,5	3,2	3,6	4,0				
>125 and ≤250	0,6	1,3	1,8	2,5	3,2	3,6	4,0				
>125 and ≤250	1,2	2,6	3,6	5,0	6,4	7,2	8,0				
>250 and ≤400	1,0	2,0	2,8	4,0	5,0	5,6	6,3				
>250 and ≤400	1,0	2,0	2,8	4,0	5,0	5,6	6,3				
>250 and ≤400	2,0	4,0	5,6	8,0	10,0	11,2	12,6				
>400 and ≤500	1,3	2,5	3,6	5,0	6,3	7,1	8,0				
>400 and ≤500	1,3	2,5	3,6	5,0	6,3	7,1	8,0				
>400 and ≤500	2,6	5,0	7,2	10,0	12,6	14,2	16,0				
>500 and ≤800	1,8	3,2	4,5	6,3	8,0	9,0	10,0				
>500 and ≤800	1,8	3,2	4,5	6,3	8,0	9,0	10,0				
>500 and ≤800	3,6	6,4	9,0	12,6	16,0	18,0	20,0				
>800 and ≤1000	2,4	4,0	5,6	8,0	10,0	11,0	12,5				
>800 and ≤1000	2,4	4,0	5,6	8,0	10,0	11,0	12,5				
>800 and ≤1000	4,8	8,0	11,2	16,0	20,0	22,0	25,0				
>1000 and ≤1250	3,2	5,0	7,1	10,0	12,5	14,0	16,0				
>1000 and ≤1250	3,2	5,0	7,1	10,0	12,5	14,0	16,0				
>1000 and ≤1250	6,4	10,0	14,2	20,0	25,0	28,0	32,0				
>1250 and ≤1600	4,2	6,3	9,0	12,5	16,0	18,0	20,0				
>1250 and ≤1600	4,2	6,3	9,0	12,5	16,0	18,0	20,0				
>1250 and ≤1600	8,4	12,6	18,0	25,0	32,0	36,0	40,0				
>1600 and ≤2000	5,6	8,0	11,0	16,0	20,0	22,0	25,0				

[illegible]

29.2	TABLE: Creepage distances, functional insulation							P
Working voltage (V)	Creepage distance (mm) Pollution degree							
	1	2			3			
		Material group			Material group			
		I	II	IIIa/IIIb	I	II	IIIa/IIIb	Verdict / Remark
≤50	0,2	0,6	0,8	1,1	1,4	1,6	1,8	
>50 and ≤125	0,3	0,7	1,0	1,4	1,8	2,0	2,2	
>125 and ≤250	0,4	1,0	1,4	2,0	2,5	2,8	3,2	
>250 and ≤400	0,8	1,6	2,2	3,2	4,0	4,5	5,0	
>400 and ≤500	1,0	2,0	2,8	4,0	5,0	5,6	6,3	
>500 and ≤800	1,8	3,2	4,5	6,3	8,0	9,0	10,0	
>800 and ≤1000	2,4	4,0	5,6	8,0	10,0	11,0	12,5	
>1000 and ≤1250	3,2	5,0	7,1	10,0	12,5	14,0	16,0	
>1250 and ≤1600	4,2	6,3	9,0	12,5	16,0	18,0	20,0	
>1600 and ≤2000	5,6	8,0	11,0	16,0	20,0	22,0	25,0	
>2000 and ≤2500	7,5	10,0	14,0	20,0	25,0	28,0	32,0	
>2500 and ≤3200	10,0	12,5	18,0	25,0	32,0	36,0	40,0	
>3200 and ≤4000	12,5	16,0	22,0	32,0	40,0	45,0	50,0	
>4000 and ≤5000	16,0	20,0	28,0	40,0	50,0	56,0	63,0	
>5000 and ≤6300	20,0	25,0	36,0	50,0	63,0	71,0	80,0	
>6300 and ≤8000	25,0	32,0	45,0	63,0	80,0	90,0	100,0	
>8000 and ≤10000	32,0	40,0	56,0	80,0	100,0	110,0	125,0	
>10000 and ≤12500	40,0	50,0	71,0	100,0	125,0	140,0	160,0	

30.1	TABLE: Ball pressure			P
Part	Test temperature (°C)		Impression diameter (mm)	Allowed impression diameter (mm)
Enclosure	75		1.31	≤2mm

30.2	TABLE: resistance to heat, fire and tracking, tracking and glow-wire test						P
Part under test	Tracking test		Glow wiring test				Result
	175V	250V	550°C	650°C	750 °C	850°C	--
Enclosure			✓				P



Technical Construction File

File No.: TCF(15)-365-5-EMC

Type of Equipment:	SUBMERSIBLE PUMP
Model No.:	DVX 25,DVX 35,DVX 80,DVX 100 , DVX 150M , DVX 150T, DVX 200M ,DVX 300M,DVX 300T, BAFA 150M,BAFA 200M,BAFA 200T, BAFA 300M, BAFA 300T,BKS 150M , BKS 200M,2BKS 100M,2 BKS 150M, 3 BKS 200M , 4 BKS 200M
Issued Date:	2015-06-24
Brand Name/ Trade mark:	NORTEK
Directive(S)	2014/30/EU Electromagnetic Compatibility Directive
standard(s):	EN 55014-1:2006+A1:2009+A2:2011,EN 61000-3-2:2014, EN61000-3-3:2013, EN 55014-2 : 2015



Presented for

NORTEK POMPA SAN.TİC.LTD.ŞTİ.
1203/7 SOK NO 1-C YENİŞEHİR / İZMİR / TURKEY

Presented by

Shanghai ECO Information Technology Co., Ltd.
Room 721-722, Cimic Plaza,No.800 Shangcheng Road,Pudong New
Zone,Shanghai 200120 P.R.C

TEST REPORT

**EN 55014-1:2006+A1:2009+A2:2011, EN 61000-3-2:2014,
EN61000-3-3:2013, EN 55014-2 : 2015**

Report

Report reference No. : No: TCF(15)-365-5-EMC

Tested by(+ signature).....

Downey Xue

Reviewed by(+ signature).....

Guo Sheng

Date of issue : 2015-06-24

Number of pages (Report) : 46

Testing laboratory

Name : Shanghai ECO Information Technology Co., Ltd.

Address : Room 721-722, Cimic Plaza, No.800 Shangcheng Road, Pudong
New Zone, Shanghai 200120 P.R.C

Testing location : GUANZHUANG VILLAGE, RUOHENG TOWN, WENLING CITY,
ZHEJIANG PROVINCE, P.R.CHINA

Client

Name : NORTEK POMPA SAN.TİC.LTD.ŞTİ.

Address : 1203/7 SOK NO 1-C YENİŞEHİR / İZMİR / TURKEY

Manufacturer

Name : TAIZHOU WENGGE PUMPS CO.,LTD

Address : GUANZHUANG VILLAGE, RUOHENG TOWN, WENLING CITY,
ZHEJIANG PROVINCE, P.R.CHINA

Test specification

Standard : EN 55014-1:2006+A1:2009+A2:2011, EN 61000-3-2:2014,
EN61000-3-3:2013, EN 55014-2 : 2015

Test procedure : CE-MD

Procedure deviation : N.A.

Non-standard test method : N.A.

General description

This device is ideal for fume and dust purification in industrial processing, welding, cutting and grinding.

Ambient temperature: 22°C humidity: 60% Complete File was conducted on DVX 25

DVX 25, DVX 35, DVX 80, DVX 100, DVX 150M, DVX 150T, DVX 200M, DVX 300M, DVX 300T, BAFA 150M, BAFA 200M, BAFA 200T, BAFA 300M, BAFA 300T, BKS150M, BKS 200M, 2BKS 100M, 2 BKS 150M, 3 BKS 200M, 4 BKS 200M are series products.

They belong to the same circuit type except the difference in power, weight and the dimension.

1. TEST SUMMARY

Test procedures according to the technical standards:

EMC Emission				
Standard	Test Item	Limit	Judgment	Remark
EN 55014-1: 2006+A1:2009+A2:2011	Conducted Emission	Class B	PASS	
	Radiated Emission	Class B	PASS	
EN61000-3-2: 2014	Harmonic Current Emission	Class A	PASS	
EN 61000-3-3: 2013	Voltage Fluctuations & Flicker	-----	PASS	
EMC Immunity				
Section EN55014-2: 2015	Test Item	Performance Criteria	Judgment	Remark
EN 61000-4-2: 2009	Electrostatic Discharge	B	PASS	
EN 61000-4-3: 2010	RF electromagnetic field	A	PASS	
EN 61000-4-4: 2004+A1: 2010	Fast transients	B	PASS	
EN 61000-4-5: 2006	Surges	B	PASS	
EN 61000-4-6: 2009	Injected Current	A	PASS	
EN 61000-4-11: 2004	Volt. Interruptions Volt. Dips	C/C/C NOTE (1)	PASS	

NOTE:

- (1) Voltage dip: 0% reduction – Performance Criteria **C**
- Voltage dip: 30% reduction – Performance Criteria **C**
- Voltage dip: 60% reduction – Performance Criteria **C**

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	SUBMERSIBLE PUMP
Model Name	DVX 25
Model	DVX 25,DVX 35,DVX 80,DVX 100 , DVX 150M , DVX 150T, DVX 200M ,DVX 300M,DVX 300T, BAFA 150M,BAFA 200M, BAFA 200T, BAFA 300M, BAFA 300T,BKS 150M , BKS 200M, 2BKS 100M,2 BKS 150M, 3 BKS 200M , 4 BKS 200M
Serial No	2013030001
Model Difference	All models are identical except the size, weight, and power
Product Description	<p>The EUT is a SUBMERSIBLE PUMP.</p> <p>More details of EUT technical specification, please refer to the User's Manual.</p>
Power Source	AC Voltage
Power Rating	220V~, 50Hz, 1.5A

2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generated from EUT, the test system was pre-scanning tested based on the consideration of following EUT operation mode or test configuration mode which possibly have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	Running

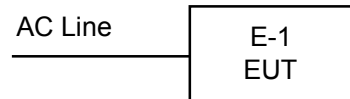
For Conducted Test	
Final Test Mode	Description
Mode 1	Running

For Radiated Test	
Final Test Mode	Description
Mode 1	Running

For EMS Test	
Final Test Mode	Description
Mode 1	Running

2.3 DESCRIPTION OF TEST SETUP

Mode 1:



2.4 DESCRIPTION TEST PERIPHERAL AND EUT PERIPHERAL

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	SUBMERSIBLE PUMP	NORTEK	DVX 25	2013030001	EUT

Item	Shielded Type	Ferrite Core	Length	Note

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.
- (3) 'YES' means 'shielded' 'with core'; 'NO' means 'unshielded' 'without core'.

2.5 MEASUREMENT INSTRUMENTS LIST

2.5.1 CONDUCTED TEST SITE

Item	Kind of Equipment	Manufacturerr	Type No.	Serial No.	Calibrated until
1	LISN	R&S	ENV216	101313	Jul. 06,2015
2	LISN	EMCO	3816/2	00042990	Jul. 06,2015
3	50Ω Switch	ANRITSU CORP	MP59B	6200983704	Jul. 06,2015
4	Test Cable	N/A	C01	N/A	Jul. 06,2015
5	Test Cable	N/A	C02	N/A	Jul. 06,2015
6	Test Cable	N/A	C03	N/A	Jul. 06,2015
7	EMI Test Receiver	R&S	ESCI	101160	Jul. 06,2015
8	Passive Voltage Probe	ESH2-Z3	R&S	100196	Jul. 06,2015
9	Triple-Loop Antenna	EVERFINE	LIA-2	11020003	Jul. 06,2015
10	Absorbing Clamp	R&S	MDS-21	100423	Jul. 08, 2015

2.5.2 RADIATED TEST SITE

Item	Kind of Equipment	Manufacturerr	Type No.	Serial No.	Calibrated until
1	Bilog Antenna	TESEQ	CBL6111D	31216	Jul. 06,2015
2	Test Cable	N/A	R-01	N/A	Jul. 06,2015
3	Test Cable	N/A	R-02	N/A	Jul. 06,2015
4	EMI Test Receiver	R&S	ESCI-7	101318	Jul. 06,2015
5	Antenna Mast	EM	SC100_1	N/A	N/A
6	Turn Table	EM	SC100	060531	N/A
7	50Ω Switch	Anritsu Corp	MP59B	6200983705	Jul. 06,2015
8	Spectrum Analyzer	Aglient	E4407B	MY45108040	Jul. 06,2015
9	Horn Antenna	EM	EM-AH-1018 0	2011071402	Jul. 06,2015
10	Amplifier	EM	EM-30180	060538	Jul. 06,2015

2.5.3 HARMONICS AND FILCK

Item	Kind of Equipment	Manufacturerr	Type No.	Serial No.	Calibrated until
1	Harmonic & Flicker	EM TEST	DPA500	0303-04	Jul. 06,2015
2	AC Power Source	EM TEST	ACS500	0203-01	Jul. 06,2015

2.5.4 ESD

Item	Kind of Equipment	Manufacturerr	Type No.	Serial No.	Calibrated until
1	ESD TEST GENERATOR	EVERFINE	EMS61000-2 A-V200	11040001T	Jul. 06,2015

2.5.5 RS

Item	Kind of Equipment	Manufacturerr	Type No.	Serial No.	Calibrated until
1	Signal Generator	R&S	SMT 06	832080/007	Jul. 24, 2015
2	Log-Bicon Antenna	Schwarzbeck	VULB9161	4022	Aug. 15, 2015
3	Power Amplifier	AR	150W1000M1	320946	Sep. 23, 2015
4	Microwave Horn Antenna	AR	AT4002A	321467	Jun. 11, 2016
5	Power Amplifier	AR	25S1G4A	308598	Sep. 23, 2015

2.5.6 SURGE, EFT/BURST, VOLTAGE INTERRUPTION/DIPS

Item	Kind of Equipment	Manufacturerr	Type No.	Serial No.	Calibrated until
1	Surge Generator	EVERFINE	EMS61000-5 A	1101002	Jul. 06,2015
2	DIPS Generator	EVERFINE	EMS61000-1 1K	1011002	Jul. 06,2015
	EFT/B Generator	EVERFINE	EMS61000-4 A-V2	1012005	Aug. 04, 2015

2.5.7 INJECTION CURRENT

Item	Kind of Equipment	Manufacturerr	Type No.	Serial No.	Calibrated until
1	Signal Generator	IFR	2023A	202301/368	May. 31, 2016
2	Power Amplifier	AR	75A250AM1	0320709	Sep. 23, 2015
3	CDN	FCC	FCC-801-M2	06043	Jun. 02, 2016
4	EM Clamp	FCC	F-203I-23MM	504	Jun. 09, 2016

2.4.8 MF

Item	Kind of Equipment	Manufacturerr	Type No.	Serial No.	Calibrated until
1	Generator	EVERFINE	EMS61000-8 K	1007001	Jul. 06,2015

3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION (Frequency Range 150KHz-30MHz)

Frequency Range (MHz)	At mains terminals		At load terminals and additional terminals	
	Quasi-peak (dBuV)	Average (dBuV)	Quasi-peak (dBuV)	Average (dBuV)
0.15 -0.5	66 - 56 *	56 - 46 *	80.00	70.00
0.50 -5.0	56.00	46.00	74.00	64.00
5.0 -30.0	60.00	50.00	74.00	64.00

3.1.2 MAINS TERMINALS OF TOOLS

Frequency Range	Rated motor power not exceeding 700W		Rated motor power above 700W and not exceeding 1 000 W		Rated motor power above 1 000 W	
(MHz)	dB (uV) Quasi-peak	dB (uV) Average**	dB (uV) Quasi-peak	dB (uV) Average**	dB (uV) Quasi-peak	dB (uV) Average**
0.15 -0.5	66.0 to 59.0*	59.0 to 49.0*	70.0 to 63.0*	63.0 to 53.0*	76.0 to 69.0*	69.0 to 59.0*
0.50 -5.0	59.0	49.0	63.0	53.0	69.0	59.0
5.0 -30.0	64.0	54.0	68.0	58.0	74.0	64.0

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of ' * ' marked band means the limitation decreases linearly with the logarithm of the frequency in the range.
- (3) '**' If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.

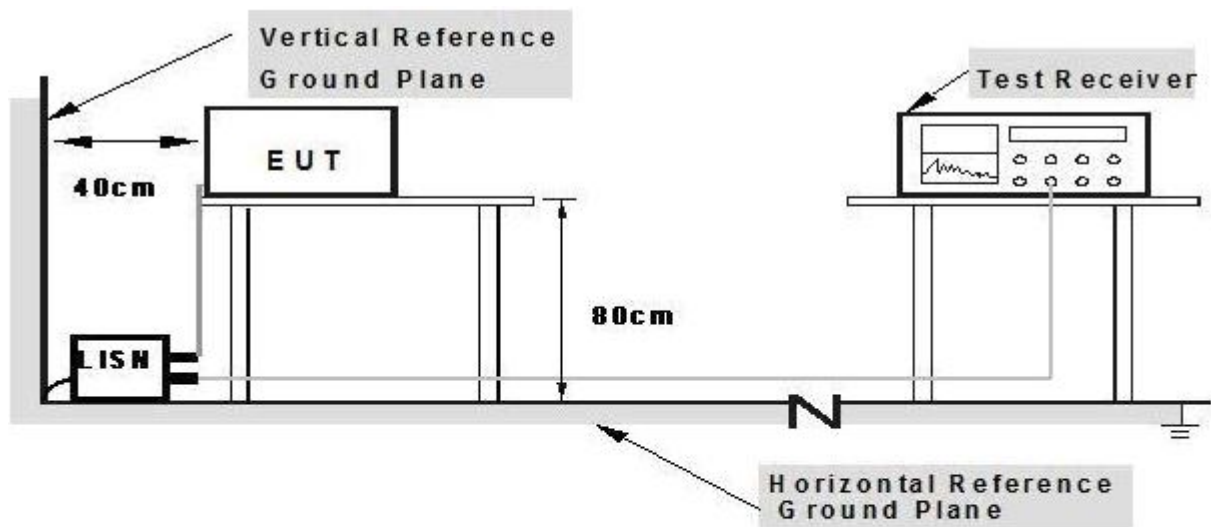
The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

3.1.3 TEST PROCEDURE

- The EUT was placed 0.4 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- LISN at least 80 cm from nearest part of EUT chassis.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.4 TEST SETUP



Note: 1. Support units were connected to second LISN.

2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

3.1.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **2.3** Unless otherwise a special operating condition is specified in the follows during the testing.

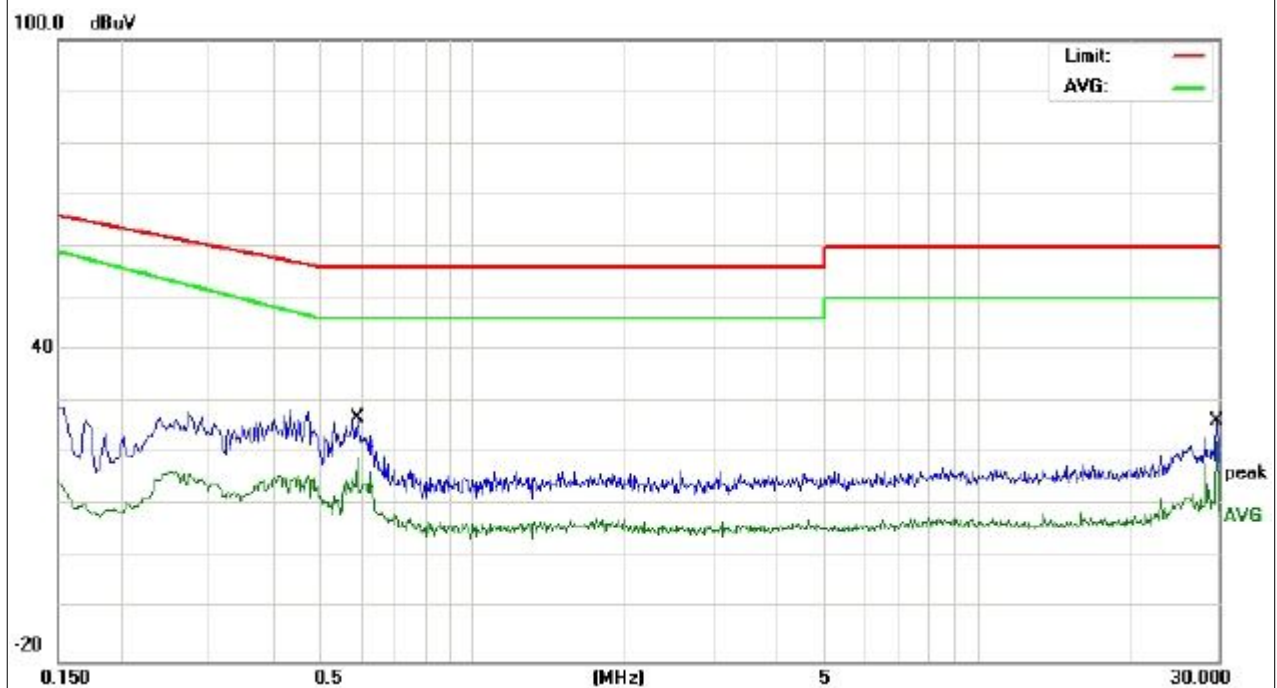
3.1.6 TEST RESULTS

EUT:	SUBMERSIBLE PUMP	Model Name. :	DVX 25
Temperature:	24 °C	Relative Humidity:	56%
Pressure:	1010hPa	Test Date :	2015-06-24
Test Mode:	Running	Phase :	L
Test Voltage :	AC220V/50Hz		

Freq. (MHz)	Reading (dBuV)	Factor (dBuV)	Measurement (dBuV)	Limit (dBuV)	Over (dB)	Detector
0.5899	16.59	10.40	26.99	56.00	-29.01	QP
0.5899	8.85	10.40	19.25	46.00	-26.75	AVG
29.6980	15.87	10.60	26.47	60.00	-33.53	QP
29.6980	11.90	10.60	22.50	50.00	-27.50	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.
3. N/A means All Data have pass Limit.

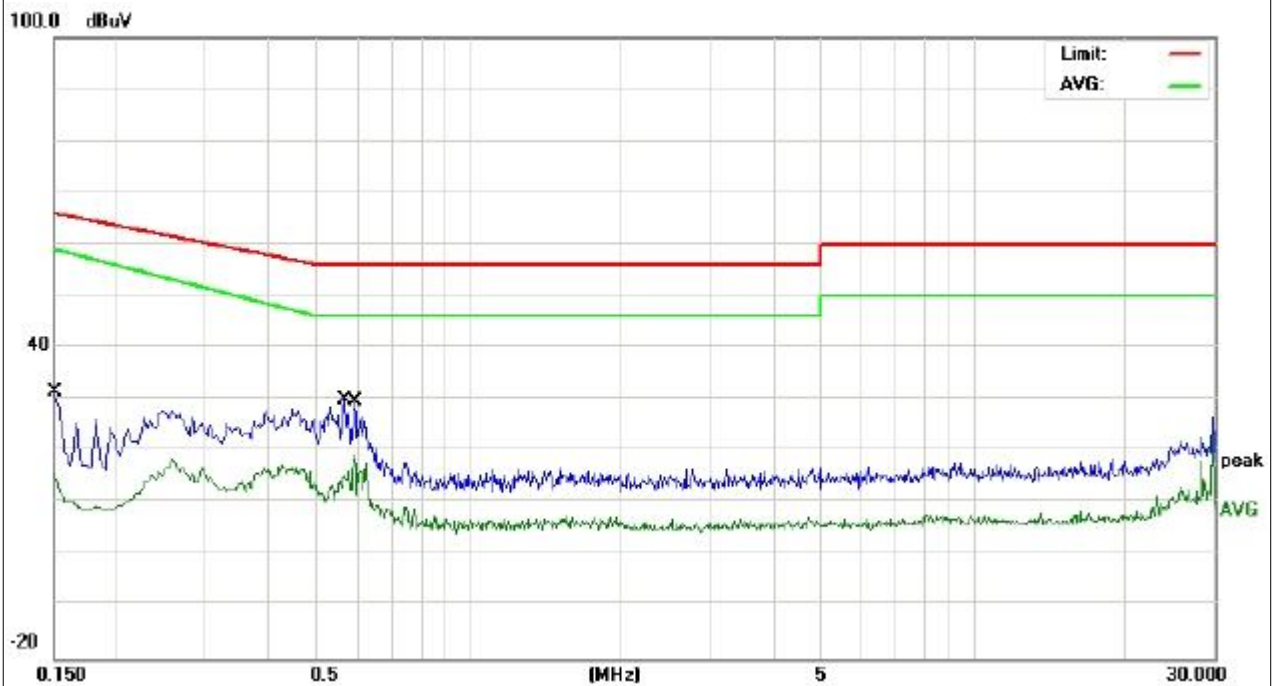


EUT:	SUBMERSIBLE PUMP	Model Name. :	DVX 25
Temperature:	24 °C	Relative Humidity:	56%
Pressure:	1010hPa	Test Date :	2015-06-24
Test Mode:	Running	Phase :	N
Test Voltage :	AC 220V/50Hz		

Freq. (MHz)	Reading (dBuV)	Factor (dBuV)	Measurement (dBuV)	Limit (dBuV)	Over (dB)	Detector
0.1500	20.04	11.49	31.53	65.99	-34.46	QP
0.1500	4.49	11.49	15.98	58.99	-43.01	AVG
0.5660	19.64	10.41	30.05	56.00	-25.95	QP
0.5899	8.77	10.41	19.18	46.00	-26.82	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.
3. N/A means All Data have pass Limit.



3.2 RADIATED EMISSION MEASUREMENT

3.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

(Below 1000MHz)

FREQUENCY (MHz)	At 10m	At 3m
	dBuV/m	dBuV/m
30 – 230	30	40
230 – 1000	37	47

3.2.2 LIMITS OF DISTURBANCE POWER MEASUREMENT

(Below 1000MHz)

	Household and similar appliances		Tools					
Frequency Range			Rated motor power not exceeding 700 W		Rated motor power above 700 W and not exceeding 1 000 W		Rated motor power above 1 000 W	
(MHz)	dB(pW) Quasi-peak	dB (pW) Averag*	dB (pW) Quasi-peak	dB (pW) Averag*	dB (pW) Quasi-peak	dB (pW) Averag*	dB (pW) Quasi-peak	dB (pW) Average *
30-300	44-55	35-45	44-55	35-45	49-59	39-49	55-65	45-55

* If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.

Notes:

- (1) The limit for radiated test was performed according to as following: CISPR 14.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

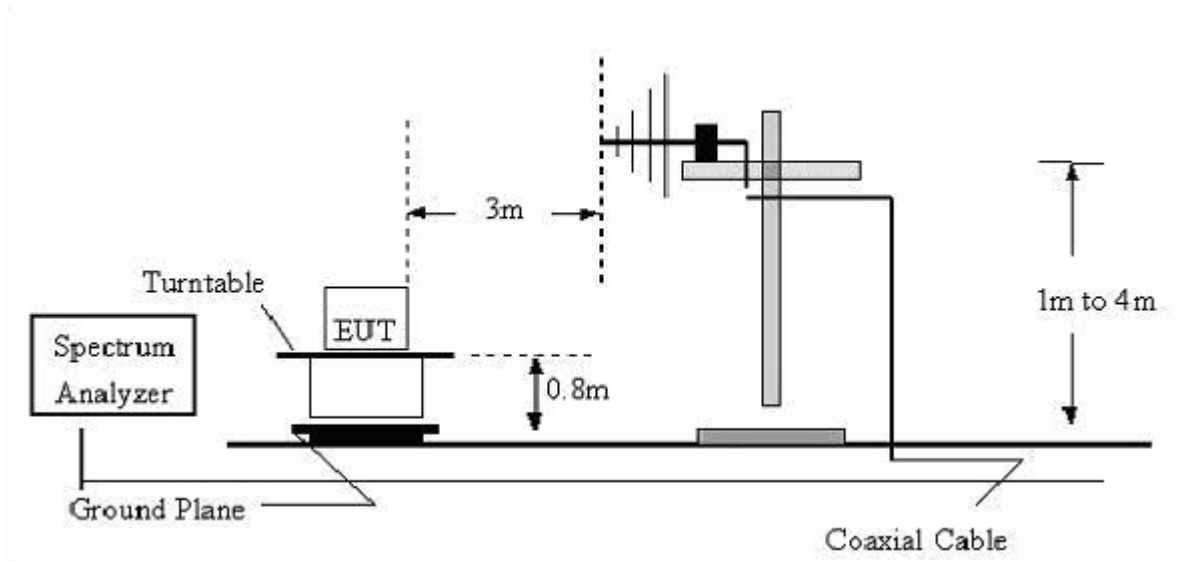
3.2.3 TEST PROCEDURE

- a. The measuring distance of at 10 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured, above 1G Average detector mode will be instead.

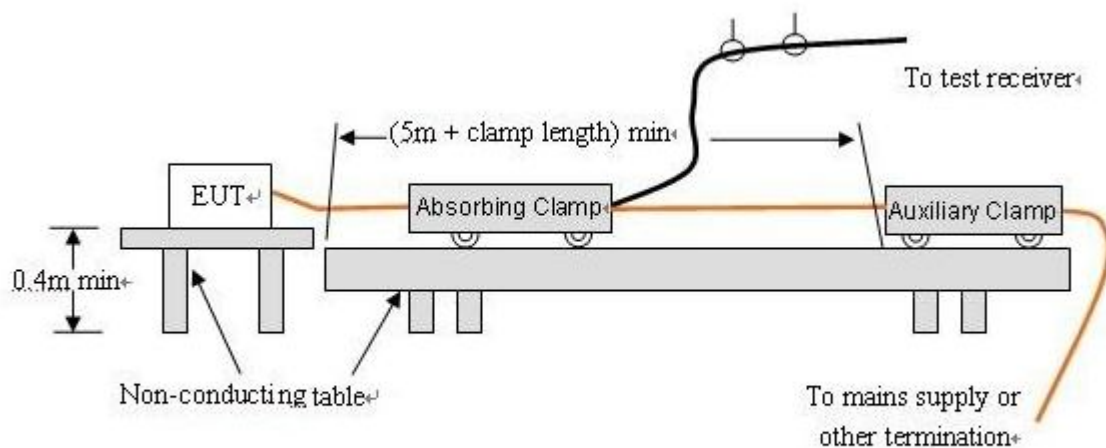
- e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP(AV) Limits and then no additional QP Mode measurement performed.
- f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.2.4 TEST SETUP

(A) Radiated Emission Test Set-Up Frequency Below 1 GHz.



(B) Disturbance Power Test Set-UP Frequency Below 1GHz



3.2.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **2.3** Unless otherwise a special operating condition is specified in the follows during the testing.

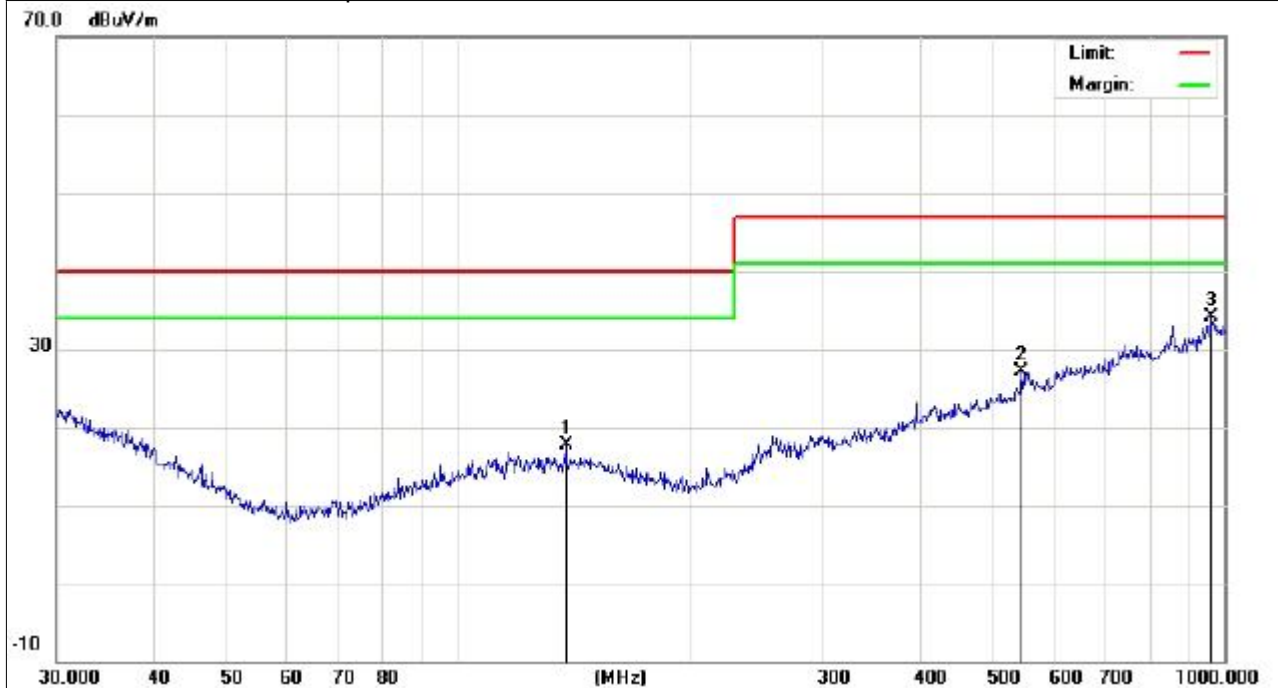
3.2.6 TEST RESULTS(30MHz-1000MHz)

EUT:	SUBMERSIBLE PUMP	Model Name. :	DVX 25
Temperature:	24 °C	Relative Humidity:	56%
Pressure:	1010hPa	Test Date :	2015-06-24
Test Mode:	Running	Polarization :	Horizontal
Test Power:	AC 220V/50Hz		

Freq. (MHz)	Reading (dBuV)	Factor (dBuV)	Measurement (dBuV)	Limit (dBuV)	Over (dB)	Detector
138.3873	5.71	11.95	17.66	40.00	-22.34	QP
543.2742	6.23	20.95	27.18	47.00	-19.82	QP
962.1623	6.31	27.71	34.02	47.00	-12.98	QP

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Antenna Factor + Cable Loss.
3. N/A means All Data have pass Limit.

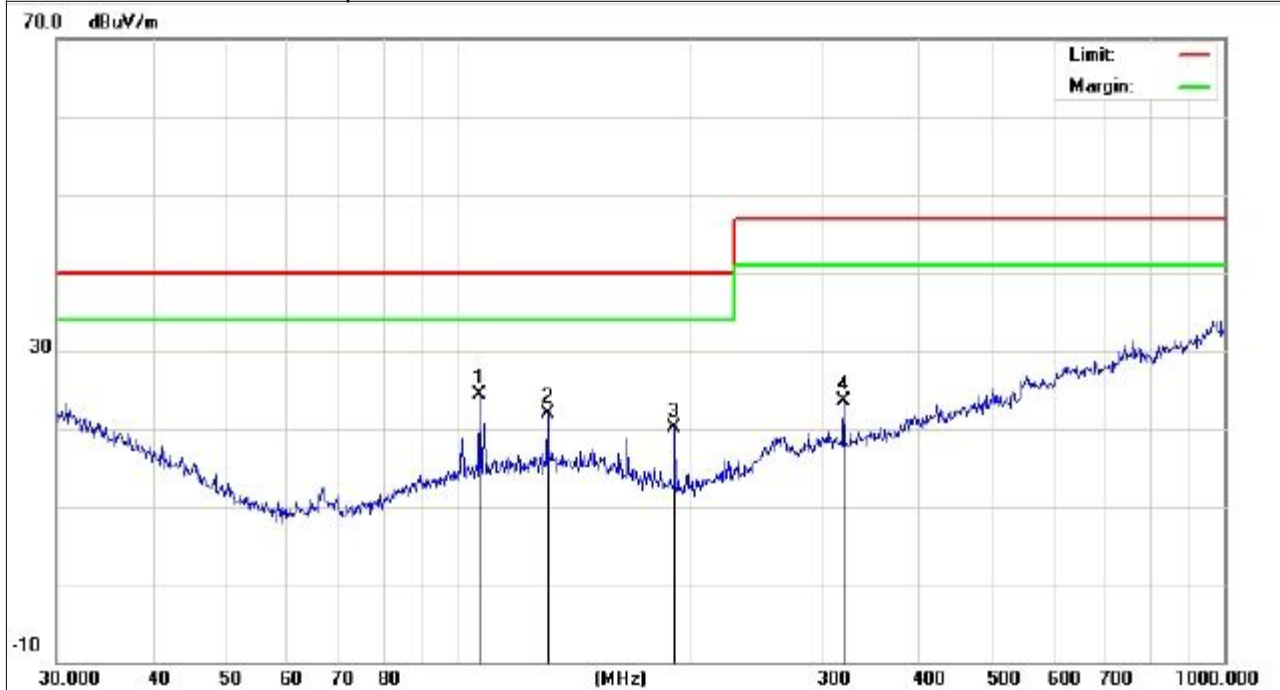


EUT:	SUBMERSIBLE PUMP	Model Name. :	DVX 25
Temperature:	24 °C	Relative Humidity:	56%
Pressure:	1010hPa	Test Date :	2015-06-24
Test Mode:	Running	Polarization :	Vertical
Test Power:	AC 220V/50Hz		

Freq. (MHz)	Reading (dBuV)	Factor (dBuV)	Measurement (dBuV)	Limit (dBuV)	Over (dB)	Detector
106.7587	13.23	11.10	24.33	40.00	-15.67	QP
130.8369	9.89	11.92	21.81	40.00	-18.19	QP
191.7450	11.34	8.72	20.06	40.00	-19.94	QP
318.8170	8.86	14.71	23.57	47.00	-23.43	QP

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Antenna Factor + Cable Loss.
3. N/A means All Data have pass Limit.



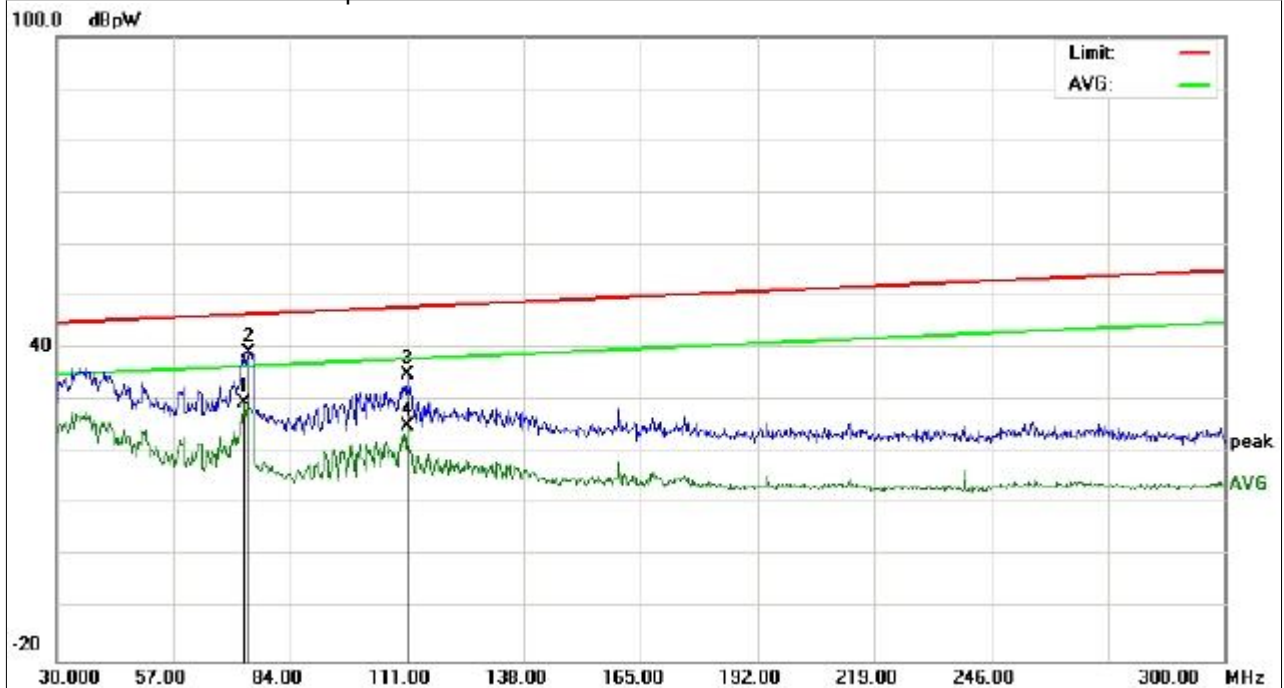
3.2.7 TEST RESULTS(30MHz ~300MHz)

EUT:	SUBMERSIBLE PUMP	Model Name. :	DVX 25
Temperature:	24 °C	Relative Humidity:	56%
Pressure:	1010hPa	Test Date :	2015-06-24
Test Mode:	AC Line		
Test Power:	AC220V/50Hz		

Freq. (MHz)	Reading (dBuV)	Factor (dBuV)	Measurement (dBuV)	Limit (dBuV)	Over (dB)	Detector
73.3598	4.65	24.92	29.57	36.61	-7.04	AVG
74.7198	14.54	24.76	39.30	46.66	-7.36	QP
111.2000	11.72	23.28	35.00	48.01	-13.01	QP
111.2000	1.92	23.28	25.20	38.01	-12.81	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Antenna Factor + Cable Loss - Amplifier.
3. N/A means All Data have pass Limit.



3.3 HARMONICS CURRENT

3.3.1 LIMITS OF HARMONICS CURRENT

IEC 555-2					
Table - I			Table - II		
Equipment Category	Harmonic Order n	Max. Permissible Harmonic Current (in Amperes)	Equipment Category	Harmonic Order n	Max. Permissible Harmonic Current (in Amperes)
Non Portable Tools or TV Receivers	Odd Harmonics		TV Receivers	Odd Harmonics	
	3	2.30		3	0.80
	5	1.14		5	0.60
	7	0.77		7	0.45
	9	0.40		9	0.30
	11	0.33		11	0.17
	13	0.21		13	0.12
	15≤n≤39	0.15 · 15/n		15≤n≤39	0.10 · 15/n
	Even Harmonics			Even Harmonics	
	2	1.08		2	0.30
	4	0.43		4	0.15
	8	0.30			
8≤n≤40	0.23 · 8/n		DC	0.05	

EN 61000-3-2/IEC 61000-3-2					
Equipment Category	Max. Permissible Harmonic Current (in Amperes)	Equipment Category	Harmonic Order n	Max. Permissible Harmonic Current (in A) (mA/w)	
Class A	Same as Limits Specified in 4-2.1, Table - I, but only odd harmonics required	Class D	3	2.30	3.4
			5	1.14	1.9
			7	0.77	1.0
			9	0.40	0.5
			11	0.33	0.35
			$13 \leq n \leq 39$	see Table I	$3.85/n$
			only odd harmonics required		

3.3.1.1 TEST PROCEDURE

a. The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the maximum harmonic components under normal operating conditions.

b. The classification of EUT is according to section 5 of EN 61000-3-2. The EUT is classified as follows:

Class A: Balanced three-phase equipment, Household appliances excluding equipment as Class D, Tools excluding portable tools, Dimmers for incandescent lamps, audio equipment, equipment not specified in one of the three other classes.

Class B: Portable tools. Portable tools.; Arc welding equipment which is not professional equipment.

Class C: Lighting equipment.

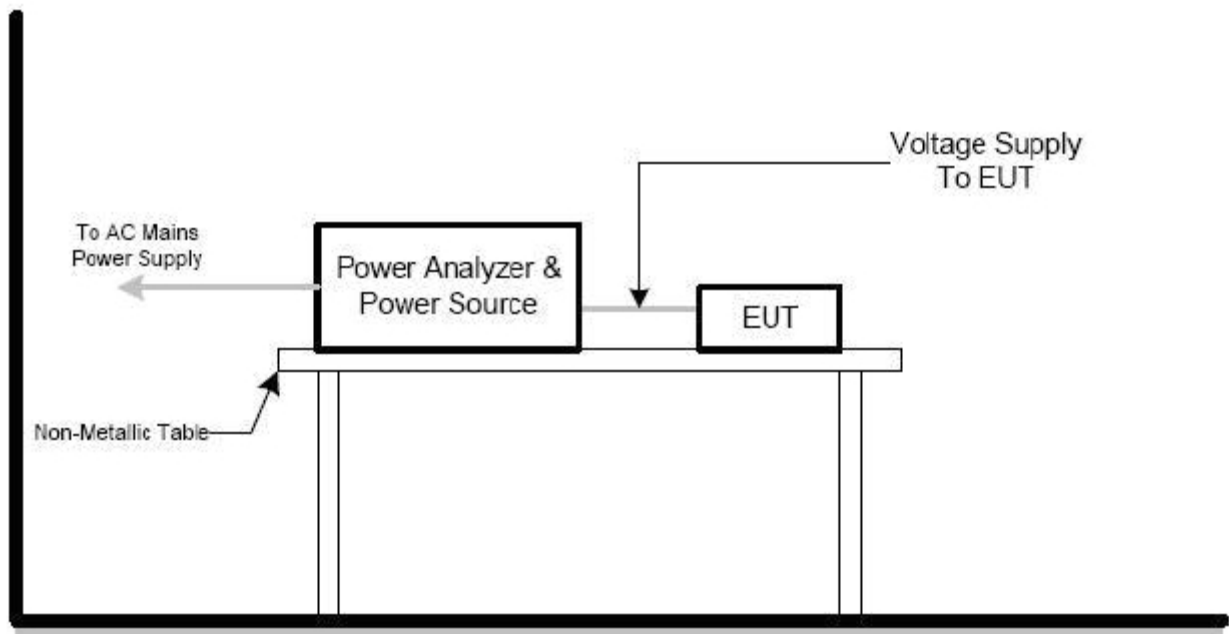
Class D: Equipment having a specified power less than or equal to 600 W of the following types: Personal computers and personal computer monitors and television receivers.

c. The correspondent test program of test instrument to measure the current harmonics emanated from EUT is chosen. The measure time shall be not less than the time necessary for the EUT to be exercised.

3.3.1.2 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **2.3** Unless otherwise a special operating condition is specified in the follows during the testing.

3.3.1.3 TEST SETUP



3.3.2 TEST RESULTS

EUT:	SUBMERSIBLE PUMP	Model Name. :	DVX 25
Temperature:	24 °C	Relative Humidity:	56%
Pressure:	1010hPa	Test Date :	2015-06-24
Test Mode:	Running		
Test Power:	AC 220V/50Hz		

E. U. T. Res ul t

Harmonic(s) > 200%:	
Order (n):	None
Harmonic(s) with average > 90%:	
Order (n):	None
Harmonic(s) between 150% and 200% during more than 10% of the test time or max. 10min:	
Order (n):	None

Po we r So u r c e Re su l t

First dataset out of limit:	
DS (time):	None
Harmonic(s) out of limit:	
Order (n):	None

Average harmonic current results

Hn	I _{eff} [A]	I _{eff} [%]	Limit [A]	Result
1	25.804E-3	100.000		
2	1.055E-3	4.089	972.00E-3	PASS
3	25.376E-3	98.341	2.07	PASS
4	4.736E-3	18.355	387.00E-3	PASS
5	23.472E-3	90.962	1.03	PASS
6	1.076E-3	4.172	270.00E-3	PASS
7	20.705E-3	80.239	693.00E-3	PASS
8	1.753E-3	6.793	207.00E-3	PASS
9	17.568E-3	68.080	360.00E-3	PASS
10	1.658E-3	6.425	165.60E-3	PASS
11	14.118E-3	54.712	297.00E-3	PASS
12	917.710E-6	3.556	138.00E-3	PASS
13	10.874E-3	42.141	189.00E-3	PASS
14	886.436E-6	3.435	118.29E-3	PASS
15	7.842E-3	30.389	135.00E-3	PASS
16	844.380E-6	3.272	103.50E-3	PASS
17	5.610E-3	21.742	119.11E-3	PASS
18	1.331E-3	5.158	92.00E-3	PASS
19	4.332E-3	16.790	106.58E-3	PASS
20	785.047E-6	3.042	82.80E-3	PASS
21	3.892E-3	15.083	96.43E-3	PASS
22	1.349E-3	5.228	75.28E-3	PASS
23	3.815E-3	14.785	88.05E-3	PASS
24	705.276E-6	2.733	68.99E-3	PASS
25	3.665E-3	14.203	81.00E-3	PASS
26	1.164E-3	4.510	63.69E-3	PASS
27	3.343E-3	12.954	75.00E-3	PASS
28	687.583E-6	2.665	59.14E-3	PASS
29	2.763E-3	10.706	69.83E-3	PASS
30	725.358E-6	2.811	55.20E-3	PASS
31	2.427E-3	9.405	65.32E-3	PASS
32	739.522E-6	2.866	51.75E-3	PASS
33	1.755E-3	6.800	61.36E-3	PASS
34	691.836E-6	2.681	48.71E-3	PASS
35	1.863E-3	7.219	57.86E-3	PASS
36	697.284E-6	2.702	46.00E-3	PASS
37	1.543E-3	5.980	54.73E-3	PASS
38	631.023E-6	2.445	43.58E-3	PASS
39	1.558E-3	6.036	51.92E-3	PASS
40	1.042E-3	4.038	41.40E-3	PASS

Maximum harmonic current results

Hn	leff [A]	leff [%]	Limit [A]	Result
1	26.062E-3	100.000		
2	1.328E-3	5.097	2.16	PASS
3	25.598E-3	98.218	4.60	PASS
4	4.965E-3	19.052	860.00E-3	PASS
5	23.679E-3	90.855	2.28	PASS
6	1.320E-3	5.064	600.00E-3	PASS
7	20.842E-3	79.971	1.54	PASS
8	1.940E-3	7.444	460.00E-3	PASS
9	17.684E-3	67.853	800.00E-3	PASS
10	1.870E-3	7.176	368.00E-3	PASS
11	14.240E-3	54.641	660.00E-3	PASS
12	1.068E-3	4.096	306.66E-3	PASS
13	10.959E-3	42.048	420.00E-3	PASS
14	1.013E-3	3.885	262.86E-3	PASS
15	7.922E-3	30.397	300.00E-3	PASS
16	976.317E-6	3.746	230.00E-3	PASS
17	5.696E-3	21.856	264.70E-3	PASS
18	1.463E-3	5.614	204.44E-3	PASS
19	4.409E-3	16.916	236.84E-3	PASS
20	893.016E-6	3.426	184.00E-3	PASS
21	4.055E-3	15.559	214.28E-3	PASS
22	1.485E-3	5.698	167.28E-3	PASS
23	3.947E-3	15.146	195.66E-3	PASS
24	806.237E-6	3.094	153.32E-3	PASS
25	3.739E-3	14.347	180.00E-3	PASS
26	1.310E-3	5.027	141.54E-3	PASS
27	3.450E-3	13.237	166.66E-3	PASS
28	770.540E-6	2.957	131.42E-3	PASS
29	2.854E-3	10.951	155.18E-3	PASS
30	811.237E-6	3.113	122.66E-3	PASS
31	2.564E-3	9.836	145.16E-3	PASS
32	840.728E-6	3.226	115.00E-3	PASS
33	1.835E-3	7.040	136.36E-3	PASS
34	770.515E-6	2.956	108.24E-3	PASS
35	1.966E-3	7.543	128.58E-3	PASS
36	796.904E-6	3.058	102.22E-3	PASS
37	1.614E-3	6.192	121.62E-3	PASS
38	714.244E-6	2.741	96.84E-3	PASS
39	1.647E-3	6.318	115.38E-3	PASS
40	1.135E-3	4.355	92.00E-3	PASS

Maximum harmonic voltage results

Hn	Ueff [V]	Ueff [%]	Limit [%]	Result
1	221.41	100.641		
2	74.66E-3	0.032	0.2	PASS
3	113.01E-3	0.049	0.9	PASS
4	18.80E-3	0.008	0.2	PASS
5	35.13E-3	0.015	0.4	PASS
6	12.18E-3	0.005	0.2	PASS
7	31.28E-3	0.014	0.3	PASS
8	10.98E-3	0.005	0.2	PASS
9	33.51E-3	0.015	0.2	PASS
10	10.86E-3	0.005	0.2	PASS
11	41.80E-3	0.018	0.1	PASS
12	11.75E-3	0.005	0.1	PASS
13	29.03E-3	0.013	0.1	PASS
14	8.08E-3	0.004	0.1	PASS
15	28.48E-3	0.012	0.1	PASS
16	10.41E-3	0.005	0.1	PASS
17	20.20E-3	0.009	0.1	PASS
18	9.57E-3	0.004	0.1	PASS
19	39.86E-3	0.017	0.1	PASS
20	9.99E-3	0.004	0.1	PASS
21	30.24E-3	0.013	0.1	PASS
22	11.98E-3	0.005	0.1	PASS
23	28.59E-3	0.012	0.1	PASS
24	10.64E-3	0.005	0.1	PASS
25	12.16E-3	0.005	0.1	PASS
26	12.47E-3	0.005	0.1	PASS
27	29.55E-3	0.013	0.1	PASS
28	9.99E-3	0.004	0.1	PASS
29	31.66E-3	0.014	0.1	PASS
30	11.23E-3	0.005	0.1	PASS
31	23.50E-3	0.010	0.1	PASS
32	8.09E-3	0.004	0.1	PASS
33	11.48E-3	0.005	0.1	PASS
34	9.76E-3	0.004	0.1	PASS
35	24.81E-3	0.011	0.1	PASS
36	8.03E-3	0.003	0.1	PASS
37	21.20E-3	0.009	0.1	PASS
38	11.20E-3	0.005	0.1	PASS
39	29.07E-3	0.013	0.1	PASS
40	11.32E-3	0.005	0.1	PASS

Harmonic current results - DS: 15

Hn	I _{eff} [A]	I _{eff} [%]	Limit [A]	Result
1	25.987E-3	100.000		
2	956.289E-6	3.680	1.08	PASS
3	25.321E-3	97.439	2.30	PASS
4	4.711E-3	18.129	430.00E-3	PASS
5	23.634E-3	90.945	1.14	PASS
6	1.053E-3	4.052	300.00E-3	PASS
7	20.794E-3	80.017	770.00E-3	PASS
8	1.699E-3	6.538	230.00E-3	PASS
9	17.624E-3	67.819	400.00E-3	PASS
10	1.603E-3	6.170	184.00E-3	PASS
11	14.097E-3	54.245	330.00E-3	PASS
12	881.729E-6	3.393	153.33E-3	PASS
13	10.865E-3	41.811	210.00E-3	PASS
14	842.426E-6	3.242	131.43E-3	PASS
15	7.887E-3	30.350	150.00E-3	PASS
16	803.349E-6	3.091	115.00E-3	PASS
17	5.668E-3	21.810	132.35E-3	PASS
18	1.347E-3	5.182	102.22E-3	PASS
19	4.282E-3	16.477	118.42E-3	PASS
20	756.954E-6	2.913	92.00E-3	PASS
21	3.875E-3	14.913	107.14E-3	PASS
22	1.300E-3	5.004	83.64E-3	PASS
23	3.837E-3	14.764	97.83E-3	PASS
24	662.428E-6	2.549	76.66E-3	PASS
25	3.670E-3	14.123	90.00E-3	PASS
26	1.034E-3	3.978	70.77E-3	PASS
27	3.313E-3	12.749	83.33E-3	PASS
28	654.024E-6	2.517	65.71E-3	PASS
29	2.735E-3	10.524	77.59E-3	PASS
30	669.093E-6	2.575	61.33E-3	PASS
31	2.495E-3	9.601	72.58E-3	PASS
32	709.400E-6	2.730	57.50E-3	PASS
33	1.779E-3	6.847	68.18E-3	PASS
34	692.903E-6	2.666	54.12E-3	PASS
35	1.801E-3	6.930	64.29E-3	PASS
36	660.232E-6	2.541	51.11E-3	PASS
37	1.535E-3	5.906	60.81E-3	PASS
38	604.576E-6	2.326	48.42E-3	PASS
39	1.533E-3	5.898	57.69E-3	PASS
40	1.079E-3	4.152	46.00E-3	PASS

Caution: Results related to the 100% limit values

Harmonic voltage results - DS: 15

Hn	Ueff [V]	Ueff [%]	Limit [%]	Result
1	221.41	100.641		
2	55.78E-3	0.024	0.2	PASS
3	109.61E-3	0.048	0.9	PASS
4	14.07E-3	0.006	0.2	PASS
5	24.77E-3	0.011	0.4	PASS
6	5.37E-3	0.002	0.2	PASS
7	28.87E-3	0.013	0.3	PASS
8	6.35E-3	0.003	0.2	PASS
9	13.59E-3	0.006	0.2	PASS
10	3.01E-3	0.001	0.2	PASS
11	35.23E-3	0.015	0.1	PASS
12	8.30E-3	0.004	0.1	PASS
13	22.30E-3	0.010	0.1	PASS
14	6.62E-3	0.003	0.1	PASS
15	22.96E-3	0.010	0.1	PASS
16	4.20E-3	0.002	0.1	PASS
17	13.77E-3	0.006	0.1	PASS
18	2.04E-3	0.001	0.1	PASS
19	35.55E-3	0.015	0.1	PASS
20	4.09E-3	0.002	0.1	PASS
21	24.53E-3	0.011	0.1	PASS
22	6.30E-3	0.003	0.1	PASS
23	22.62E-3	0.010	0.1	PASS
24	7.03E-3	0.003	0.1	PASS
25	6.39E-3	0.003	0.1	PASS
26	4.66E-3	0.002	0.1	PASS
27	20.80E-3	0.009	0.1	PASS
28	4.00E-3	0.002	0.1	PASS
29	23.81E-3	0.010	0.1	PASS
30	5.98E-3	0.003	0.1	PASS
31	19.93E-3	0.009	0.1	PASS
32	3.37E-3	0.001	0.1	PASS
33	3.20E-3	0.001	0.1	PASS
34	2.40E-3	0.001	0.1	PASS
35	12.40E-3	0.005	0.1	PASS
36	5.10E-3	0.002	0.1	PASS
37	16.18E-3	0.007	0.1	PASS
38	3.97E-3	0.002	0.1	PASS
39	22.66E-3	0.010	0.1	PASS
40	3.40E-3	0.001	0.1	PASS

Power and THD results - DS: 15

True power P:	177.6W	Apparent power S:	183.6VA
Reactiv power Q:	221.41var	Power factor:	0.9754
THD (U):	0.001	THD (I):	1.903
Crest Factor (U):	1.414	Crest Factor (I):	3.932

3.4 VOLTAGE FLUCTUATION AND FLICKERS

3.4.1 LIMITS OF VOLTAGE FLUCTUATION AND FLICKERS

Tests	Limits		Descriptions
	IEC555-3	IEC/EN 61000-3-3	
Pst	≤ 1.0 , Tp= 10 min.	≤ 1.0 , Tp= 10 min.	Short Term Flicker Indicator
Plt	N/A	≤ 0.65 , Tp=2 hr.	Long Term Flicker Indicator
dc	$\leq 3\%$	$\leq 3.3\%$	Relative Steady-State V-Chang
dmax	$\leq 4\%$	$\leq 4\%$	Maximum Relative V-change
d (t)	N/A	$\leq 3.3\%$ for > 500 ms	Relative V-change characteristic

3.4.1.1 TEST PROCEDURE

a. Harmonic Current Test:

Test was performed according to the procedures specified in Clause 5.0 of IEC555-2 and/or Sub-clause 6.2 of IEC/EN 61000-3-2 depend on which standard adopted for compliance measurement.

b. Fluctuation and Flickers Test:

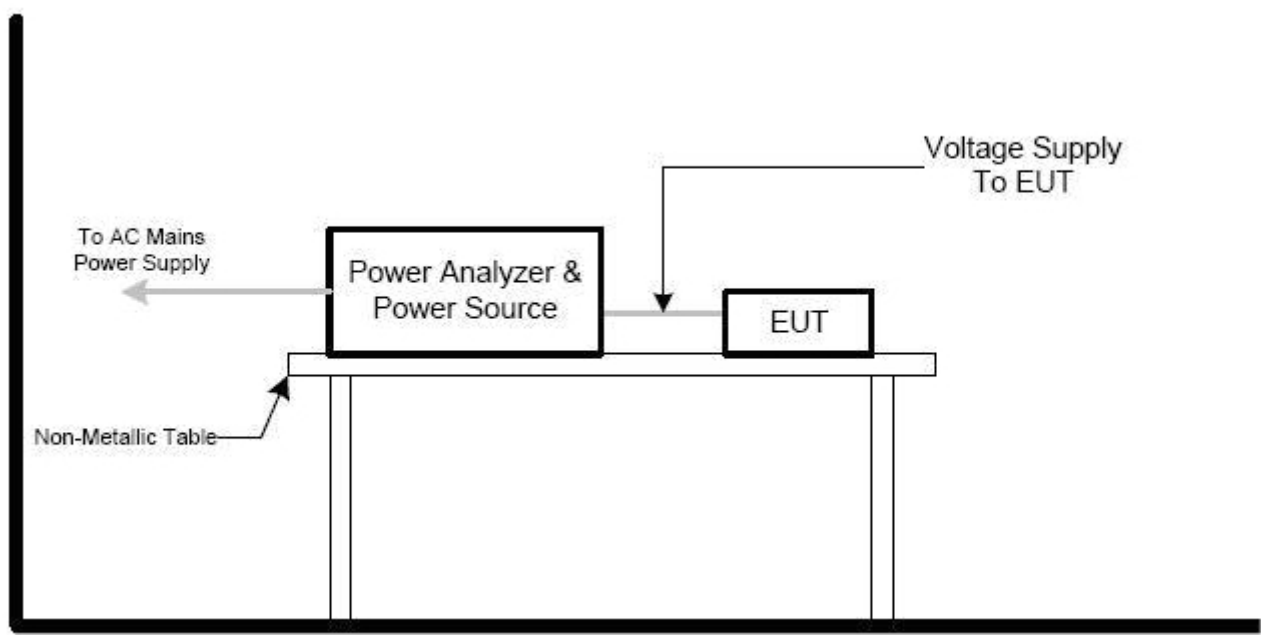
Tests was performed according to the Test Conditions/Assessment of Voltage Fluctuations specified in Clause 5.0/6.0 of IEC555-3 and/or Clause 6.0/4.0 of IEC/EN 61000-3-3 depend on which standard adopted for compliance measurement.

c. All types of harmonic current and/or voltage fluctuation in this report are assessed by direct measurement using flicker-meter.

3.4.1.2 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **2.3** Unless otherwise a special operating condition is specified in the follows during the testing.

3.4.1.3 TEST SETUP



3.4.2 TEST RESULTS

EUT:	SUBMERSIBLE PUMP	Model Name. :	DVX 25
Temperature:	24 °C	Relative Humidity:	56%
Pressure:	1010hPa	Test Date :	2015-06-24
Test Mode:	Running		
Test Power:	AC 220V/50Hz		

M a x i m u m F l i c k e r r e s u l t s

	EUT values	Limit	Result
Pst	0.089	1.00	PASS
Plt	0.035	0.65	PASS
dc [%]	0.012	3.30	PASS
dmax [%]	0.180	4.00	PASS
dt [s]	0.000	0.50	PASS

4. EMC IMMUNITY TEST

4.1 STANDARD COMPLIANCE/ SERVIRITY LEVEL/ CRITERIA

Tests Standard No.	TEST SPECIFICATION	Test Mode Test Ports	Perform. Criteria
1. ESD IEC/EN 61000-4-2	8KV air discharge 4KV contact discharge	Direct Mode	B
	4KV HCP discharge 4KV VCP discharge	Indirect Mode	B
2. RS IEC/EN 61000-4-3	80 MHz to 1000 MHz, 1000Hz, 80%, AM modulated	Enclosure	A
3. EFT/Burst IEC/EN 61000-4-4	5/50ns Tr/Th 5KHz Repetition Freq.	Power Supply Port	B
	5/50ns Tr/Th 5KHz Repetition Freq.	CTL/Signal Data Line Port	B
4. Surges IEC/EN 61000-4-5	1.2/50(8/20) Tr/Th us	L-N	B
	1.2/50(8/20) Tr/Th us	L-PE N-PE	B
5 Injected Current IEC/EN 61000-4-6	0.15 MHz to 80 MHz, 1000Hz 80 % , AM Modulated 150 Ω source impedance	CTL/Signal Port	A
	0.15 MHz to 80 MHz, 1000Hz 80 % , AM Modulated 150 Ω source impedance	AC Power Port	A
	0.15 MHz to 80 MHz, 1000Hz 80 % , AM Modulated 150 Ω source impedance	DC Power Port	A
6. Power Frequency Magnetic Field IEC/EN 61000-4-8	50 Hz,	Enclosure	A
7. Volt. Interruptions Volt. Dips IEC/EN 61000-4-11	Voltage dip 0%	AC Power Port	C
	Voltage dip 30%		C
	Voltage dip 60%		C

4.2 GENERAL PERFORMANCE CRITERIA

According to **EN 55014-2** standard, the general performance criteria as following:

Criterion A	<p>The equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the equipment is used as intended.</p> <p>The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.</p>
Criterion B	<p>After the test, the equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the equipment is used as intended.</p> <p>The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is allowed. However, no change of operating state or stored data is allowed to persist after the test.</p>
Criterion C	<p>Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions.</p> <p>Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.</p>

4.3 GENERAL PERFORMANCE CRITERIA TEST SETUP

The EUT tested system was configured as the statements of **2.3** Unless otherwise a special operating condition is specified in the follows during the testing.

4.4 ESD TESTING

4.4.1 TEST SPECIFICATION

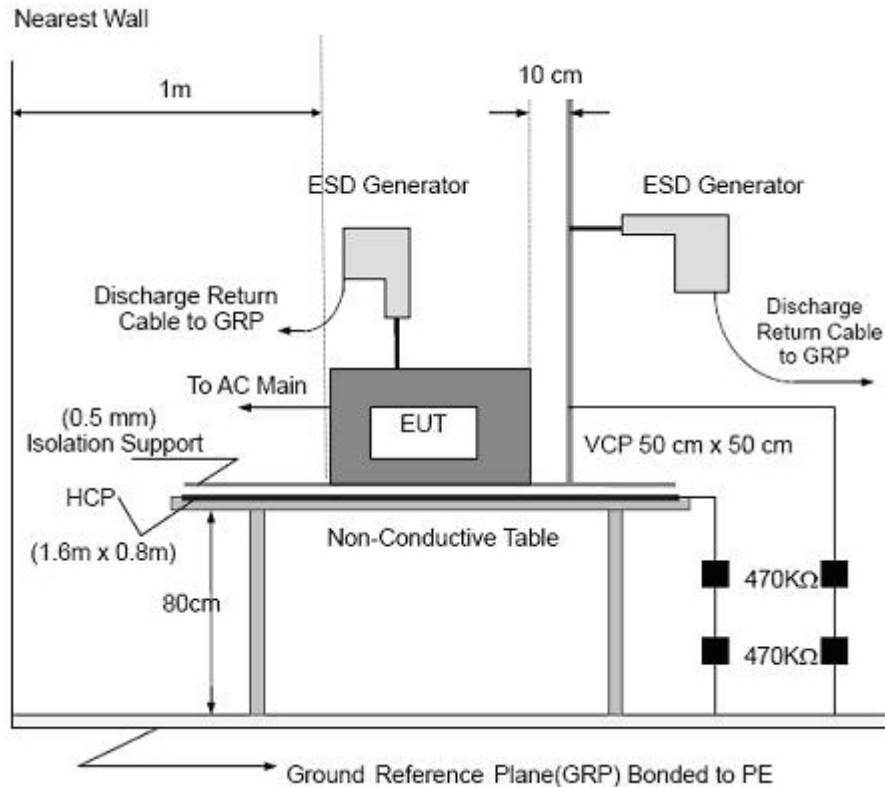
Basic Standard:	IEC/EN 61000-4-2
Discharge Impedance:	330 ohm / 150 pF
Required Performance	B
Discharge Voltage:	Air Discharge: 2kV/4kV/8kV (Direct) Contact Discharge: 2kV/4kV (Direct/Indirect)
Polarity:	Positive & Negative
Number of Discharge:	Air Discharge: min. 20 times at each test point Contact Discharge: min. 20 at each test point
Discharge Mode:	Single Discharge
Discharge Period:	1 second minimum

4.4.2 TEST PROCEDURE

The test generator necessary to perform direct and indirect application of discharges to the EUT in the following manner:

- a. Contact discharge was applied to conductive surfaces and coupling planes of the EUT.
During the test, it was performed with single discharges. For the single discharge time between successive single discharges was at least 1 second. The EUT shall be exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points. One of the test points shall be subjected to at least 50 indirect discharges to the center of the front edge of the horizontal coupling plane. The remaining three test points shall each receive at least 50 direct contact discharges.
If no direct contact test points are available, then at least 200 indirect discharges shall be applied in the indirect mode. Test shall be performed at a maximum repetition rate of one discharge per second.
Vertical Coupling Plane (VCP):
The coupling plane, of dimensions 0.5m x 0.5m, is placed parallel to, and positioned at a distance 0.1m from, the EUT, with the Discharge Electrode touching the coupling plane.
The four faces of the EUT will be performed with electrostatic discharge.
Horizontal Coupling Plane (HCP):
The coupling plane is placed under to the EUT. The generator shall be positioned vertically at a distance of 0.1m from the EUT, with the Discharge Electrode touching the coupling plane.
The four faces of the EUT will be performed with electrostatic discharge.
- b. Air discharges at insulation surfaces of the EUT.
It was at least ten single discharges with positive and negative at the same selected point.

4.4.3 TEST SETUP



Note:

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meters high standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system. A Horizontal Coupling Plane (1.6m x 0.8m) was placed on the table and attached to the GRP by means of a cable with 940k total impedance. The equipment under test, was installed in a representative system as described in section 7 of IEC /EN 61000-4-2, and its cables were placed on the HCP and isolated by an insulating support of 0.5mm thickness. A distance of 1-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

FLOOR-STANDING EQUIPMENT

The equipment under test was installed in a representative system as described in section 7 of IEC/EN 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of 0.1-meter thickness. The GRP consisted of a sheet of aluminum that is at least 0.25mm thick, and 2.5meters square connected to the protective grounding system and extended at least 0.5 meters from the EUT on all sides.

4.4.4 TEST RESULTS

EUT:	SUBMERSIBLE PUMP	Model Name. :	DVX 25
Temperature:	24 °C	Relative Humidity:	56%
Pressure:	1010hPa	Test Date :	2015-06-24
Test Mode:	Running		
Test Power:	AC 220V/50Hz		

Mode	Air Discharge								Contact Discharge								Criterion	Result
Test level (kV)	4		8		10		15		2		4		6		8			
Test Location	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-		
HCP									A	A	A	A					B	PASS
VCP									A	A	A	A						PASS

Note:

- 1) +/- denotes the Positive/Negative polarity of the output voltage.
- 2) Test condition:
Direct / Indirect (HCP/VCP) discharges: Minimum 50 times (Positive/Negative) at each point. Air discharges: Minimum 10 times (Positive/Negative) at each point.
- 3) Test location(s) in which discharge (Air and contact discharge) to be applied illustrated by photos shown in next page(s)
- 4) The Indirect (HCP/VCP) discharges description of test point as following:
1. left side 2.right side 3.front side 4.rear side.
- 5) N/A - denotes test is not applicable in this test report.

4.5 RS TESTING

4.5.1 TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-3
Required Performance	A
Frequency Range:	80 MHz - 1000 MHz
Field Strength:	3 V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Polarity of Antenna:	Horizontal and Vertical
Test Distance:	3m
Antenna Height:	1.5 m
Dwell Time:	at least 3 seconds

4.5.2 TEST PROCEDURE

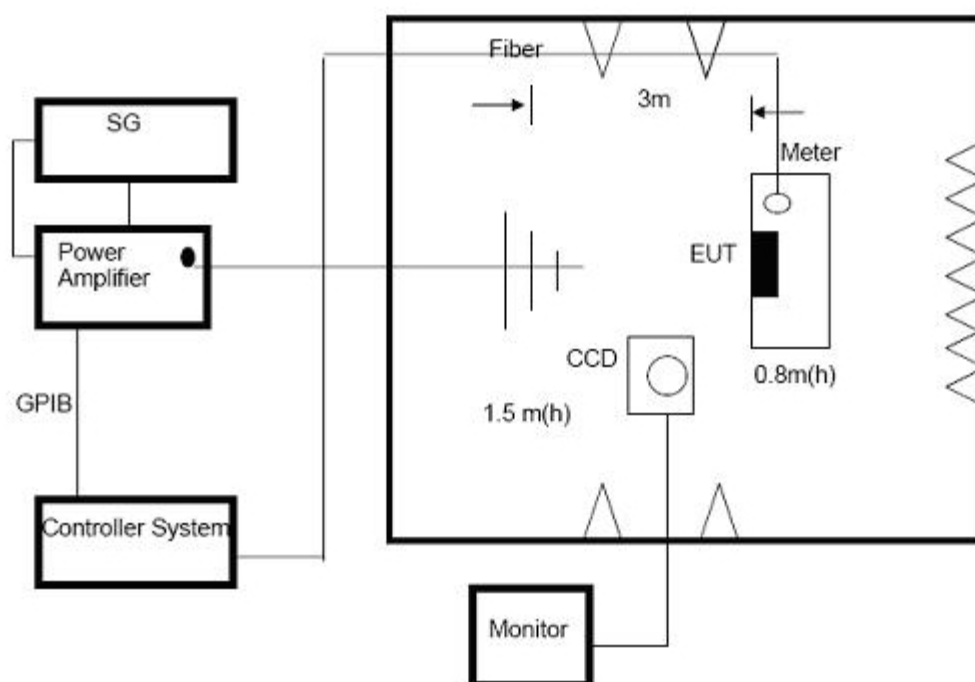
The EUT and support equipment, which are placed on a table that is 0.8 meter above ground and the testing was performed in a fully-anechoic chamber.

The testing distance from antenna to the EUT was 3 meters.

The other condition as following manner:

- a. The frequency range is swept from 80 MHz to 1000 MHz, & 1400MHz - 2700MHz with the signal 80%amplitude modulated with a 1kHz sine wave. The rate of sweep did not exceed 1.5x 10⁻³ decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
- b. Sweep Frequency 900 MHz, with the Duty Cycle: 1/8 and Modulation: Pulse 217 Hz(if applicable)
- c. The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
- d. The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

4.5.3 TEST SETU



Note:

TABLE-TOP EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC/EN 61000-4-3 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

FLOOR-STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC/EN 61000-4-3 was placed on a non-conductive wood support 0.1 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

4.5.4 TEST RESULTS

EUT:	SUBMERSIBLE PUMP	Model Name. :	DVX 25
Temperature:	24 °C	Relative Humidity:	56%
Pressure:	1010hPa	Test Date :	2015-06-24
Test Mode:	Running		
Test Power:	AC 220V/50Hz		

Frequency Range (MHz)	RF Field Position	R.F. Field Strength	Azimuth	Perform. Criteria	Results	Judgment
80MHz - 1000MHz	H/V	3V/m (rms) AM Modulated 1000Hz, 80%	Front	A	A	PASS
			Rear			
			Left			
			Right			

Note:

- 1) N/A - denotes test is not applicable in this test report.
- 2) Criteria A: There was no change operated with initial operating during the test.
- 3) Criteria B: The EUT function loss during the test, but self-recoverable after the test.
- 4) Criteria C: The system shut down during the test.

4.6 EFT/BURST TESTING

4.6.1 TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-4
Required Performance	B
Test Voltage:	Power Line: 1 kV Signal/Control Line: 0.5 KV
Polarity:	Positive & Negative
Impulse Frequency:	5 kHz
Impulse Wave shape :	5/50 ns
Burst Duration:	15 ms
Burst Period:	300 ms
Test Duration:	Not less than 1 min.

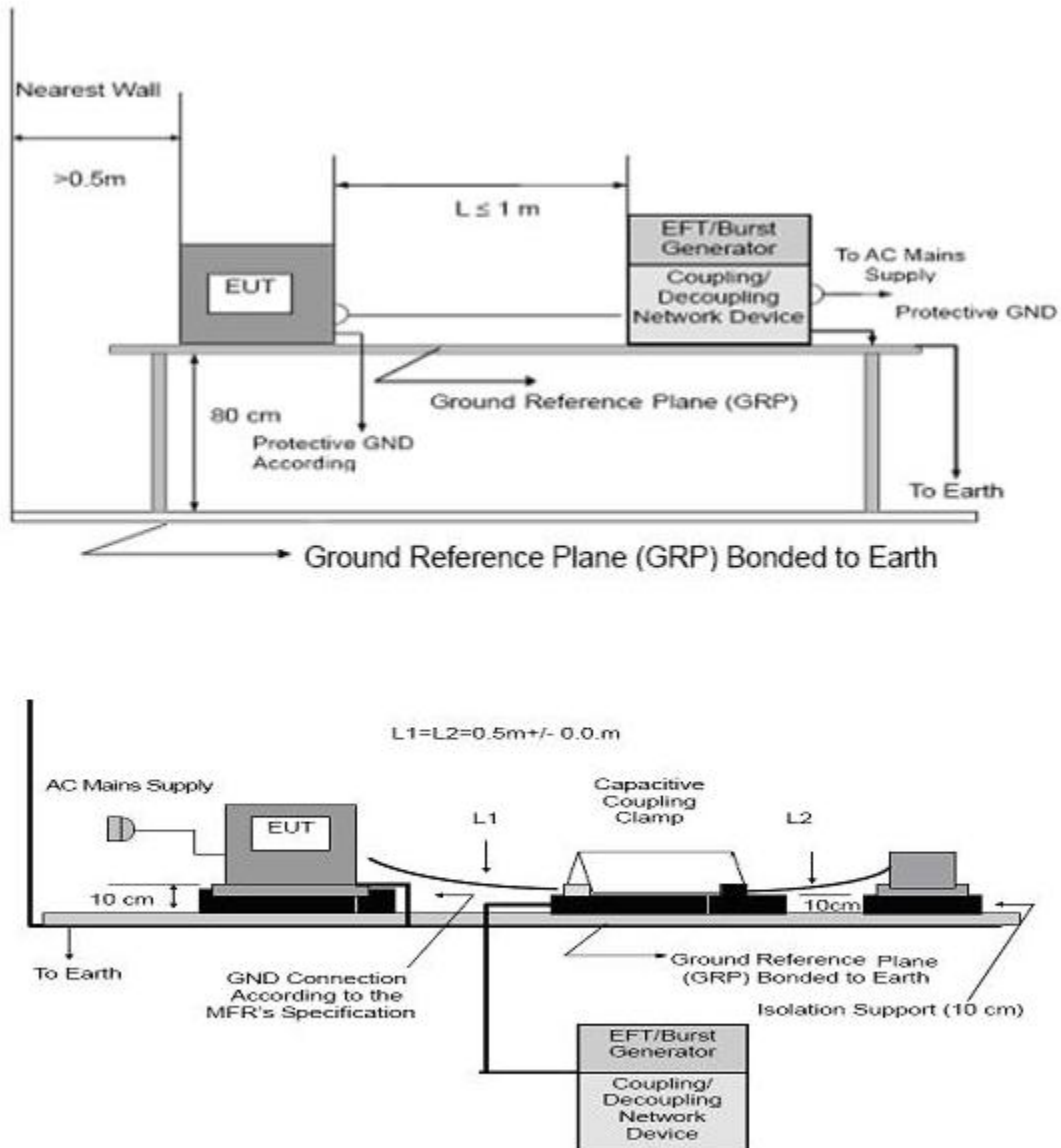
4.6.2 TEST PROCEDURE

The EUT and support equipment, are placed on a table that is 0.8 meter above a metal ground plane measured 1m*1m min. and 0.65mm thick min.

The other condition as following manner:

- a. The length of power cord between the coupling device and the EUT should not exceed 1 meter.
- b. Both positive and negative polarity discharges were applied.
- c. The duration time of each test sequential was 1 minute.

4.6.3 TEST SETUP



Note:

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table (0.8m high) standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system. A minimum distance of 0.5m was provided between the EUT and the walls of the laboratory or any other metallic structure.

FLOOR-STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC/EN 61000-4-4 and its cables, were isolated from the Ground Reference Plane by an insulating support that is 0.1-meter thick. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system.

4.6.4 TEST RESULTS

EUT:	SUBMERSIBLE PUMP	Model Name. :	DVX 25
Temperature:	24 °C	Relative Humidity:	56%
Pressure:	1010hPa	Test Date :	2015-06-24
Test Mode:	Running		
Test Power:	AC 220V/50Hz		

Coupling Line		Test level (kV)								Criterion	Result
		0.5		1		2		4			
		+	-	+	-	+	-	+	-		
AC line	L	A	A	A	A					B	PASS
	N	A	A	A	A						PASS
	PE	A	A	A	A						PASS
	L+N	A	A	A	A						PASS
	L+PE	A	A	A	A						PASS
	N+PE	A	A	A	A						PASS
	L+N+PE	A	A	A	A						PASS
DC Line											
Signal Line											

Note:

- 1) +/- denotes the Positive/Negative polarity of the output voltage.
- 2) N/A - denotes test is not applicable in this test report.
- 3) Criteria A: There was no change operated with initial operating during the test.
- 4) Criteria B: The EUT function loss during the test, but self-recoverable after the test.
- 5) Criteria C: The system shut down during the test.

4.7 SURGE TESTING

4.7.1 TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-5
Required Performance	B
Wave-Shape:	Combination Wave 1.2/50 us Open Circuit Voltage 8 /20 us Short Circuit Current
Test Voltage:	Power Line: 0.5 kV, 1 kV, 2 kV
Surge Input/Output:	L-N, L-PE, N-PE
Generator Source:	2 ohm between networks
Impedance:	12 ohm between network and ground
Polarity:	Positive/Negative
Phase Angle:	0 /90/180/270°
Pulse Repetition Rate:	1 time / min. (maximum)
Number of Tests:	5 positive and 5 negative at selected points

4.7.2 TEST PROCEDURE

a. For EUT power supply:

The surge is to be applied to the EUT power supply terminals via the capacitive coupling network. Decoupling networks are required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines, and to provide sufficient decoupling impedance to the surge wave. The power cord between the EUT and the coupling/decoupling networks shall be 2meters in length (or shorter).

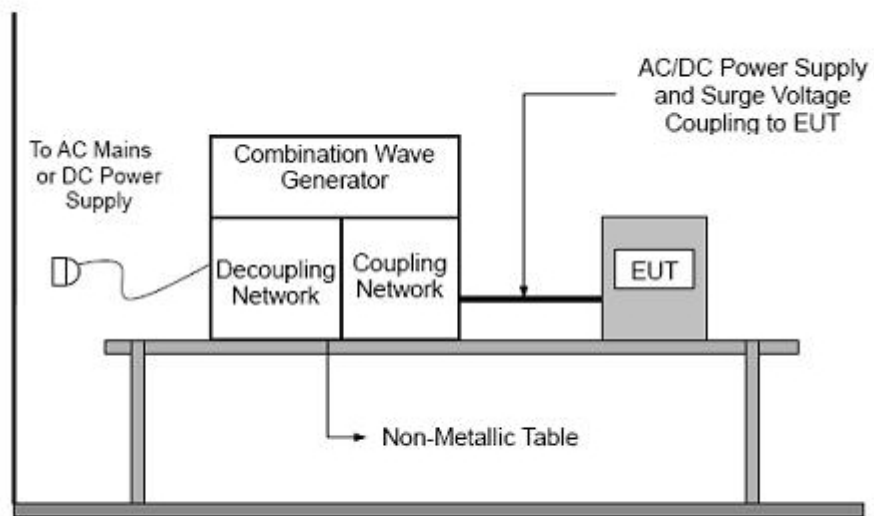
b. For test applied to unshielded unsymmetrically operated interconnection lines of EUT:

The surge is applied to the lines via the capacitive coupling. The coupling /decoupling networks shall not influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

c. For test applied to unshielded symmetrically operated interconnection /telecommunication lines of EUT:

d. The surge is applied to the lines via gas arrestors coupling. Test levels below the ignition point of the coupling arrestor cannot be specified. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

4.7.3 TEST SETUP



4.7.4 TEST RESULTS

EUT:	SUBMERSIBLE PUMP	Model Name. :	DVX 25
Temperature:	24 °C	Relative Humidity:	56%
Pressure:	1010hPa	Test Date :	2015-06-24
Test Mode:	Running		
Test Power:	AC 220V/50Hz		

Coupling Line			Test level								Criterion	Result
			0.5 kV		1 kV		2 kV		4 kV			
			+	-	+	-	+	-	+	-		
AC line	L-PE	0°	A	A	A	A					B	PASS
		90°	A	A	A	A						
		180°	A	A	A	A						
		270°	A	A	A	A						
	L-N	0°	A	A	A	A						PASS
		90°	A	A	A	A						
		180°	A	A	A	A						
		270°	A	A	A	A						
	N-PE	0°	A	A	A	A						PASS
		90°	A	A	A	A						
		180°	A	A	A	A						
		270°	A	A	A	A						
DC Line												
Signal Line												

Note:

- 1) Polarity and Numbers of Impulses: 5 Pst / Ngst at each tested mode.
- 2) N/A - denotes test is not applicable in this Test Report.
- 3) Criteria A: There was no change operated with initial operating during the test.
- 4) Criteria B: The EUT function loss during the test, but self-recoverable after the test.
- 5) Criteria C: The system shut down during the test.

4.8 INJECTION CURRENT TESTING

4.8.1 TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-6
Required Performance	A
Frequency Range:	0.15 MHz - 80 MHz
Field Strength:	3 Vr.m.s.
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Dwell Time:	at least 3 seconds

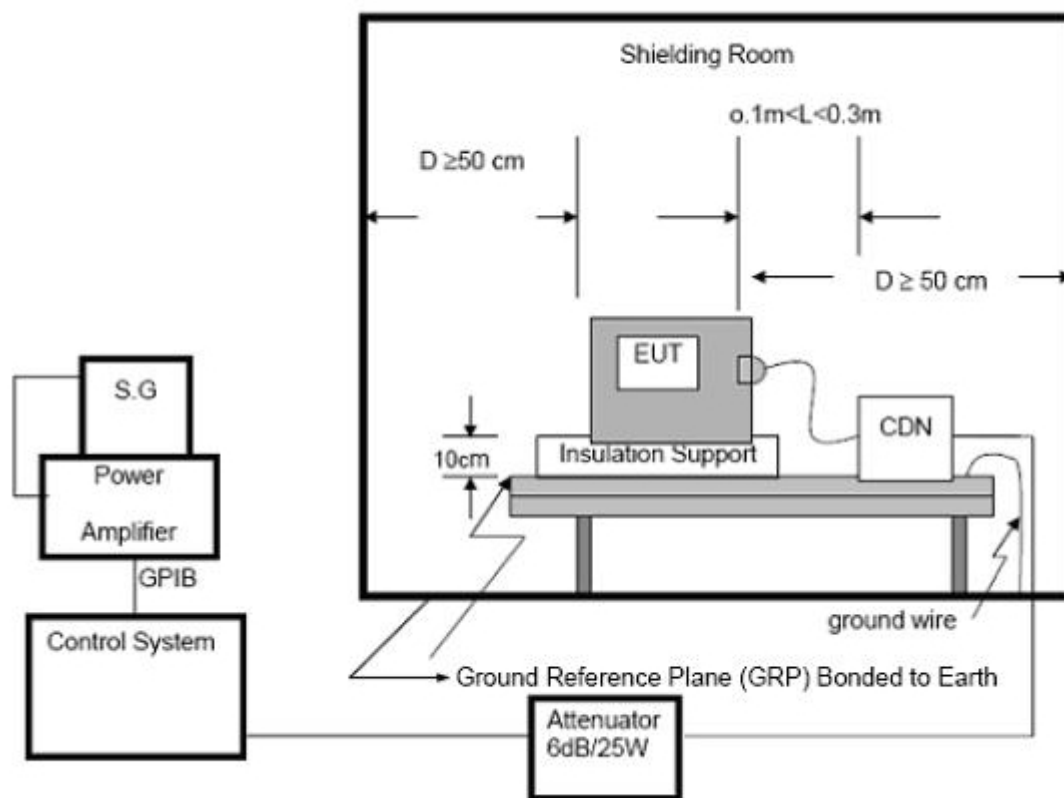
4.8.2 TEST PROCEDURE

The EUT and support equipment, are placed on a table that is 0.8 meter above a metal ground plane measured 1m*1m min. and 0.65mm thick min.

The other condition as following manner:

- a. The frequency range is swept from 150 KHz to 80 MHz, with the signal 80%amplitude modulated with a 1kHz sine wave. The rate of sweep did not exceed 1.5×10^{-3} decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
- b. The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.

4.8.3 TEST SETUP



NOTE:

FLOOR-STANDING EQUIPMENT

The equipment to be tested is placed on an insulating support of 0.1 meters height above a ground reference plane. All relevant cables shall be provided with the appropriate coupling and decoupling devices at a distance between 0.1 meters and 0.3 meters from the projected geometry of the EUT on the ground reference plane.

4.8.4 TEST RESULTS

EUT:	SUBMERSIBLE PUMP	Model Name. :	DVX 25
Temperature:	24 °C	Relative Humidity:	56%
Pressure:	1010hPa	Test Date :	2015-06-24
Test Mode:	Running		
Test Power:	AC 220V/50Hz		

Test Ports (Mode)	Freq. Range MHz)	Field Strength	Perform. Criteria	Results	Judgment
Input/ Output AC. Power Port	0.15 ---80	3V(rms)	A	A	PASS
Input/ Output DC. Power Port	0.15 --- 80	AM Modulated	A	N/A	N/A
Signal Line	0.15 --- 80	1000Hz, 80%	A	N/A	N/A

Note:

- 1) N/A - denotes test is not applicable in this Test Report.
- 2) Criteria A: There was no change operated with initial operating during the test.
- 3) Criteria B: The EUT function loss during the test, but self-recoverable after the test.
- 4) Criteria C: The system shut down during the test.

4.9 VOLTAGE INTERRUPTION/DIPS TESTING

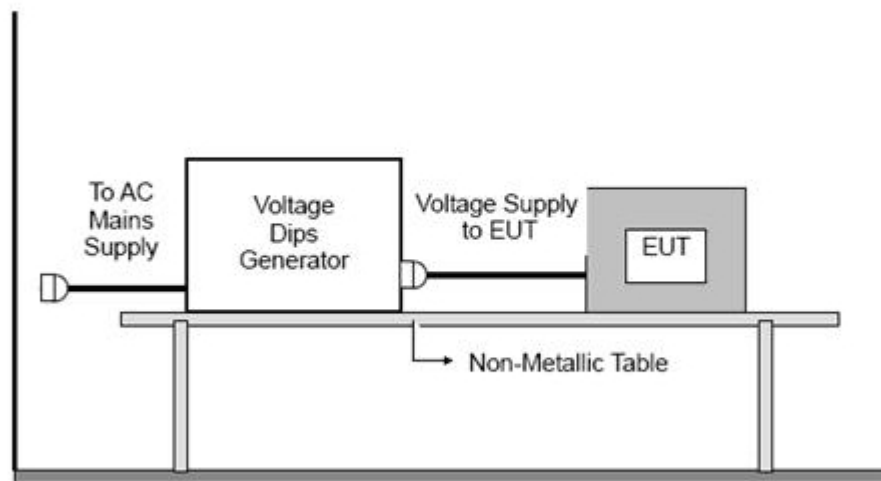
4.9.1 TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-11
Required Performance:	C (For 0% Voltage Dips) C (For 30% Voltage Dips) C (For 60% Voltage Dips)
Test Duration Time:	Minimum three test events in sequence
Interval between Event:	Minimum ten seconds
Phase Angle:	0°/45°/90°/135°/180°/225°/270°/315°/360°
Test Cycle:	3 times

4.9.2 TEST PROCEDURE

The EUT shall be tested for each selected combination of test levels and duration with a sequence of three dips/interruptions with intervals of 10 s minimum (between each test event). Each representative mode of operation shall be tested. Abrupt changes in supply voltage shall occur at zero crossings of the voltage waveform.

4.9.3 TEST SETUP



4.9.4 TEST RESULTS

EUT:	SUBMERSIBLE PUMP	Model Name. :	DVX 25
Temperature:	24 °C	Relative Humidity:	56%
Pressure:	1010hPa	Test Date :	2015-06-24
Test Mode:	Running		
Test Power:	AC 220V/50Hz		

Interruption & Dips	Duration (T)	Perform Criteria	Results	Judgment
Voltage dip 0%	0.5	C	B	PASS
Voltage dip 40%	10	C	B	PASS
Voltage dip 70%	50	C	B	PASS

Note:

- 1). N/A - denotes test is not applicable in this test report.
- 2) Criteria A: There was no change operated with initial operating during the test.
- 3) Criteria B: The EUT function loss during the test, but self-recoverable after the test.
- 4) Criteria C: The system shut down during the test.

A.1 Photo



Fig.1



Fig.2

A.2 Nameplate



A.3 Drawing

Function and feature:

Submersible pump with cutter is an ideal machine for draining sewage. A high-speed rotating cutter is assembled at the inlet hole of the pump, make it easy to cut off long-fibre and firm sundries contained in the sewage, so as to avoid the impeller is blocked by the entanglement. It is suitable for draining sewage in sanitation, factory, mine and family. The float switch can automatically control on and off with the change of the liquid level. The protector in the motor can automatically cut off the power when it overheated or overloaded, thus guarantee the security and reliability of pump's run even in the atrocious environment.

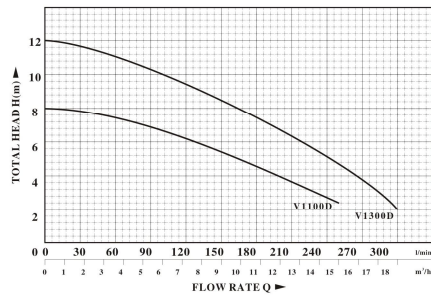
Condition of usage:

- 1.The maximum deep it is allowed in water is 5m from its center of impeller;
- 2.The trans medium's temperature shouldn't be higher than 40°C;
- 3.The trans medium's PH scope is from 4-10;
- 4.The kinematics viscosity of the trans medium is $7 \times 10^{-7} \sim 23 \times 10^{-7} \text{ m}^2/\text{s}$;
- 5.The maximum density of the trans medium is $1.2 \times 10^3 \text{ kg/m}^3$.

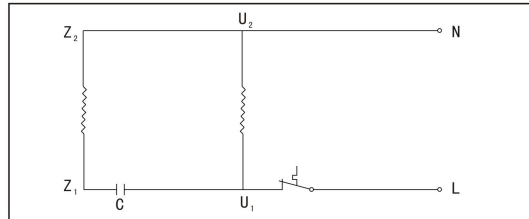
Technical data:

Model	Power (kw)	Outlet diameter (mm)	Max.flow (l/min)	Max.head (m)	G.W. (kg)	Dimensions (cm)
V1100D(F)	1.1	50	250 (15m ³ /h)	8	22.5	29.0X23.5X56.5
V1300D(F)	1.3	50	300 (18m ³ /h)	12	25	29.0X23.5X56.5

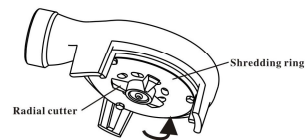
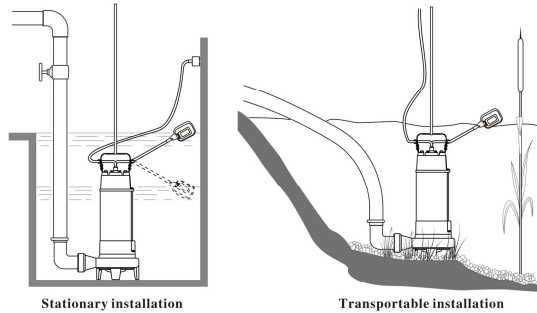
Performance curve



Circuit diagram



The installation diagrams



A high-speed rotating cutter is assembled at the inlet hole of the pump, make it easy to cut off long-fibre and firm sundries contained in thesewage, so as to avoid the impeller is blocked by the entanglement.