TEST REPORT
EN ISO12100:2010; EN 60204-1:2018; EN 1012-1:2010

Safety of machinery - General principles for design - Risk assessment and risk reduction
Safety of machinery - Electrical equipment of machines - Part 1: General requirements
Compressors and vacuum pumps - Safety requirements - Part 1: Air compressors

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Applicant's name.....:	SHENYANG ABT DRILLING EQUIPMENT CO., LTD.
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Manufacturer name.....:	SHENYANG SULLER TECHNOLOGY CO., LTD
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Test specification:	
Standard..... :	EN ISO12100:2010; EN 60204-1:2018; EN 1012-1:2010
Test procedure.....:	CE-MD
Non-standard test method..... :	N/A

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Test Report Form No.....:	-EN ISO12100:2010; - EN 60204-1:2018; - EN 1012-1:2010
Product.....:	AIR COMPRESSOR
Trade Mark.....:	N/A
Manufacturer.....:	SHENYANG SULLER TECHNOLOGY CO., LTD
Main Model/Type reference.....:	ANBIT-S60T(Additional models are as follows)
Ratings..... :	12A/24V,162KW

List of Attachments (including a total number of pages in each attachment):

Attachment : 3 page of photos.

Summary of testing: N/A

Tests performed (name of test and test clause):	**Testing location:**
EN ISO 12100:2010 Safety of machinery - General principles for design - Risk assessment and risk reduction (ISO 12100:2010) EN 60204-1:2018 Safety of machinery - Electrical equipment of machines - Part 1: General requirements EN 1012-1:2010 Compressors and vacuum pumps - Safety requirements - Part 1: Air compressors	Guangdong KEYS Testing Technology Co., Ltd. Building 1, No.18, Shihuan Road, Dongcheng Subdistrict, Dongguan, Guangdong, China Tel:+ 86-0769-89798319 http://www.keys-lab.com E-mail: info@keys-lab.com

Summary of compliance with National Differences
List of countries addressed:

☒ **The product fulfils the requirements of**

-EN ISO12100:2010;
- EN 60204-1:2018;
- EN 1012-1:2010

Additional model：

ANBIT-S85T, ANBIT-S95T, ANBIT-S100T, ANBIT-S125D, ANBIT-40SCG, ANBIT-40SCY, ANBIT-60SCY, ANBIT-95SCY, ANBIT-110SCY, ANBIT-141SCY, ANBIT-145SCYT, ANBIT-146SCYT, ANBIT-153SCYT, ANBIT-162SCYT, ANBIT-186SCYT, ANBIT-190SCYT, ANBIT-198SCYT, ANBIT-200SCYT, ANBIT-226SCYT, ANBIT-265SCYT, ANBIT-298SCYT, ANBIT-300SCYT, ANBIT-300SCYT, ANBIT-310SCYT, ANBIT-410SCYT, ANBIT-500SCYT, ANBIT-SPD650D, ANBIT-SPD850D, ANBIT-SPD1050D, ANBIT-SPD1100D, ANBIT-1300D, ANBIT-1650D, ANBIT300-8, ANBIT400-13, ANBIT550-16, ANBIT550-18, ANBIT700-18, ANBIT700-18C, ANBIT800-20, ANBIT24-22C, ANBIT30-25, ANBIT32-25, ANBIT36-30, ANBIT15-15, ANBIT17-17, ANBIT18-18, ANBIT350-10.3, ANBIT350-12, ANBIT400-7, ANBIT450-14, ANBIT600-14, ANBIT500-14, ANBIT650-14, ANBIT650-20, ANBIT750-12, ANBIT800-10.3, ANBIT850-8.6, ANBIT900-25, ANBIT888-23, ANBIT1000-14, ANBIT1200-10.3, ANBIT1100-25, ANBIT1200-25, ANBIT1300-30, ANBIT1500-20, ANBIT68, ANBIT78, ANBIT88, ANBIT98, All models are similar in construction except for appearance, power and names.

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

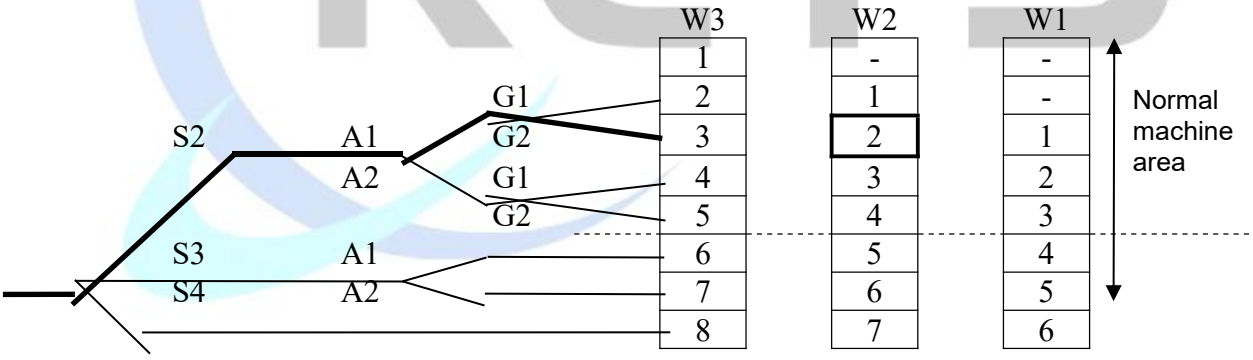
-G2：Impossible

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***	***1***	***1***	***1***	**-**
1.2	Shearing					
1.3	Cutting or severing					
1.4	Entanglement	***1***	***1***	***1***	***1***	**-**
1.5	Drawing-in or trapping	***1***	***1***	***1***	***1***	**-**
1.6	Impact	***1***	***1***	***1***	***1***	**-**
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	***2***	***1***	***1***	***1***	***1***
2.2	Contact with parts which have become live under faulty conditions	***2***	***1***	***1***	***1***	***1***
2.3	Approach to live part under high voltage					
2.4	Electrostatic phenomena					
2.5	Thermal radiation or other phenomena such as projection of molten particles and chemical effects form 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	***1***	***1***	***1***	***1***	**-**
4.2	Interference with speech communication, acoustic signals, etc.	***1***	***1***	***1***	***1***	**-**
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	*1*	*1*	*1*	*1*	-
8.7	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	*1*	*1*	*1*	*1*	-
10.2	Restoration of energy on supply after an interruption					
10.3	External influences on electrical equipment					
10.4	Other external influences (gravity, wind, etc.)					
10.5	Errors in the software					
10.6	Error made by the operator (due to mismatch of machinery with human characteristics and abilities, see 8.6)					
Impossibility of stopping the machine in the best possible conditions						
11	Impossibility of stopping the machine in the best possible conditions					
Variations in the rotational speed of tools						
12	Variations in the rotational speed of tools					
Failure of the power supply						
13	Failure of the power supply					
Failure of the control circuit						
14	Failure of the control circuit	*1*	*1*	*1*	*1*	-
Errors of fitting						
15	Errors of fitting	*1*	*1*	*1*	*1*	-
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 immobilisated					

Linked to the work position (including driving station) on the machine						
21.1	Fall of persons during access to (or at/from) the work position					
21.2	Exhaust gases/lack of oxygen at the work position					
21.3	Fire（flammability of the cab, lack of extinguishing means）					
21.4	Mechanical hazards at the work position： contact with the wheels； rollover； fall of objects, penetration by objects； break-up of parts rotation at high speed； contact of persons with machine parts or tools（pedestrian controlled machines）					
21.5	Insufficient visibility form the work positions					
21.6	Inadequate lighting					
21.7	Inadequate seating					
21.8	Noise at the work position					
21.9	Vibration at the work position					
21.10	Insufficient means for evacuation/emergency exit					
Due to the control system						
22.1	Inadequate location of manual controls					
22.2	Inadequate design of manual controls and their mode of operation					
Form handling the machine（lack of stability）						
23	Form handling the machine（lack of stability）					
Due to the power source and to the transmission of power						
24.1	Hazards form the engine and the batteries					
24.2	Hazards form the transmission of power between machines					
24.3	Hazards form coupling and towing					
Form/to third persons						
25.1	Unauthorized start-up/use					
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					
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 then 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**
1.1	Crushing	*1*	*1*	*1*	*1*	-
Where	Near machine					
When	*loading/unloading,maintenance*					
Improvement result						
Method		**S**	**A**	**G**	**W**	**Level**
1. Affixing suitable warning signs. *2. Only operation by training/authorized persons.* *3. Operation of the machine shall conform to the instructions of the instruction manual.*		*1*	*1*	*1*	*1*	-

4. Check and inspection according to the specified durations of the instruction manual. *5. Provide guards.*					

NO.	Hazards source	S	A	G	W	Level
1.4	Entanglement	*1*	*1*	*1*	*1*	-
Where	Contact with roller of the machine					
When	*during operation, inspection and maintenance of machine*					
Improvement result						
Method		**S**	**A**	**G**	**W**	**Level**
1. Affixing suitable warning signs. *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. Provide guards.*		*1*	*1*	*1*	*1*	-

NO.	Hazards source	S	A	G	W	Level
1.5	Drawing-in or trapping	*1*	*1*	*1*	*1*	-
Where	Contact with the conveyor of the machine					
When	*during operation, inspection and maintenance of machine*					
Improvement result						
Method		**S**	**A**	**G**	**W**	**Level**
1. Affixing suitable warning signs. *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. Provide guards.*		*1*	*1*	*1*	*1*	-

NO.	Hazards source	S	A	G	W	Level
1.6	Impact	*1*	*1*	*1*	*1*	-
Where	*moving/rotating tool*					
When	*during operation, inspection and maintenance of 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. Provide guards.*					

NO.	Hazards source	S	A	G	W	Level
2.1	Contact with live parts	*2*	*1*	*1*	*1*	*1*
Where	*contact with live parts or connections*					
When	*During commissioning,maintenance*					
Improvement result						
Method		**S**	**A**	**G**	**W**	**Level**
1.Only operation by training/authorized persons. *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.*		*1*	*1*	*1*	*1*	-

NO.	Hazards source	S	A	G	W	Level
2.2	Contact with parts which have become live under faulty conditions	*2*	*1*	*1*	*1*	*1*
Where	*contact with live parts or connections*					
When	*during operation, inspection and maintenance of machine*					
Improvement result						
Method		**S**	**A**	**G**	**W**	**Level**
1. Only operation by training/authorized persons. *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.*		*1*	*1*	*1*	*1*	-

NO.	Hazards source	S	A	G	W	Level
4.1	Hearing loss (deafness), other physiological disorders	*1*	*1*	*1*	*1*	-
Where	*Near machine*					
When	*during operation, inspection and maintenance of machine*					
Improvement result						
Method		**S**	**A**	**G**	**W**	**Level**
1. Only operation by training/authorized persons. *2. Operation of the machine shall conform to the instructions of the instruction manual.*		*1*	*1*	*1*	*1*	-

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
4.2	Interference with speech communication, acoustic signals, etc.	*1*	*1*	*1*	*1*	-
Where	*Near machine*					
When	*during operation, inspection and maintenance of machine*					
Improvement result						
Method		**S**	**A**	**G**	**W**	**Level**
1. *Only operation by training/authorized persons.* *2.Use of warning label.* *3.Use the PPE.*		*1*	*1*	*1*	*1*	-

NO.	Hazards source	S	A	G	W	Level
8.6	Human error, human behavior	*1*	*1*	*1*	*1*	-
Where	*At load/unload, tool mounting positions*					
When	*Reasonably foreseeable misuse, inadvertent operation of controls, incorrect work material and cutter handling and setting during loading/ unloading, process control, tool handling.*					
Improvement result						
Method		**S**	**A**	**G**	**W**	**Level**
1.Only authorized person can use the machine. *2.Training before using this machine.* *3.Make reference to the instruction manual before using this machine.*		*1*	*1*	*1*	*1*	-

NO.	Hazards source	S	A	G	W	Level
10.1	Failure/disorder of the control system	*1*	*1*	*1*	*1*	-
Where	*the control system of the machine*					
When	*Mechanical hazards associated with selected machine movement during setting, cleaning*					
Improvement result						
Method		**S**	**A**	**G**	**W**	**Level**
1. Only authorized person can use the machine. *2. Make reference to the instruction manual before using this machine.* *3. Check before operation.* *4. Periodic maintenance.*		*1*	*1*	*1*	*1*	-

NO.	Hazards source	S	A	G	W	Level
14	Failure of the control circuit	*1*	*1*	*1*	*1*	-
Where	*In the wireway*					
When	*Unexpected movements of machine during setting, cleaning or maintenance*					
Improvement result						
Method		**S**	**A**	**G**	**W**	**Level**
1. Checking before operation. *2. Make reference to the instruction manual before operate this machine.* *3. Daily/periodic inspection and maintenance.*		*1*	*1*	*1*	*1*	-

NO.	Hazards source	S	A	G	W	Level
15	Errors of fitting	*1*	*1*	*1*	*1*	-
Where	*At machine*					
When	*machine elements fail or swing unexpectedly during process control, tool mounting, maintenance*					
Improvement result						
Method		**S**	**A**	**G**	**W**	**Level**
1. Only authorized person can use the machine. *2.Make reference to the instruction manual before using this machine.* *3.Check before operation.* *4. Periodic maintenance.*		*1*	*1*	*1*	*1*	-

2. EN ISO 12100:2010 part 6-7

EN ISO 12100:2010			
Clause	Requirement-Test	Result-Remark	Verdict
6	**Risk reduction**		**P**
6.1	General		P
	The objective of risk reduction can be achieved by the elimination of hazards, or by separately or simultaneously reducing each of the two elements that determine the associated risk: -severity of harm from the hazard under consideration; - probability of occurrence of that harm. All protective measures intended for reaching this objective shall be applied in the following sequence, referred to as the three-step method (see also Figures 1 and 2).	Appropriate machine design has been performed by the manufacturer	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 characteristics of the machine are likely to remain effective, whereas experience has shown that even well-designed safeguarding may fail or be violated and information for use may not be followed.	Appropriate machine design has been performed by the manufacturer.	P
	Inherently safe design measures are achieved by avoiding hazards or reducing risks by a suitable choice of design features of the machine itself and/or interaction between the exposed persons and the machine. NOTE See 6.3 for safeguarding and complementary measures that can be used to achieve the risk reduction objectives in the case where inherently safe design measures are not sufficient (see 6.1 for the three-step method).	Appropriate machine design has been performed by the manufacturer.	P
6.2.2	Consideration of geometrical factors and physical aspects		P
6.2.2.1	Geometrical factors		P
	Such factors include the following.		
	a) The form of machinery is designed to maximize direct visibility of the working areas and hazard zones from the control position — reducing blind spots, for example — and choosing and locating means of indirect vision where necessary (mirrors, etc.) so as to take into account	Reducing blind spots	P

EN ISO 12100:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	the characteristics of human vision, particularly when safe operation requires permanent direct control by the operator, for example: -the travelling and working area of mobile machines; -the zone of movement of lifted loads or of the carrier of machinery for lifting persons; -the area of contact of the tool of a hand-held or hand-guided machine with the material being worked. The design of the machine shall be such that, from the main control position, the operator is able to ensure that there are no exposed persons in the danger zones.		
	b) The form and the relative location of the mechanical components parts: for instance, crushing and shearing hazards are avoided by increasing the minimum gap between the moving parts, such that the part of the body under consideration can enter the gap safely, or by reducing the gap so that no part of the body can enter it (see ISO 13854 and ISO 13857).	By increasing the minimum gap between the moving parts or by reducing the gap.	P
	c) Avoiding sharp edges and corners, protruding parts: in so far as their purpose allows, accessible parts of the machinery shall have no sharp edges, no sharp angles, no rough surfaces, no protruding parts likely to cause injury, and no openings which can “trap” parts of the body or clothing. In particular, sheet metal edges shall be deburred, flanged or trimmed, and open ends of tubes which can cause a “trap” shall be capped.	No sharp edges, no sharp angles, no rough surfaces, no protruding parts.	P
	d) The form of the machine is designed so as to achieve a suitable working position and provide accessible manual controls (actuators).	Suitable working position,accessible manual controls.	P
6.2.2.2	Physical aspects		P
	Such aspects include the following:		
	a) limiting the actuating force to a sufficiently low value so that the actuated part does not generate a mechanical hazard;	The actuating force has been limited to be a sufficiently low value.	P
	b)limiting the mass and/or velocity of the movable elements, and hence their kinetic energy;	The mass of the tool has been limited.	P
	c) limiting the emissions by acting on the characteristics of the source using measures for reducing: 1) noise emission at source (see ISO/TR 11688-1), 2) the emission of vibration at source, such as redistribution or addition of mass and changes of process parameters [for example, frequency and/or amplitude of movements (for hand-held and hand-guided machinery,		P

EN ISO 12100:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	see CR 1030-1)], 3) the emission of hazardous substances, including the use of less hazardous substances or dust-reducing processes (granules instead of powders, milling instead of grinding), and 4) radiation emissions, including, for example, avoiding the use of hazardous radiation sources, limiting the power of radiation to the lowest level sufficient for the proper functioning of the machine, designing the source so that the beam is concentrated on the target, increasing the distance between the source and the operator or providing for remote operation of the machinery [measures for reducing emission of non-ionizing radiation are given in 6.3.4.5 (see also EN 12198-1 and EN 12198-3)].		
6.2.3	Taking into account 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 :		
	a) mechanical stresses such as - stress limitation by implementation of correct calculation, construction and fastening methods as regards, e.g. bolted assemblies, welded assemblies - stress limitation by overload prevention, (e.g. “fusible” plugs, pressure-limiting valve, breakage points, torque-limiting devices); - avoiding fatigue in elements under variable stresses (notably cyclic stresses); - static and dynamic balancing of rotating elements;	The appropriate technical knowledge of mechanical has been taken into account.	P
	b) materials and their properties such as - resistance to corrosion, ageing, abrasion and wear; - hardness, ductility, brittleness; - homogeneity; - toxicity; - flammability.	The materials have been treated by appropriate methods.	P
	c) emission values for : - noise; - vibration; - hazardous substances; - radiation.		P

EN ISO 12100:2010			
Clause	Requirement-Test	Result-Remark	Verdict
	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. :		-
	a) on machines intended for use in explosive atmospheres: - fully pneumatic or hydraulic control system and machine actuators; - “intrinsically safe” electrical equipment (see IEC 60079-11)		N
	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		P
	Positive mechanical action is achieved when a moving mechanical component inevitably moves another component along with it, either by direct contact or via rigid elements. An example of this is positive opening operation of switching devices in an electrical circuit (see IEC 60947-5-1 and ISO 14119).		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 .	P
	Factors to be taken into account include		-
	- geometry of the base;	The factor has been taken into account during design.	P
	- weight distribution, including loading;	The factor has been taken into account during design.	P
	- dynamic forces due to movements of parts of the	The factor has been	P

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	machine, of the machine itself, or of elements held by the machine which may result in an overturning moment;	taken into account during design.	
	- vibration	The factor has been taken into account during design.	P
	- oscillations of the centre of gravity;	The factor has been taken into account during design	P
	- characteristics of the supporting surface in case of traveling or installation on different sites (e.g. ground conditions, slope);	The factor has been taken into account during design.	P
	- external forces (e.g. wind pressure, manual forces)	The factor has been taken into account during design.	P
	Stability shall be considered in all phases of the life of the machine, including handling, traveling, installation, use, de-commissioning and dismantling.	The factor has been taken into account during design.	P
	Other protective measures for stability relevant to safeguarding are given in 6.3.2.6	Please see the related clause.	P
6.2.7	Provision for maintainability		P
	When designing a machine, the following maintainability factors shall be taken into account:		-
	- accessibility, taking into account the environment and the human body measurements, including the dimensions of the working clothes and tools used;	These factors have been taken into account during design.	P
	- 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
	Ergonomic principles shall be taken into account in designing machinery to reduce mental or physical stress and strain of the operator.	Appropriate ergonomic principles have been taken into account in designing machinery.	P
	These principles shall be considered when allocating functions to operator and machine (degree of automation) in the basic design.	These principles have been taken into account during allocating functions	P

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		to operator and machine.	
	Account shall be taken of body sizes likely to be found in the intended user population, strengths and postures, movement amplitudes, frequency of cyclic actions (see ISO 10075 and ISO 10075-2)	All these factors have been taken into account during design.	P
	All elements of the “operator-machine” interface such as controls, signaling or data display elements, shall be designed to be easily understood so that clear and unambiguous interaction between the operator and the machine is possible.(see EN 614-1, ISO 6385, EN 13861 and IEC 61310-1)	All arrangement and design of manual controls have been checked in compliance with.	P
	Designer’s attention is especially drawn to following ergonomic aspects of machine design		-
	a) Avoiding stressful postures and movements during use of the machine (e.g. by providing facilities to adjust the machine to suit the various operators).	Stressful postures and movements during use of the machine have been avoided.	P
	b) Designing machines, and more especially hand-held and mobile machines to enable them to be operated easily taking into account human effort, actuation of controls and hand, arm and leg anatomy.	This machine has been adjusted to the human strength and convenient movement.	P
	c) Limit as far as possible noise, vibration and thermal effects such as extreme temperatures.	This machine has been designed with low noise, vibration.	P
	d) Avoid linking the operator's working rhythm to an automatic succession of cycles.	This situation has been avoided.	P
	e) Select, locate and identify manual controls (actuators) so that		-
	- they are clearly visible and identifiable and appropriately marked where necessary (see6.4.4)	Clearly visible and appropriately marked	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)	Standard layout of controls. See the photos.	P
	- their location(for push-buttons) and their movement (for levers and handwheels) are consistent with their effect (see IEC 61310-3)		P
	- their operation cannot cause additional risk		P

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	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.	one-to-one correspondence	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.	Taking account of ergonomic principles	P
	Constraints due to the necessary or foreseeable use of personal protective equipment(such as footwear, gloves)shall be taken into account.		P
	f) Select, design and locate indicators, dials and visual display units so that		-
	- they fit within the parameters and characteristics of human perception		P
	- information displayed can be detected, identified and interpreted conveniently, i.e. long lasting, distinct, unambiguous and understandable with respect to the operator's requirements and the intended use;	All the information displayed comply with this requirement.	P
	- the operator is able to perceive them form the control position		P
6.2.9	Preventing electrical hazard		P
	For the design of the electrical equipment of machines EN 60204-1 gives general provisions, especially in clause 6 for protection against electric shock.	See the test report of EN 60204-1	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 and hydraulic hazards		N
	Pneumatic and hydraulic equipment of machinery shall be designed so that :		-
	- the maximum rated pressure cannot 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		N

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	gas loaded accumulators) comply with the design rules for these elements;		
	- 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. See also ISO 4413 and ISO4414		N
6.2.11	Applying inherently safe design measures to control system		P
6.2.11.1	General		P
	The design measures of the control system shall be chosen so that their safety-related performance provides a sufficient amount of risk reduction (see ISO 13849-1 or IEC 62061)	Inherently safe design measures to control system have applied.	P
	The correct design of machine control systems can avoid unforeseen and potentially hazardous machine behaviour.	Inherently safe design measures to control system have applied.	P
	Typical causes of hazardous machine behavior are :		-
	- an unsuitable design or modification (accidental or deliberate) of the control system logic;	No this kind of hazard in this machine	N
	- a temporary or permanent defect or a failure of one or several components of the control system;		N
	- a variation or a failure in the power supply of the control system;	No this kind of hazard in this machine	N
	- inappropriate selection, design and location of the control devices;	No this kind of hazard in this machine	N
	Typical examples of hazardous machine behaviour are :		-

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	- unintended/unexpected start-up(see ISO 14118)	No this kind of hazard in this machine	N
	- uncontrolled speed change;	Speed monitor	N
	- failure to stop moving parts;	Emergency stop devices	N
	- 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	No this kind of hazard in this machine	N
	In order to prevent hazardous machine behaviour and to achieve safety functions, the design of control systems shall comply with the principles and methods presented in this subclause 6.2.11 and in 6.2.12.	See the related clause	P
	These principles and methods shall be applied singly or in combination as appropriate to the circumstances (see ISO 13849-1 and EN 60204-1and IEC 62061).	See the test report of EN 60204-1	P
	Control systems shall be designed to enable the operator to interact with the machine safely and easily; this requires one or several of the following solutions;	The operator interact with the machine safely and easily.	P
	- systematic analysis of start and stop conditions;	Systematic analysis have been applied.	P
	- provision for specific operating modes (e.g. start-up after normal stop, restart after cycle interruption or after emergency stop, removal of the workpieces contained in the machine, operation of a part of the machine in case of a failure of a machine element)	Enough provisions have been provided.	P
	- clear display of the faults;		P
	- measures to prevent accidental generation of unexpected start commands (e.g. shrouded start device) likely to cause dangerous machine behaviour (see ISO 14118:2000, figure 1)	Main switch with lock and related devices are provided.	P
	- maintained stop commands(e.g. interlock) to prevent restarting that could result in dangerous machine behaviour (see ISO 14118:2000, figure 1)	This requirement is complied with.	P
	An assembly of machines may be divided into several zones for emergency stopping, for stopping as a result of protective devices and/or for isolation and energy dissipation.		P
	The different zones shall be clearly defined and it shall		P

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	be obvious which parts of the machine belong to which zone.		
	Likewise it shall be obvious which control devices (e.g. emergency stop devices, supply disconnecting devices)and/or protective devices belong to which zone.		P
	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.		P
	Control systems shall be designed to limit the movements of parts of the machinery, the machine itself, or workpieces and/or loads held by the machinery, to the safe design parameters(e.g. range, speed, acceleration, deceleration, load capacity). Allowance shall be made for dynamic effects (e.g. the swinging of loads).	The max. speed	P
	For example:		-
	- 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.		P
	When machinery is designed to use synchronously different elements which can also be used independently the control system shall be designed to prevent risks due to lack of synchronization.		N
6.2.11.2	Starting of internal power source/switching on an external power supply		P
	The starting of an internal power source or switching-on of an external power supply shall not result in a hazardous situation. For example: -starting the internal combustion engine shall not lead to movement of a mobile machine; -connection to mains electricity supply shall not result in the starting of working parts of a machine. See EN 60204-1:2006, 7.5 (see also Annexes A and B).	Not result in the starting of working parts of a machine	P
6.2.11.3	Starting/stopping of a mechanism		P

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Clause	Requirement-Test	Result-Remark	Verdict
	The primary action for starting or accelerating the movement of a mechanism should be performed by application or increase of voltage or fluid pressure, or, if binary logic elements are considered, by passage from state 0 to state 1(if state 1 represents the highest energy state)	This requirement has been taken into account during design.	P
	The primary action for stopping or slowing down should be performed by removal or reduction of voltage or fluid pressure, or, if binary logic elements are considered, by passage from state 1 to state 0 (if state 1 represents the highest energy state).	The type of stopping of this machine belongs to state 1 and state 0.	P
	When, in order for the operator to maintain permanent control of deceleration, this principle is not observed (e.g. a hydraulic braking device of a self-propelled mobile machine), the machine shall be equipped with a means of slowing and stopping in case of failure of the main braking system	No such situation exist.	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).	A self-maintained relay	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 operation an effective way to maintain safety (e.g. locking, clamping devices, cooling or heating devices, power-assisted steering of self-propelled mobile machinery);		P
	- parts of machinery or workpieces and/or loads held by machinery which are liable to move as a result of potential energy shall be retained for the time necessary to allow them to be safely lowered.		N
6.2.11.6	Use of automatic monitoring		P
	Automatic monitoring is intended to ensure that a safety function(s) implemented by a protective measure do(es) not fail to be performed if the ability of a component or		P

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	an element to perform its function is diminished, or if the process conditions are changed in such a way that hazards are generated.		
	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.		P
	In either case, the protective measure can be initiated immediately or delayed until a specific event occurs (e.g. the beginning of the machine cycle.) The protective measures may be , e.g.:		P
	- the stopping of the hazardous process;		P
	- preventing the re-start of this process after the first stop following the failure;		
	- the triggering of an alarm		N
6.2.11.7	Safety functions implemented by programmable electronic control systems		P
6.2.11.7.1	General		P
	A control system including programmable electronic equipment (e.g. programmable controllers) can be used to implement safety functions t machinery.		P
	Where a programmable electronic control system is used it is necessary to consider its performance requirements in relation to the requirements for the safety functions.		P
	The design of the programmable electronic control system shall be such that the probability of random hardware failures and the likelihood of systematic failures that can adversely affect the performance of the safety-related control function(s) are sufficiently low.	Comply with the requirement	P
	Where a programmable electronic control system performs a monitoring function, the system behaviour on detection of a fault shall be considered (see also IEC 61508 series for further guidance)		P
	The programmable electronic control system should be installed and validated to ensure that the specified performance (e.g. safety integrity level (SIL) in IEC 61508 series) for each safety function has been achieved.	Comply with the requirement	P
	Validation comprises testing an analysis (e.g. static, dynamic or failure analysis) to show that all parts interact correctly to perform the safety function and that unintended functions do not occur.		P

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6.2.11.7.2	Hardware aspects		P
	The hardware (including e.g. sensors, actuators, logic solvers) shall be selected (and/or designed) and installed to meet both the functional and performance requirements of the safety function(s) to be performed, in particular, by means of :	Logic solvers	P
	- architectural constraints (e.g. the configuration of the system, its ability to tolerate faults, its behaviour on detection of a fault);		P
	- selecting (and/or designing) equipment and devices with an appropriate probability of dangerous random hardware failure;		P
	-Incorporating measures and techniques within the hardware to avoid systematic failures and control systematic faults.		P
6.2.11.7.3	Software aspects		P
	The software (including internal operating software (or system software) and application software) shall be designed so as to satisfy the performance specification for the safety functions (see also IEC 61508-3)	Satisfy the performance specification for the safety functions	P
	Application software		-
	Application software should not be re-programmable by the user.		P
	This may be achieved by use of embedded software in a non re-programmable memory (e.g. micro-controller, application specific integrated circuit (ASIC)		N
	When the application requires reprogramming by the user, the access o the software dealing with safety functions should be restricted e.g. by : - locks; - passwords for the authorized persons		N
6.2.11.8	Principles relating to manual control		P
	a) Manual control devices shall be designed and located according to the relevant ergonomic principles given in 6.2.8	See the photo.	P
	b) A stop control device shall be placed near each start control device. Where the start/stop function is performed by means of a hold-to-run control, a separate stop control device shall be provided when a risk can result from the hold-to-run control device failing to deliver a stop command when released.	A stop control device has been placed near each start control device.	P
	c) Manual controls shall be located out of reach of the danger zones (see IEC 61310-3), except for certain controls where, of necessity, they are located within a	Manual controls have been located out of reach of the danger	P

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	danger zone, such as emergency stop or teach pendant.	zones.	
	d) Whenever possible, control devices and control positions shall be located so that the operator is able to observe the working area or hazard zone.	The operator is able to observe the working area or hazard zone.	P
	The driver of a ride-on mobile machine shall be able to actuate all control devices required to operate the machine from the driving position, except for functions which can be controlled more safely from other positions.	Not a ride-on mobile machine	N
	On machinery intended for lifting persons, controls for lifting and lowering and, if appropriate, for moving the carrier, shall generally be located in the carrier. If safe operation requires controls to be situated outside the carrier, the operator in the carrier shall be provided with the means of preventing hazardous movements.	Not for lifting persons.	N
	e) if it is possible to start the same hazardous element by means of several controls, the control circuit shall be so arranged that only one control is effective at a given time. This applies especially to machines which can be manually controlled by means among others of a portable control unit (teach pendant, for instance), with which the operator may enter danger zones.	Only one control.	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)		P
	g) For machine functions whose safe operation depends on permanent, direct control by the operator, measures shall be taken to ensure the presence of the operator at the control position , e.g. by the design and location of control devices.		N
	h) For cableless control an automatic stop shall be performed when correct control signals are not received, including loss of communication (see EN 60204-1)		P
6.2.11.9	Control mode for setting, teaching, process changeover, fault-finding, cleaning or maintenance		P
	Where, for setting, teaching, process changeover, fault-finding, cleaning or maintenance of machinery, a guard has to 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

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	- disables all other control modes;		N
	- permits operation of the hazardous elements only by continuous actuation of an enabling device, a hold-to-run control device or a two-hand control device;		N
	- permits operation of the hazardous elements only in reduced risk conditions (e.g. reduced speed, reduced power/force, step-by-step operation, e.g. with a limited movement control device)		N
	prevents any operation of hazardous functions by voluntary or involuntary action on the machine's sensors.		N
	This control mode shall be associated with one or more of following measures:		-
	- restriction of access to the danger zone as far as possible.		P
	- emergency stop control within immediate reach of the operator;		P
	- portable control unit (teach pendant) and/or local controls allowing sight of the controlled elements.(see EN 60204-1:2006, 9.2.4)		P
6.2.11.10	Selection of control and operating modes		P
	If machinery has been designed and built to allow for its use in several control or operating modes requiring different protective measures and/or work procedures (e.g. to allow for adjustment , setting, maintenance, inspection), it shall be fitted with a mode selector which can be locked in each position.	Fitted with a mode selector which can be locked in each position.	P
	Each position of the selector shall be clearly identifiable and shall exclusively allow one control or operating mode.		P
	The selector may be replaced by another selection means which restricts the use of certain functions of the machinery to certain categories of operators (e.g. access codes for certain numerically controlled functions).		P
6.2.11.11	Applying measures achieve electromagnetic compatibility (EMC)		P
	For guidance on electromagnetic compatibility, see EN 60204-1, and IEC 61000-6 series.	EN 61000-6 series	P
6.2.11.12	Provision of diagnostic systems to aid fault-finding		P
	Diagnostic systems to aid fault finding should be included in the control system so that there is no need to disable any protective measures.		P
6.2.12	Minimizing the probability of failure of safety functions		P
6.2.12.1	General		P
	Safety of machinery is not only dependent on the		P

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	reliability of the control systems but also on the reliability of all parts of the machine.The continued operation of the safety functions is essential for the safe use of the machine. This can be achieved by :		
6.2.12.2	Use of reliable components		P
	“Reliable components” means components which are capable of withstanding all disturbances and stresses associated with the usage of the equipment in the conditions of intended use (including the environmental conditions), for the period of time or the number of operations fixed for the use, with a low probability of failures generating a hazardous malfunctioning of the machine. Components shall be selected taking into account all factors mentioned above(see also 6.213)	Reliable components have been used.	P
6.2.12.3	Use of “oriented failure mode” components		P
	“Oriented failure mode” components or systems are those in which the predominant failure mode is known in advance and which can be used so that such a failure leads to a non-hazardous alteration of the machine function.		P
	The use of such components should always be considered, particularly in cases where redundancy is (see 6.2.12.4) not employed.		P
6.2.12.4	Duplication (or redundancy) of components or subsystems		-
	In the design of safety-related parts of the machine, duplication (or redundancy) of components may be used so that, if one component fails, another component (or other components) continue(s) to perform its (their) function, thereby ensuring that the safety function remains available.	No duplication (or redundancy) of components	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,	Be preferably detected by automatic monitoring	P
	provided that the inspection interval is shorter than the expected lifetime of the components.		P
	Diversity of design and/or technology can be used to avoid common cause failures (e.g. from electromagnetic disturbance) or common mode failures.		P
6.2.13	Limiting exposure to hazards through reliability of equipment		
	Increased reliability of all component parts of machinery reduces the frequency of incidents requiring rectification, thereby reducing exposure to hazards.	This requirement is complied with.	P

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	This applies to power systems (operative part) as well as to control systems, to safety functions as well as to other functions of machinery.	This requirement is complied with.	P
	Safety-critical components (as e.g. certain sensors) with a known reliability shall be used.	Safety-critical components are used .	P
	The elements of guards and of protective services shall be particularly reliable, as their failure can expose persons to hazards, and also as poor reliability would encourage attempts to defeat them.		P
6.2.14	Limiting exposure to hazards through mechanization or automation of loading(feeding) /unloading (removal) operations		P
	Mechanization and automation of machine loading/unloading operations and more generally of handling operations (of workpieces, materials, substances) limit the risk generated by these operations by reducing the exposure of persons to hazards at the operating points.		P
	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 faults 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 (see 6.3) shall be provided if this cannot be ensured.		N
	Automatic feeding and removal devices with their own control systems and the control systems of the associated machine shall be interconnected after thoroughly studying how all safety functions are performed in all control and operation modes of the whole equipment.	Comply with the requirement	P
6.2.15	Limiting exposure to hazards through location of the setting and maintenance points outside of danger zones.		N
	The need for access to danger zones shall be minimized by locating maintenance, lubrication and setting points outside these zones.		N
6.3	Safeguarding and complementary protective measures		P
6.3.1	General		P

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Clause	Requirement-Test	Result-Remark	Verdict
	Guards and protective devices shall be used to protect persons whenever inherently safe design does not reasonably make it possible either to remove hazards or to sufficiently reduce risks. Complementary protective measures involving additional equipment (e.g. emergency stop equipment) may have to be implemented.	Appropriate guards and protective devices have been used to protect persons	P
	Certain safeguards may be used to avoid exposure to more than one hazard (e.g. a fixed guard preventing access to a zone where a mechanical hazard is present being used to reduce noise level and collect toxic emissions)	fixed guard is used.	P
6.3.2	Selection and implementation of guards and protective devices		P
6.3.2.1	General	-	
	This subclause gives guidelines for the selection and the implementation of guards and protective devices the primary purpose of which is to protect persons against hazard generated by moving parts, according to the nature of those parts (see figure 4) and to the need for access to the danger zone(s).	Please see the related clause.	P
	The exact choice of a safeguard for a particular machine shall be made on the basis of the risk assessment for that machine.		P
	In selecting an appropriate safeguard for a particular type of machinery or hazard zone, it shall be borne in mind that a fixed guard is simple and shall be used where access of an operator to the danger zone is not required during normal operation (operation without any malfunction) of the machinery.		P
	As the need for frequency of access increase this inevitably leads to the fixed guard not being replaced.		P
	This requires the use of an alternative protective measure (movable interlocking guard, sensitive protective equipment.)		P
	A combination of safeguards may sometimes be required. For example , where, in conjunction with a fixed guard, a mechanical loading (feeding) device is used to feed a workpiece into a machine, thereby removing the need for access to the primary hazard zone, a trip device may be required to protect against the secondary drawing-in or shearing hazard between the mechanical loading (feeding) device, when reachable, and the fixed guard.		P
	Consideration shall be given to the enclosure of control	This requirement has	P

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	positions or intervention zones to provide combined protection against several hazards which may include:	been taken into consideration.	
	- hazards from falling or ejected objects (e.g. falling object protection structure)		P
	- emission hazards (e.g. protection against noise, vibration, radiation , harmful substances)		P
	- hazards due to the environment (e.g. protection against heat, cold, foul weather)		P
	- hazards due to tipping over or rolling over of machinery (e.g. roll-over or tip-over protection structure)	No such hazards exist in this machine.	N
	The design of such enclosed work stations (e.g. cabs and cabins) shall take into account ergonomic principles concerning visibility, lighting, atmospheric conditions, access, posture.	No enclosed work stations.	N
6.3.2.2	Where access to the hazard zone is not required during normal operation		P
	Where access to the hazard zone is not required during normal operation of the machinery, safeguard should be selected from the following:		-
	a) fixed guard (see also ISO 14120)	Fixed guards are provided.	P
	b) interlocking guard with or without guard locking (see also 6.3.3.2.3, ISO 14119, ISO 14120);		N
	c) self-closing guard (see ISO 14120:2002, 3.3.2)		P
	d) sensitive protective equipment, e.g. electro-sensitive protective equipment (see IEC 61496) or pressure sensitive mat (see ISO 13856)	No sensitive protective equipment	N
6.3.2.3	Where access to the hazard zone is required during normal operation		P
	Where access to the hazard zone is required during normal operation of the machinery , safeguards should be selected from the following:		-
	a) interlocking guard with or without guard locking (see also ISO 14119, ISO 14120 and 6.3.3.2.3 of this standard);		N
	b) sensitive protective equipment, e.g electro-sensitive protective equipment (see IEC 61496)	No sensitive protective equipment	N
	c) adjustable guard;		N
	d) self-closing guard (see ISO 14120:2002, 3.3.2)		N
	e) two-hand control device (see ISO 13851)		N
	f) interlocking guard with a start function (control guard) (see 6.3.3.2.5 of this standard)		N
6.3.2.4	Where access to the hazard zone is required for machine setting, teaching, process changeover, fault finding,		P

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Clause	Requirement-Test	Result-Remark	Verdict
	cleaning or maintenance.		
	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.		P
	Such tasks shall be identified and considered in the risk assessment as parts of the use of the machine (see 5.2)		P
6.3.2.5	Selection and implementation of sensitive protective equipment	No sensitive protective equipment	N
6.3.2.5.1	Selection		N
	Due to the great diversity of the technologies on which their detection function is based, all types of sensitive protective equipment are far from being equally suitable for safety applications.		N
	The following provisions are intended to provide the designer with criteria for selecting , for each application , the most suitable device(s).		N
	Types of sensitive protective equipment include, e.g.:		-
	- light curtains;		N
	- scanning devices as, e.g. laser scanners;		N
	- pressure sensitive mats;		N
	- trip bars, trip wires.		N
	Sensitive protective equipment can be used:		-
	- for tripping purposes;		N
	- for presence sensing;		N
	- for both tripping and presence sensing		N
	- to re-initiate machine operation, a practice which is subject to stringent conditions.		N
	The following characteristics of the machinery, among others, can preclude the sole use of sensitive protective equipment:		N
	- tendency for the machinery to eject materials or component parts;		N
	- necessity to guard against emissions (noise, radiation, dust, etc.)		N
	- erratic or excessive machine stopping time;		N
	- inability of a machine to stop part-way through a cycle.		N
6.3.2.5.2	Implementation		N
	consideration should be given to :		-
	a) - size, characteristics and positioning of the detection		N

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Clause	Requirement-Test	Result-Remark	Verdict
	zone (see ISO 13855, which deals with the positioning of some types of sensitive protective equipment)		
	b) - reaction of the device to fault conditions (see IEC 61496for electro-sensitive protective equipment)		N
	c)- possibility of circumvention		N
	d)- detection capability and its variation over the course of time (e.g. as a result of its susceptibility to different environmental conditions such as the presence of reflecting surfaces, other artificial light sources, sunlight or impurities in the air.		N
	sensitive protective equipment shall be integrated in the operative part and associated with the control system of the machine so that:		N
	- a command is given as soon as a person or part of a person is detected;		N
	- the withdrawal of the person or part of a person detected does not, by itself, restart the hazardous machine function (s); therefore, the command given by the sensitive protective equipment shall be maintained by the control system until a new command is given;		N
	- restarting the hazardous machine function(s) results from the voluntary actuation , by the operator, of a control device placed outside the hazard zone, where this zone can be observed by the operator;		N
	- he machine cannot operate during interruption of the detection function of the sensitive protective equipment, except during muting phases,;		N
	- the position and the shape of detection field prevents, ,possibly together with fixed guards, a person or part of a person from entering the hazard zone, or being present in it, without being detected.		N
6.3.2.5.3	Additional requirements for sensitive protective equipment when used for cycle initiation.		N
	In this exceptional application, starting of the machine cycle is initiated by the withdrawal of a person or of the detected part of a person from the sensing field of the sensitive protective equipment, without any additional start command, hence deviating from the general requirement given in the second point of the dashed list in 6.3.2.5.2, above. After switching on the power supply, or when the machine has been stopped by the tripping function of the sensitive protective equipment, the machine cycle shall be initiated only by voluntary actuation of a start control.		N
	Cycle initiation by sensitive protective equipment shall		-

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Clause	Requirement-Test	Result-Remark	Verdict
	be subject to the following conditions:		
	a) only active optoelectronic protective devices (AOPDs) complying with IEC 61496 series shall be used;		N
	b) the requirements for an AOPD used as a tripping and presence-sensing device (see IEC 61496) are satisfied — in particular, location, minimum distance (see ISO 13855), detection capability, reliability and monitoring of control and braking systems;		N
	c) the cycle time of the machine is short and the facility to re-initiate the machine upon clearing of the sensing field is limited to a period commensurate with a single normal cycle;		N
	d) entering the sensing field of the AOPD(s) or opening interlocking guards is the only way to enter the hazard zone;		N
	e) if there is more than one AOPD safeguarding the machine, only one of the AOPD （s） is capable of cycle re-initiation;		N
	f) with regard to the higher risk resulting from automatic cycle initiation, the AOPD and the associated control system comply with a higher safety-related performance than under normal conditions.		N
6.3.2.6	Protective measures for stability		P
	If stability cannot be achieved by inherently safe design measures such as weight distribution (see 4.6), it will be necessary to maintain it by protective measures such as the use of :		P
	- anchorage bolts;		P
	- locking devices;		P
	- movement limiters or mechanical stops;		N
	- 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(e.g. mobile machines, cranes) 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
	- when the operator has insufficient visibility of the hazard zone;		N

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Clause	Requirement-Test	Result-Remark	Verdict
	- when the operator lacks knowledge of the actual value of a safety –related parameter (e.g. .a distance, a speed, the mass of a load, the angle of a slope)		N
	- when hazards may result from operations other than those controlled by the operator;		N
	The necessary devices include:		-
	- devices for limiting parameters of movement (distance, angle, velocity , acceleration)		N
	- overloading and moment limiting devices:		N
	- devices to prevent collisions or interference with other machines;		N
	-device for preventing hazards to pedestrian operators of mobile machinery or other pedestrians;		N
	- torque limiting devices, breakage points to prevent excessive stress of components and assemblies;		N
	- devices for limiting pressure, temperature;		N
	- devices for monitoring emissions;		N
	- devices prevent operation in the absence of the operator at the control position;		N
	- device to prevent lifting operations unless stabilizers are in place;		N
	- devices to limit inclination of the machine on a slope;		N
	- devices to ensure that components are in a safe position before traveling;		N
	Automatic protective measures triggered by such devices which take operation of the machinery out of the control of the operator (e.g. automatic stop of hazardous movement) should be preceded or accompanied by a warning signal to enable the operator to take appropriate action (see 6.4.3)		N
6.3.3	Requirements for the design of guards and protective devices		P
6.3.3.1	General requirements		P
	Guards and protective devices shall be designed to be suitable for the intended use, taking into account mechanical and other hazards involved. Guards and protective devices shall be compatible with the working environment of the machine and designed so that they cannot be easily defeated. They shall provide the minimum possible interference with activities during operation and other phases of machine life, in order to reduce any incentive to defeat them.	Guards and protective devices have been appropriately designed.	P
	Guards and protective devices shall :		-

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Clause	Requirement-Test	Result-Remark	Verdict
	- be of robust construction.	Steel	P
	- not give rise to any additional hazard;	No additional hazard	P
	- not be easy to by-pass or render non-operational;	not be easy to by-pass	P
	- be located at an adequate distance from the danger zone (see ISO 13857 and ISO 13855).	an adequate distance from the danger zone	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 area where the work has to be done, if possible without the guard or protective device having to be moved;		P
	For openings in the guards see ISO 13857		P
6.3.3.2	Requirements for fixed guards		P
6.3.3.2.1	Functions of guards		P
	The functions that guards can achieve are:		P
	- prevention of access to the space enclosed by guard and/or - containment/capture of materials, workpieces, chips, liquids which may be ejected or dropped by the machine and reduction of emissions(noise, radiation, hazardous substances such as dust, fumes, gases) which may be generated by the machine.	The space enclosed. Containment of workpieces, chips, liquids which may be ejected by the machine	P
	Additionally, they may need to have particular propertied relating to electricity, temperature, fire, explosion, vibration, visibility(see ISO 14120) and operator position ergonomics(e.g. usability, operator's movements, posture, repetitive movements).		P
6.3.3.2.2	Requirements for fixed guards		P
	Fixed guards shall be securely held in place:		-
	- either permanently (e.g. by welding) - or by means of fasteners (screws, nuts) making removal/opening impossible without using tools; they should not remain closed without their fasteners (see ISO 14120)	All the fixed guards are securely held in place by appropriate fasteners.	P
6.3.3.2.3	Requirements for movable guards		P
	a) movable guards which provide protection against hazards generated by moving transmission parts shall :		-
	- as far as possible remain fixed to the machinery or other structure (generally by means of hinges or guides) when open;	by means of guides or hinges	P
	- be interlocking guards (with guard locking when		N

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Clause	Requirement-Test	Result-Remark	Verdict
	necessary) (see ISO 14119)		
	b) movable guards against hazards generated by non-transmission moving parts shall be designed and associated with the machine control system so that:		-
	- moving parts cannot start up while they are within the operator's reach and the operator cannot reach moving parts once they have started up ; 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 (see 4.11.6)		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 :		-
	- 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
	An interlocking guard with a start function may be used provided that		-
	- all requirements for interlocking guards are satisfied (see ISO 14119)		N
	- the cycle time of the machine is short		N
	- the maximum opening time of the guard is present to a low value (e.g. equal to the cycle time). When this time is exceeded, the hazardous function(s) cannot be initiated by the closing of the interlocking guard with a start function and resetting is necessary before restarting the machine.		N
	- the dimensions or shape of the machine do not allow a person, or part of a person, to stay in the hazard zone or between the hazard zone and the guard while the guard is closed (see ISO 14120)		N
	- all other guards 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 (see 4.11.6)- that its failure cannot		N

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Clause	Requirement-Test	Result-Remark	Verdict
	lead to an unintended/unexpected start-up;		
	- the guard is securely held open (e.g. by a spring or counterweight)such that it cannot initiate a start while falling by its own weight;		N
6.3.3.2.6	Hazards from guards		P
	Care shall be taken to prevent hazards which might be generated by :		-
	- the guard construction (e.g. sharp edges or corners, material);	No harp edges and corners.	P
	- the movements of the guards (shearing or crushing zones generated by power-operated guards and by heavy guards which are liable to fall)		N
6.3.3.3	Technical characteristics of protective devices		P
	Protective devices shall be selected or designed and connected to the control system so as to ensure correct implementation of their safety function (s) is ensured.		P
	Protective devices shall be selected on the basis of their having met the appropriate product standard (for example, IEC 61496 for active optoelectronic protective devices) or shall be designed according to one or several of the principles formulated in ISO 13849-1 or IEC 62061.		P
	Protective devices shall be installed and connected to the control system so that they cannot 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 where it s known that this fitting will be necessary because the work to be done on it will vary.		N
6.3.4	Safeguarding for reducing emissions		P
6.3.4.1	General		
	If the measures for the reduction of emissions at source mentioned in 6.2.2.2 are not adequate, the machine shall be provided with additional protective measures (see 6.3.4.2 to 6.3.4.5).		P
6.3.4.2	Noise		P
	Additional protective measures include, for example: - enclosures (see ISO 15667) - screens fitted to the machine; - silencers (see ISO 14163)	Enclosures	P
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		N

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Clause	Requirement-Test	Result-Remark	Verdict
	mounting or suspended seats.		
	For measures for vibration isolation of stationary industrial machinery see EN 1299		N
6.3.4.4	Hazardous substances		P
	Additional protective measures include, for example:		-
	- encapsulation of the machine (enclosure with negative pressure);	Encapsulation of the machine	P
	- 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:		-
	- use of filtering and absorption;		N
	- use of attenuating screens or guards		N
6.3.5	Complementary protective measures		P
6.3.5.1	General		P
	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.Such measures include, but are not limited to , the ones dealt with in 6.3.5.2 to 6.3.5.6		P
6.3.5.2	Components and elements to achieve the emergency stop function		P
	If following a risk assessment, a machine needs to be fitted with components and elements to achieve an emergency stop function to enable actual or impending emergency situations to be averted, the following requirements apply:		-
	- the actuators shall be clearly identifiable, clearly visible and readily accessible		P
	- the hazardous process shall be stopped as quickly as possible without creating additional hazards . If this is not possible or the risk cannot be reduced, it should be questioned whether implementation of an emergency stop function is the best solution;		N
	- the emergency stop control shall trigger or permit the triggering of certain safeguard movements where necessary.		P
	Once active operation of the emergency stop device has ceased following an emergency stop command, the		P

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	effect of this command shall be sustained until it is reset.		
	This reset shall be possible only at that location where the emergency stop command has been initiated.The reset of the device shall not restart the machinery , but only permit restarting.		P
	More details for the design and selection of electrical components and elements to achieve the emergency stop function are provided in EN 60204 series.		P
6.3.5.3	Measures for the escape and rescue of trapped persons		P
	Measures for the escape and rescue of trapped persons may consist e.g. of :		-
	- escape routes and shelters in installations generating operator-trapping hazards		P
	- 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		P
6.3.5.4	Measures for isolation and energy dissipation		P
	Especially with regard to their maintenance and repair , machines shall be equipped with the technical means to achieve the isolation from power supply(ies) and dissipation of stored energy as a result of following actions:		P
	a) isolating (disconnecting, separating) the machine (or defined parts of the machine) from all power supplies;		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;		N
	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
	See ISO 14118:2000, clause 5 and EN 60204-1:2006, 5.5 and 5.6	See the test report of EN 60204-1.	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.	Provided with suitable attachment devices for transport by means of lifting	P

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Clause	Requirement-Test	Result-Remark	Verdict
		gear.	
	These attachments may be, among others,		-
	- standardized lifting appliances with slings, hooks, eyebolts, or tapped holes for appliance fixing;	slings	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; See also 6.4.4c)（ item 3).	Not removed manually in operation	N
6.3.5.6	Measures for safe access to machinery		N
	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.	Comply with requirements	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
	The walking areas shall be made from materials which remain as slip resistant as practicable under working conditions and, depending on the height from the ground, suitable guard-rails (see ISO 14122-3) shall be provided.	Comply with requirements	P
	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 sations)		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

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Clause	Requirement-Test	Result-Remark	Verdict
	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.		P
	Movement of the lifting platform shall be prevented while the guards are open.		P
	For detailed provisions see ISO 14122.		N
6.4	Information for use		P
6.4.1	General requirements		P
6.4.1.1	Drafting information for use is an integral part of the design of a machine (see figure 2).		P
	Information of use consists of communication links, such as texts, words, signs, signals, symbols or diagrams, used separately or in combination to convey information to the user. It is directed to professional and/or non-professional users.		P
6.4.1.2	Information shall be provided to the user about the intended use of the machine, taking into account, notably, all its operating modes.	See the instruction	P
	The information shall contain all directions required to ensure safe and correct use of the machine. With this in view, it shall inform and warn the user about residual risk.	See the instruction	P
	The information shall indicate, as appropriate,		-
	- the need for training,	See the instruction	P
	- the need for personal protective equipment,		P
	- the possible need for additional guards or protective devices (see Figure 2, Footnote d).	See the instruction	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.	See the instruction	P
6.4.1.3	Information for use shall cover, separately or in combination, transport, assembly and installation, commissioning, use of the machine (setting, teaching/programming or process changeover, operation, cleaning, fault-finding and maintenance) and, if necessary, dismantling, disabling and scrapping.	See the instruction	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		P

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Clause	Requirement-Test	Result-Remark	Verdict
	to be given:		
	- in /on the machine itself (see 6.3 and 6.4.4)	Adequate information is stated in the machine itself.	P
	- in accompanying documents (in particular instruction handbook , see 6.4.5)	See the instruction	P
	- on the packaging	Adequate information is stated on the packaging	P
	- by other means such as signals and warnings outside the machine.	Signals and warnings outside the machine.	P
	Standardized phrases shall be considered where important messages such as warnings need to be given (see also IEC 62079)		P
6.4.3	Signals and warning devices		P
	Visual signals (e.g. flashing lights) and audible signals (e.g. sirens) may be used to warn of an impending hazardous event such as machine start-up or overspeed.	Signals and warning devices are provided.	P
	Such signals may also be used to warn the operator before the triggering of automatic protective measures (see last paragraph of 5.2.7)	Please the related clause.	P
	It is essential that these signals:		-
	- be emitted before the occurrence of the hazardous event; - be unambiguous; - be clearly perceived and differentiated from all other signals used; - be clearly recognized by the operator and other persons.	Unambiguous, clearly perceived, clearly recognized	P
	The warning devices shall be designed and located such that checking is easy.		N
	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:		-
	a) for its unambiguous identification, at least :		-
	- name and address of the manufacturer; - designation of series or type; - serial number, if any.		P

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Clause	Requirement-Test	Result-Remark	Verdict
	b) in order to indicate its compliance with mandatory requirements; - marking; - written indications (e.g. for machines intended for use in potentially explosive atmosphere)		N
	c) for its safe use, e.g. :		-
	- maximum speed of rotating parts;		N
	- maximum diameter of tools;		N
	- mass (expressed in kilograms) of the machine itself and/or of removable parts		N
	- maximum working load;		N
	-necessity of wearing personal protective equipment;		P
	- guard adjustment data;		P
	- frequency of inspection.	See the instruction	P
	Information printed directly on the machine should be permanent and remain legible throughout the expected life of the machine.	Permanent and remain legible	P
	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.		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
	Markings shall comply with recognized standards (see ISO 2972, ISO 7000, particularly for pictograms, symbols , colours) See EN 60204 series as regards marking of electrical equipment.	All the markings are standard.	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:		-

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Clause	Requirement-Test	Result-Remark	Verdict
	a) information relating to transport, handling and storage of the machine e.g. : - storage conditions for the machine; - dimensions , mass value(s), position of the centre (s) of gravity; - indications for handling (e.g. drawings indicating application points for lifting equipment)	All the related information is stated in the instruction handbook	P
	b) information relating to installation and commissioning of the machine, e.g. - fixing/anchoring and vibration dampening requirements; - assembly and mounting conditions; - space needed for use and maintenance; - permissible environmental conditions (e.g. temperature, moisture, vibration, electromagnetic radiation); - instructions for connecting the machine to power supply (particularly about protection against electrical overloading); - advice about waste removal /disposal; - if necessary, recommendations about protective measures which have to be taken by the user; e.g. additional safeguards, safety distances, safety signs and signals.	All the related information is stated in the instruction handbook	P
	c) information relating to the machine itself, e.g. : - detailed description of the machine, its fittings, its guards and/or protective devices; - 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. - diagrams ; - data about noise and vibration generated by the machine, about radiation , gases, vapours, dust emitted by it, with reference to the measuring methods used. - technical documentation about electrical equipment - documents attesting that the machine complies with mandatory requirements;	All the related information is stated in the instruction handbook	P

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Clause	Requirement-Test	Result-Remark	Verdict
	d) information relating to the use of the machine, e.g. about: - intended use; - description of manual controls (actuators); - setting and adjustment; - modes and means for stopping - risks which could not be eliminated by the protective measures taken by the designer; - 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. - reasonably foreseeable misuse and prohibited usages; - fault identification and location , repair, and re-starting after an intervention; - personal protective equipment which need to be used and training required.	All the related information is stated in the instruction handbook	P
	e) information for maintenance e.g. - nature and frequency of inspections for safety functions; - 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) - instructions relating to maintenance actions (e.g. replacement of parts) which do not require specific skills and hence may be carried out by users (e.g. operators) - drawings and diagrams enabling maintenance personnel to carry out their task rationally	All the related information is stated in the instruction handbook	P
	f) information relating to de-commissioning , dismantling and disposal;	See the instruction handbook	P
	g) information for emergency situations , e.g. : - type of fire-fighting equipment to be used. - 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.	All the related information is stated in the instruction handbook	P
6.4.5.2	Production of the instruction handbook		P

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Clause	Requirement-Test	Result-Remark	Verdict
	a) type and size of print shall ensure the best possible legibility. Safety warnings and/or cautions should be emphasized the use of colours, symbols and/or large print.	Legibility.	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.	English	P
	c) whenever helpful to the understanding, text should be supplemented with written details enabling , for instance, manual controls (actuators) to be located and identified; they should not be separated from the accompanying text and should follow sequential operations.	See the Instruction handbook.	P
	d) consideration should be given to presenting information in tabular form where this will aid understanding. Tables should be adjacent to the relevant text.	See the Instruction handbook.	P
	e) the use of colours should be considered, particularly in relation to components requiring quick identification.		N
	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 readily available to the operator.		P
6.4.5.3	Drafting and editing information for use		P
	a) relationship to model : the information shall clearly relate to the specific model of machine and, if necessary, other appropriate identification (for example, by serial number).	See the difference between the models	P
	b) communicate principles : when information for use is being prepared, the communication process “see-think-use” should be followed in order to achieve the maximum effect and should follow sequential 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

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Clause	Requirement-Test	Result-Remark	Verdict
	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.	Not for non-professional use	N
	e) durability and availability of the documents : documents giving instructions for use should be produced in durable form (i.e. they should be able to survive frequent handling by the user). It may be useful to mark them “keep for future reference”. Where information for use is kept in electronic form (e.g. CD, DVD, tape) information on safety-related issues that need immediate action shall always be backed up with a hand copy that is readily available.	Kept in electronic form	P
7	Documentation of risk assessment and risk reduction		P
	The documentation shall demonstrate the procedure that has been followed and the results that have been achieved. This includes, when relevant, documentation of		-
	a) the machinery for which the risk assessment has been made (for example, specifications, limits, intended use);		P
	b) any relevant assumptions that have been made (loads, strengths, safety factors, etc.);		P
	c) the hazards and hazardous situations identified and the hazardous events considered in the risk assessment;		P
	d) the information on which risk assessment was based (see 5.2):		-
	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;	Warning sign and wear PPE	P
	g) residual risks associated with the machinery;		P
	h) the result of the risk assessment (see Figure 1);	See the risk assessment report.	P
	i) any forms completed during the risk assessment.		P

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Clause	Requirement-Test	Result-Remark	Verdict
	Standards or other specifications used to select protective measures referred to in f) above should be referenced.		P

EN 60204-1:2018			
Clause	Requirement – Test	Result - Remark	Verdict

1	**Scope**		--
	This standard applies to the application electrical and electronic equipment and systems to machines.	The product is within the scope of IEC/EN 60204-1 for industrial use.	**Pass**

4	**General requirements**		--
4.1	General		**Pass**
4.2	Selection of equipment		**Pass**
4.3	The electrical equipment shall operate correctly under full load.	According to marking on the equipment and function test, the electrical equipment would operate correctly.	**Pass**
4.3.1	a.c. supplies	Ditto	**N/A**
	Voltage variations: 0,9 - 1,1		**Pass**
	Frequency variation: 0,99 - 1,01 0,98 - 1,02	Ditto	**N/A**
	Harmonics distortion: 10% 2nd to 5th harmonics 12% 6th to 30th harmonics	Ditto	**N/A**
	Voltage unbalance in 3-phase supplies	Ditto	**N/A**
	Voltage impulses (1,5ms ....)	Ditto	**N/A**
	Voltage interruption (3ms)	Ditto	**N/A**
	Voltage dips (20%)	Ditto	**N/A**
4.3.2	d.c. supplies		**N/A**
	From batteries:		**N/A**
	Voltage variations: 0,85 - 1,15 0,7 - 1,2		**N/A**
	Voltage interruption (5ms)		**N/A**
	From converting equipment		**N/A**
	Voltages variations: 0,85 - 1,15 0,7 - 1,2		**N/A**
	Voltage interruption (5ms)		**N/A**
	Ripple (0,05% of nom. voltage)		**N/A**
4.4	Physical environment and operating condition	Reference to instruction	--
4.4.1	Electromagnetic compatibility (EMC)		**Pass**
	Withstand test specified in EN61004-6-4，EN61000-6-2	Complies	**Pass**

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Clause	Requirement – Test	Result - Remark	Verdict
4.4.2.	Temperature, between 5°C to 40 °C Average temp. not more than +35°C	According to the instruction manual, this machine is designed within this range.	**Pass**
	Temperature, between 5°C to 40 °C	Ditto	**Pass**
4.4.3.	Humidity:	Ditto	**Pass**
4.4.4.	Altitude: max 1000m	Ditto	**Pass**
4.4.5.	Contaminants: Adequate protection against the ingress of solid bodies and liquids.		**Pass**
4.4.6.	Ionizing and non-ionizing radiation: When the equipment is subject to radiation	Not applicable	**N/A**
4.4.7.	Vibration, shock and bump.	No particular requirements for vibration, shock & bump are found required, unless otherwise special agreement.	**Pass**
4.5	Transportation and storage. -25 to +55 °C and short periods up to +70 °C	According to safe instruction of instruction manual, this machine is designed within this range.	**Pass**
4.6	Provisions for handling. Suitable means for handling by cranes or similar equipment.	Not applicable	**N/A**
4.7	Installation and operation Suppliers instruction	All the electrical equipment have been installed, and operated in accordance with the supplier‘s manual.	**Pass**
5.0	**Incoming supply conductors termination and devices for disconnecting and switching of.**		**--**
5.1	Incoming supply conductor termination		**--**
	Single or multiple power supply		**Pass**
	Separate terminals	Separate terminals have been provided.	**Pass**
	Plug provided with the machine	Not applicable	**N/A**
	Neutral conductor labelled and marked in installation instruction.		**N/A**
	Connection between protective earth and neutral.		**N/A**
	Identification of incoming supply connection.		**Pass**
5.2	External protective conductor terminal	No such terminals	**N/A**
	The placing of the terminal		**N/A**
	Size of the terminal		**N/A**

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Clause	Requirement – Test	Result - Remark	Verdict
	Marking of the external protective conductor with letters “PE”		**N/A**
	Other protective terminals shall be marked with the symbol 417-IEC-5019 or by use of bicolour combination GREEN-AND-YELLOW		**N/A**
5.3	Supply disconnecting (isolating) device		**--**
5.3.1	Hand operated disconnect device for each incoming device.		**N/A**
	Interlocks	Single supply disconnector, no need	**N/A**
5.3.2	a) Switch-disconnecting device b) A disconnector with auxiliary device c) Circuit breaker d) Plug / socket combination.		**Pass**
5.3.3	Requirements		**--**
5.3.3.1	General		**N/A**
	Marked with “I” and “O”		**N/A**
	When “Off” then all conductors are open		**N/A**
	Have an external operating handle. Not emergency stop device and not RED.		**N/A**
	Means to be locked in “OFF” position		**N/A**
	Disconnect all live conductors		**N/A**
	Breaking capacity		**N/A**
5.3.3.2	Power operated circuit-breakers		**N/A**
	Means for manual operation		**N/A**
	Manual as well as remote closing		**N/A**
5.3.4	Disconnect device shall be easily accessible. 0,6 and 1,9 m		**Pass**
5.3.5	Excepted circuits - lightning - plug / Socked circuits - Undervoltage protection - Circuits supplying equipment - Control circuits	No excepted circuit	**N/A**
	Warning label for excepted circuits - Warning label at disconnect device - Warning label at each circuit - Statement in maintenance manual	Not applicable	**N/A**
5.4	Not applicable		**N/A**

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Clause	Requirement – Test	Result - Remark	Verdict
5.5	Devices for disconnecting electrical equipment		**N/A**
5.6	Protection against unauthorized, inadvertent and/or mistaken connection		**N/A**
6	**Protection against electric shock**		**--**
6.1	General: Protections against: - direct contact; and - indirect contact	According clause 6.2. and 6.3., No PELV of clause 6.4., it is not applicable.	**Pass**
6.2	Protection against direct contact. 6.2.1. and 6.2.2. are applicable and 6.2.3. shall be applied		**Pass**
6.2.1	Protection by enclosures.		**Pass**
	Minimum protection : IP4X or IPXXB		**N/A**
a)	Use of key or tool for access for skilled persons.		**N/A**
	Minimum requirement inside doors: IP1X or IPXXA		**N/A**
	Minimum requirement inside doors for live parts which are likely to be touched: IP2X or IPXXB		**Pass**
	Rooms used as enclosures which are accessible only to skilled persons, then IEC 364-4-41, IEC 364-4-47 and EN 60439-1 apply.	Not applicable	**N/A**
b)	Interlocking of doors		**N/A**
	Device or tools to defeat the interlock		**N/A**
	Disconnect device shall be protected against direct contact to at least IP2X or IPXXB		**N/A**
	Warning sign according to 18.2		**N/A**
c)	without use of key or tool		**N/A**
	Protected against direct contact to at least IP2X or IPXXB		**N/A**
	Where barriers are used then tool or disconnect device are required.		**N/A**
6.2.2	Protection by insulation of live parts		**Pass**
	Live part shall be covered by insulation which withstand mechanical, chemical, electrical and thermal stresses during normal service conditions.		**Pass**
	Protection against residual voltages		**Pass**

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Clause	Requirement – Test	Result - Remark	Verdict
	After disconnection the voltage shall drop to 60V or less within 5 second.		**Pass**
	Exemption: - Components with stored charge of 60μC or less or - If the rate of discharge does interfere with the proper function of the equipment.	No this situation	**N/A**
	Warning notice located on or adjacent to the enclosure.	No this situation	**N/A**
	Plugs: Discharge time shall not exceed 1 second.	No this situation	**N/A**
	Exemption: The conductors are protected against direct contact to at least IP2X or IPXXB.	No this situation	**N/A**
6.3	Protection against indirect contact		**Pass**
	Hazardous condition when insulation fails between live parts and exposed conductive parts.	According to clause 6.3.2. and 6.3.3. to fulfil with statement.	**Pass**
	Each circuit or part one of 6.3.1, 6.3.2 or 6.3.3 shall be applied.	See following test	**Pass**
6.3.1	Protection by automatic disconnection of supply.	No device of able automatic disconnection of supply	**N/A**
	Protective bonding circ		**N/A**
	Protective device for automatic disconnection of the supply in case of insulation failure.		**N/A**
	Co-ordination between type of power supply and disconnect device accordance with 413.1 of IEC 364-4-41		**N/A**
6.3.2	Protection by use of Class II equipment or by equivalent insulation		**N/A**
	- Use of class II electrical device or reinforced or by equivalent insulation.		**N/A**
	- Use of switchgear and controlgear assemblies		**N/A**
	- application of supplementary or reinforced insulation according to IEC 364-4-41		**N/A**
6.3.3	Protection by electrical separation		**Pass**

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Clause	Requirement – Test	Result - Remark	Verdict
	Electrical separation by an individual circuit to prevent shock current through contact with exposed conductive parts. IEC 364-4-41 shall apply.		**Pass**
6.4	Protection by use of PELV (Protective Extra Low Voltage).	No PELV circuit	**N/A**
	PELV shall satisfy all of the following conditions: a) Max 25 Vac or 60Vdc b) Max current when failure to 1A a.c. or 0,2A d.c. c) Max 80 mm2 of area not protected. d) Only indoor with dry condition. e) Source of supply shall be insulated according to with higher voltage according to 6.3.3 and 15.1.3 f) PELV circuit shall be bonded to protective earth. g) Exposed conductive parts associated with PELV shall be insulated or bonded. h) Plugs and socket outlets: 1) Plugs shall not be able to enter other sockets than in PELV circuits 2) Socket outlets shall exclude plugs from other circuits than PELV i) Where this circuits are used as control circuits then they shall also fulfil the relevant requirements of clause 9.		**N/A**
7	**Protection of equipment**		**--**
7.1	General		**Pass**
7.2	Overcurrent protection		**Pass**
7.2.1	Supply conductors		**Pass**
	The supplier is not responsible for the overcurrent device for the supply conductors.		**Pass**
	Installation diagram with data necessary for selection of overcurrent protective device.		**Pass**
7.2.2	Power circuits		**Pass**
	All live conductors except earthed neutral conductor shall be protected against overcurrent.		**Pass**

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Clause	Requirement – Test	Result - Remark	Verdict
	Cross section area for Neutral conductor is at least equal to or equivalent to that of the phase conductors. It is not necessary		**N/A**
	For Neutral conductors smaller than phase conductors then IEC 60364-4-473 shall apply	The clause has been met.	**Pass**
	For IT power system it is generally necessary to provide an overcurrent protection.	No IT power system	**N/A**
7.2.3	Control circuits		**Pass**
	Conductors for control circuits connected to supply voltage shall be protected against overcurrent according to 7.2.2	Conductors for control circuit have overcurrent protective device in approved switch power supply.	**Pass**
	Control circuits feed through a transformer		**N/A**
7.2.4	Socket outlets and their associated conductors		**Pass**
	Overcurrent protection is required for socket outlets		**Pass**
	Provided in phase conductors	Not applicable	**N/A**
7.2.5	Local lightning circuits	Without local lighting circuit	**N/A**
	Separate protected by overcurrent device	Not applicable	**N/A**
7.2.6	Transformers		**N/A**
	Transformers shall be protected against overcurrent in accordance with IEC 76-5 and EN 60742	Not applicable	**N/A**
7.2.7	Location of overcurrent protective device		**N/A**
	Overcurrent protective device shall be located where the conductors are connected to the power supply.		**Pass**
7.2.8	Overcurrent protective device		**Pass**
	The breaking capacity		**Pass**
7.2.9	Rating and setting of overcurrent device		**Pass**
7.3	Overload protection of motors		**Pass**
7.4	Abnormal temperature protection		**Pass**
7.5	Protection against supply interruption or voltage reduction and subsequent restoration		**Pass**
7.6	Motor overspeed protection		**Pass**
7.7	Earth fault/residual current protection	Not applicable	**N/A**
7.8	Phase sequence port	Not applicable	**N/A**

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Clause	Requirement – Test	Result - Remark	Verdict
7.9	Protection against overvoltages due to lightning and to switching surges	Not applicable	**N/A**
8	**Equipotent bonding**		**--**
8.1	General		**Pass**
8.2	Protective bonding circuit		**Pass**
8.2.1	General		**Pass**
8.2.2	Protective conductors		**Pass**
8.2.3	Continuity of the protective bonding circuit		**N/A**
8.2.4	Exclusion of switching devices from the protective bonding circuit	No this device	**N/A**
8.2.5	Parts which need not to be connected to the protective bonding circuit		**Pass**
8.2.6	Interruption of the protective bonding circuits		**Pass**
	Protective conductor connecting points		**Pass**
8.2.7	Mobile machines	No this situation	**N/A**
8.2.8	Additional protective bonding requirements for electrical equipment having earth leakage currents higher than 10mA a.c. or d.c.		**N/A**
8.3	Bonding to the protective circuit for operational purposes	No this situation	**N/A**
8.4	insulation failures Measures to limit the effects of high leakage current		**N/A**
8.5	Bonding to a common reference potential	No this situation	**N/A**
8.6	Electrical interference	No this situation	**N/A**
9	**Control circuits and control functions**		**--**
9.1	Control circuits		**--**
9.1.1	Control circuit supply		**Pass**
9.1.2	Control circuit voltages		**Pass**
9.1.3	Protections		**Pass**
9.1.4	Connection to control devices		**Pass**
9.2	Control function		**Pass**
9.2.1	Start functions		**Pass**
9.2.2	Stop functions		**Pass**
9.2.3	Operating modes		**N/A**
9.2.4	Suspensions of safeguards		**N/A**
9.2.5	Operation		**Pass**
9.2.5.1	General		**Pass**
9.2.5.2	Start		**Pass**
	Interlocks		**N/A**

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Clause	Requirement – Test	Result - Remark	Verdict
	Machines which require more than one control station to indicate a start.	Not applicable	**N/A**
9.2.5.3	Stop		**Pass**
	Interlocks		**N/A**
	The reset of the stop function		**N/A**
	Machines which require more than one control station to indicate a start.	Not applicable, only one starts.	**N/A**
9.2.5.4	Emergency stop		**N/A**
9.2.5.5	Monitoring of command actions		**N/A**
9.2.6	Other control functions		**N/A**
9.2.6.1	Hold-to-run controls	No this device	**N/A**
9.2.6.2	Two-hand control	No this device	**N/A**
9.2.6.3	Enabling control		**N/A**
9.2.6.4	Combined start and stop controls		**N/A**
9.2.7	Cableless control	Not applicable	**N/A**
9.3	Protective interlocks		**N/A**
9.3.1	Restoration of interlocked safeguards	Not applicable	**N/A**
9.3.2	Overtravel limits		**N/A**
9.3.3	Operation of auxiliary functions	Not applicable	**N/A**
9.3.4	Interlocks between different operations and for contrary motions		**N/A**
9.3.5	Reverse current breaking	No this device	**N/A**
9.4	Control functions in case of failure		**N/A**
9.4.1	General requirements		**N/A**
9.4.2	Measures to minimize risk in case of failure		**N/A**
9.4.2.1	Use of proven circuit techniques and components		**N/A**
9.4.2.2	Provision of redundancy		**N/A**
9.4.2.3	Use of diversity		**N/A**
9.4.2.4	Functional test		**N/A**
9.4.3	Protection against maloperations due to earth faults and voltage interruption		**N/A**
9.4.3.1	Earth faults		**N/A**
9.4.3.2	Voltage interruptions		**N/A**
9.4.3.3	Loss of circuit continuity		**N/A**
10	**Operator interface and machine mounted control devices**		**--**
10.1	General	Comply with requirement	**N/A**
10.1.1	Location and mounting		**N/A**
10.1.2	Protection		**N/A**

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Clause	Requirement – Test	Result - Remark	Verdict
10.1.3	Position sensors	Not applicable	**N/A**
10.2	Push-buttons		**Pass**
10.2.1	Colours		**Pass**
10.2.2	Markings	Markings are compliance with IEC-417	**Pass**
10.3	Indicator lights and displays		**Pass**
10.3.1	Modes of use		**Pass**
10.3.2	Colours		**Pass**
10.3.3	Flashing lights	No this device	**N/A**
10.4	Illuminated push-buttons		**Pass**
10.5	Rotary control devices	Not applicable	**N/A**
10.6	Start devices	They are constructed to minimize inadvertent operation.	**N/A**
10.7	Emergency stop devices		**--**
10.7.1	Location of emergency stop devices E		**N/A**
10.7.2	Types		**N/A**
10.7.3	Colour of actuators		**Pass**
10.7.4	Local operation of the supply disconnecting device to effect emergency stop	Not applicable	**N/A**
10.7.5	Use of means of disconnection	No this situation	**N/A**
10.8	Emergency switching off device		**N/A**
10.8.1	Location	Operation location	**N/A**
10.8.2	Types		**N/A**
10.8.3	Colour of actuators		**N/A**
10.8.4	Local operation of the supply disconnecting device to effect emergency switching off		**N/A**
10.9	Enabling control device	No this situation	**N/A**
11	**Electronic equipment**		**--**
11.1	General		**Pass**
11.2	Basic requirements	Indications of state about input and output are supplied.	**Pass**
11.2.2	Electronic control equipment		**Pass**
11.2.3	Equipotent bonding		**N/A**
11.3	Programmable equipment	Not applicable	**N/A**
11.3.1	Programmable controllers	Not applicable	**N/A**
11.3.2	Memory retention and protection	The clause has been met.	**Pass**
11.3.3	Programming equipment	Not applicable	**N/A**
11.3.4	Software verification	Software verification has been carried out.	**N/A**
11.3.5	Use in safety-related functions	It has been tested.	**Pass**

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Clause	Requirement – Test	Result - Remark	Verdict
11	**Controlgear: location, mounting and enclosures**		**--**
11.1	General requirements		**Pass**
11.2	Location and mounting		**Pass**
11.2.1	Accessibility and maintenance	Not applicable	**N/A**
11.2.2	Segregation		**Pass**
11.2.3	Heating effects		**Pass**
11.3	Degrees of protection		**Pass**
11.4	Enclosures, doors and openings		**Pass**
11.5	Access to controlgear Minimum dimension of gangways	No this situation	**N/A**
12	**Conductors and cables**		**--**
12.1	General requirements		**Pass**
12.1	General requirements	Suitable for the operating condition.	**Pass**
12.2	Conductors		**Pass**
12.3	Insulation		**Pass**
12.4	Current carrying capacity in normal service		**Pass**
12.5	Voltage drop		**Pass**
12.6	Minimum cross-section area		**Pass**
12.6	Flexible cables		**Pass**
12.6.1	General		**Pass**
12.6.2	Mechanical rating		**Pass**
12.6.3	Current-carrying capacity of cables wound on drums		**Pass**
12.7	Collector wires, collector bars and slip-ring assemblies		**N/A**
12.7.1	Protection of against direct contact		**Pass**
17.2	Protective conductor circuit	Not applicable	**N/A**
12.7.3	Protective conductor current collectors	Not applicable	**N/A**
12.7.4	Removable current collectors with a disconnector function	Not applicable	**N/A**
12.7.5	Clearances in air （IEC60664-1)		**Pass**
12.7.6	Creepage distance (IEC60664-1)		**Pass**
12.7.7	Conductor system section	Not applicable	**N/A**
12.7.8	Construction and installation		**Pass**
13	**Wiring practices**		**--**
13.1	Connection and routing		**Pass**

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Clause	Requirement – Test	Result - Remark	Verdict
13.1.1	General requirements	Compliance by inspection	**Pass**
13.1.2	Conductor and cable runs	Compliance by inspection	**Pass**
13.1.3	Conductors of different circuits	Compliance by inspection	**Pass**
13.2	Identification of conductors		**Pass**
13.2.1	General requirements	Conductors can be identifiable	**Pass**
13.2.2	Identification of the protective conductor		**Pass**
13.2.3	Identification of Neutral conductor		**Pass**
13.2.4	Identification by colour		**Pass**
13.3	Wiring inside enclosures	Compliance by inspection	**Pass**
13.4	Wiring outside enclosures		**Pass**
13.4.1	General requirements	IP is the same with enclosure.	**Pass**
13.24.2	External ducts	Compliance by inspection	**Pass**
13.4.3	Connection to moving elements of the machine	No this situation	**N/A**
13.4.4	Interconnection of devices on the machine	Compliance by inspection	**Pass**
13.4.5	Plug and socket connection		**Pass**
13.4.6	Dismantling for shipment	Compliance by inspection of instruction manual	**Pass**
13.4.7	Additional conductors	Not applicable	**N/A**
13.5	Ducts, connection and junction boxes		**Pass**
13.5.1	General requirements	No sharp edges	**Pass**
13.5.2	Percentage fill of ducts	Suitable	**Pass**
13.5.3	Rigid metal conduit and fittings	Conduits are securely held in place.	**Pass**
13.5.4	Flexible metal conduit and fittings		**Pass**
13.5.5	Flexible non-metal conduit and fittings		**N/A**
13.5.6	Cable trunking systems		**Pass**
13.5.7	Machines compartments and cable trunking systems	Not applicable	**N/A**
13.5.8	Connection boxes and other boxes		**Pass**
13.5.9	Motor connection boxes		**Pass**
14	**Electric motors and associated equipment**		**--**
14.1	General requirements (IEC60034)		**Pass**
14.2	Motor enclosures		**Pass**
14.3	Motor dimensions (IEC60072)		**Pass**
14.4	Motor mounting and compartments		**Pass**
14.5	Criteria for motor selections		**N/A**
14.6	Protective devices for mechanical brakes		**N/A**

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Clause	Requirement – Test	Result - Remark	Verdict
15	**Accessories and lightning**		
15.1	Accessories	No accessories	**N/A**
15.2	Local lightning of the machines and equipment		**N/A**
15.2.1	General		**N/A**
15.2.2	Supply		**N/A**
15.2.3	Protection		**N/A**
15.2.4	Fittings		**N/A**
16	**Marking, warning signs and reference designation**		**--**
16.1	General--Nameplates, marking and identification plates	Nameplates, marking and identification plates have been provided.	**Pass**
16.2	Warning signs		**Pass**
16.2.1	Electric shock hazard	Machine is marked with warning signs.	**Pass**
16.2.2	Hot surfaces hazard	Machine is marked with warning signs.	**Pass**
16.3	Functional identification	According to symbol of panel and instruction manual, it is met.	**Pass**
16.4	Marking of control equipment	Marking of equipment is checked by inspection.	**Pass**
16.5	Reference designations	The clause has been met.	**Pass**
17	**Technical documentation**		**--**
17.1	General	English approved	**Pass**
17.2	Information to be provided	The clause has been met.	**Pass**
17.3	Requirements applicable to all documentation	These documents are: Installation diagram, Circuit diagram, Parts list of electrical components, Marking, Instruction manual	**Pass**
18.4	Basic information	Information is fulfilled.	**Pass**
17.4	Installation diagram Documents	Installation diagram is checked by inspection.	**Pass**
17.5	System (bloc) diagram Overview diagrams and function diagrams	The clause has been met.	**Pass**
17.6	Circuit diagrams	Circuit diagram is checked by inspection.	**Pass**

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Clause	Requirement – Test	Result - Remark	Verdict
17.7	Operating manual	Operating of instruction manual is checked by inspection.	**Pass**
17.8	Maintenance manual	Maintenance of instruction manual is checked by inspection.	**Pass**
17.9	Part list	Parts list of electrical components is checked by inspection.	**Pass**
18	**Verification**		**--**
18.1	General	See the following test reports of annex A	**Pass**
18.2	Continuity of the protective bonding circuit		**N/A**
18.3	Insulation resistance test	Refer to the Test report	**Pass**
18.4	Voltage	Refer to the Test report	**Pass**
18.5	Protection against residual voltages	Refer to the Test report	**Pass**
18.6	Functional	Functional tests have carried out.	**Pass**
18.7	Retesting	Refer to instruction manual, being the fulfilment with this statement.	**Pass**

Annex A – Test tables

19.2 for IEC/EN	**TABLE: Continuity of the protective bonding circuit**			**N/A**
Location	Current(A)	Frequency(Hz)	Time(s)	Measured voltage(V)

19.3 for IEC/EN 60204-1	**TABLE: Insulation resistance tests**			**P**
Location	Voltage(V) d.c.	Frequency(Hz)	Time(s)	Measured insulation resistance(MΩ)
Enclosure	420	<30k	60	>100

19.4 for IEC/EN 60204-1	**TABLE: voltage tests**	**P**
test voltage applied between:	Test Voltage (V) a.c / d.c	Breakdown YES/NO
L/N to enclosure with Metal foil	DC1500V	No
T1 primary to secondary	DC1500V	No
One layer of insulation tape	DC1500V	No

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Clause	Requirement – Test	Result - Remark	Verdict
5	Safety requirements and/or protective measures		P
5.1	General		P
	Machinery shall comply with the safety requirements and/or protective measures of this clause. In addition, the machine shall be designed according to the principles of EN ISO 12100 (all parts) for relevant but not significant hazards, which are not dealt with by this document. When choices are necessary for the application of type B standards referred to in this European Standard, i.e. listed in Clause 2, the manufacturer shall carry out an appropriate risk assessment for making these choices. The measures adopted to comply with the requirements of this clause shall take account of the state-of-the-art when more effective technical means become available.		P
5.2	Mechanical safety		P
5.2.1	Guards		P
5.2.1.1	General		P
	When fixed guards have to be removed for periodic maintenance or repair their fixing systems shall remain attached to the guard or machinery when the guards are removed.		P
5.2.1.2	Cutting and severing, friction and abrasion		P
	All moving parts shall be enclosed within the permanent compressor casing or compressor unit cover, enclosure or canopy. When this is not possible, separate guards shall be provided to prevent contact with all rotating and reciprocating parts to minimize the risk of cutting and severing, friction and abrasion to personnel in accordance with Clause 5 of EN 953:1997+A1:2009 and EN ISO 13857 for safety distances.		P
5.2.1.3	Bodily contact		P
	Guards shall be sufficiently rigid so as not to deflect excessively as a result of bodily		P

EN 1012-1			
Clause	Requirement – Test	Result - Remark	Verdict
	contact. Such deflections shall not result in contact with moving parts, or that the deflection should not result in permanent deformation of the guard. The provisions for rigidity of guards shall be in accordance with 5.5.3 of EN 953:1997+A1:2009.		
5.2.1.4	Ejection of parts		P
	Moving parts shall be designed and mounted in such a way that in all foreseeable modes of operation the risk of ejection of parts is minimised. Where the risk assessment identifies a remaining risk of ejection, e.g. a drive belt from a belt driven compressor, then the impact resistance for guarding shall be in accordance with 5.5.2 of EN 953:1997+A1:2009.		P
5.2.1.5	Entry to inlet ducts and enclosures		P
	Atmospheric inlets and inspection openings in inlets shall be provided with protective devices, so that persons cannot be drawn in or danger zones reached when the compressor is running. For this purpose, any openings shall comply with Table 4 of EN ISO 13857:2008 for upper limbs and Table 7 of EN ISO 13857:2008 for lower limbs, when applicable. Openings giving access to moving parts creating a risk of trapping or shearing shall be prevented by either: total enclosure with an interlocked means of access, e.g. door, cover, etc. such that the compressor is shut down when the access is opened and cannot be started until the access is closed; or total enclosure without interlock when access to moving parts, e.g. fan belts, barring gear, timing marks, etc., shall be prevented by local guarding; or without total enclosure when access to moving parts, e.g. fan belts, barring gear, timing marks, etc., shall be prevented by local guarding.		P

EN 1012-1			
Clause	Requirement – Test	Result - Remark	Verdict
	Where service, maintenance or inspection activities require access within the enclosure doors whilst the compressor is still operational, consideration shall be given to the additional hazards created and the measures taken shall be in accordance with 5.2.4 of EN ISO 12100-2:2003. The provisions of 7.3.3 shall also be applied. Where whole body access is required to inlet ducts and enclosures for service, maintenance or inspection the provisions of EN 547-1 shall be followed when determining the minimum dimensions of openings for such whole body access. Where whole body access is required to inlet ducts for service, maintenance or inspection, a guard shall be fitted to prevent unauthorised access. The guard shall be: interlocked such that when the guard is opened the compressor is shutdown and cannot be restarted until the guard is closed; and unintentional closure of the guard is prevented by the use of a trapped key interlock or a padlock where the only key for the trapped key or the padlock is retained by the person entering the inlet duct. Where it is foreseeable that the compressor will remain operational during whole body access to the inlet duct for service, maintenance or inspection, the design of the inlet duct shall be such that the air flow at the entrance to the inlet duct shall be ≤ 2,5m/s2 and in addition a protective grid shall be installed inside the duct to prevent personnel being drawn into the compressor. A safe system of work shall also be identified in accordance with 7.4.1.		
5.2.2	Fluid injection		
	The risk of fluid (gas or liquid) injection into the human body shall be minimized by:		P

EN 1012-1			
Clause	Requirement – Test	Result - Remark	Verdict
	designing and supporting integral pipework, hoses and auxiliaries to withstand vibration, thermal expansion and their own mass, foreseeable external forces, influence of contaminants and external chemical substances; ensuring that all piping which is in a position likely to be damaged is protected, robust and sufficiently supported, but shall be free to move with changing temperature; ensuring that the design of oil/coolant filler plugs does not allow the dangerous release of fluid, e.g. by means of preventing the removal of the filler plug under pressure or an effective warning system; the design and location of pressure vents and drains, shall take account of the velocity of air, gas, vapour or liquid likely to be discharged.		
5.2.3	Loss of stability		P
5.2.3.1	Generally applicable		P
	Compressor units shall be in accordance with 4.6 of EN ISO 12100-2:2003.		P
5.2.3.2	Portable and skid-mounted compressor units		
	The centre of gravity, mainly associated with the engine/compressor combination shall be low enough to ensure that the compressor unit remains stable, without tipping or slipping, when used within intended limits. The provisions of 7.3.2 d) shall be applied to indicate the intended limits. Tyres of a portable compressor unit shall be rated to carry the maximum gross mass of the portable compressor unit at the highest towing speed the compressor unit is intended for. All tyres shall be of the same construction. The support leg or jockey wheel shall be capable of supporting the gross nose weight of the portable compressor unit as defined in the instruction handbook. It shall be possible to securely lock it in the support and towing		N/A

EN 1012-1			
Clause	Requirement – Test	Result - Remark	Verdict
	positions by, for example, a clamping system or removable pin in locating holes. The jockey wheel device shall be positively retained in the draw bar in the event of the operator leaving it unlocked. NOTE Portable compressor units used on-road are also subject to regulations related to motor vehicles and their trailers.		
5.2.4	Slip, trip and fall		P
	If access to elevated areas around a compressor unit is necessary and is an integral part of a compressor unit then these access areas shall be in accordance with 5.5.6 of EN ISO 12100-2:2003. Where such access is provided, permanent means of access to working platforms, walkways, fixed ladders and stairways shall be in accordance with EN ISO 14122-1, EN ISO 14122-2, EN ISO 14122-3 and EN ISO 14122-4. If access to elevated areas is required and is not an integral part of the compressor unit, appropriate installation instructions shall be given in the instruction handbook.		P
5.3	Electrical safety		P
5.3.1	Generally applicable		P
	The electrical equipment of a compressor unit shall be in accordance with EN 60204-1 and/or EN 60204-11 as appropriate.		P
5.3.2	Protection from overload		P
	Where the compressor unit is not fitted with an over-current protection of the power circuit due to it being installed outside the compressor enclosure on site, the provisions of 7.2.1.3.1 shall be followed.		P
5.3.3	Protection from live parts		P
	Where the compressor unit is not fitted with an electrical disconnecting device, the provisions of 7.2.1.3.2 shall be followed. Electrical and instrument cabling shall: be adequately secured and protected; not be in contact with hot surfaces;		P

EN 1012-1			
Clause	Requirement – Test	Result - Remark	Verdict
	have adequate electrical insulation. Cabling and cabling practices shall be in accordance with Clauses 12 and 13 of EN 60204-1:2006.		
5.3.4	Portable and skid-mounted compressor units		
5.3.4.1	General		N/A
	A suitable over-current protection device, e.g. fuse, shall be provided in the electrical installation to protect the wiring harness and the electric equipment. This excludes the pre-heat, starting and charging circuits. Where fuses are provided as over-current protection devices, a type readily available in the country of use shall be selected, or arrangements made for the supply of spare parts.		N/A
5.3.4.2	Fluid, corrosive action		N/A
	Batteries shall be of the type with lifting handles or with lifting points. They shall be mounted and firmly secured so there is no risk of electrolyte splashing on personnel and surrounding equipment.		N/A
5.4	Control systems		P
5.4.1	General		P
	Effective control system design shall be in accordance with 4.11 of EN ISO 12100-2:2003, 9.4 of EN 60204-1:2006 and EN ISO 13849-1.		P
5.4.2	Emergency stop		P
	The need for and provision of an emergency stop shall be in accordance with 5.5.2 of EN ISO 12100-2:2003. A manual emergency stop shall be in accordance with Clause 5 of EN ISO 13849-1:2008 and specifically in 5.2.1 of that standard. Where an emergency stop is identified as a requirement, then this and the stop category shall be in accordance with EN ISO 13850. The emergency stop device shall be coloured in accordance with 4.4.5 of EN ISO		P

EN 1012-1			
Clause	Requirement – Test	Result - Remark	Verdict
	13850:2008 and as shown in A.14 of this standard.		
5.4.3	Manual reset		P
	The requirements for a manual reset after a stop command has been initiated shall be in accordance with 5.5.2 of EN ISO 13849-1:2008 and 9.2.5.3, 9.2.5.4 of EN 60204-1:2006.		P
5.4.4	Start/restart		P
	The requirements for a start and restart shall be in accordance with 5.2.3 of EN ISO 13849-1:2008. Compressor units that are fitted with automatic or remote start controls shall follow the provisions of 7.2.2 b) and c). Automatic or remote start during service, maintenance or inspection shall be prevented by an interlock included in the control system, for example a trapped key system or if software controlled then password protected to prevent inadvertent automatic starting after each shutdown.		P
5.4.5	External influences on electrical equipment		P
	The safety system and other electrical equipment shall be so designed and constructed that they cannot give rise to a hazardous situation in case of disturbances such as: short circuiting; external impacts; interruptions or variations in the supply voltage; earthing faults. Failure of the power supply to the control system shall employ an "oriented failure mode system" in accordance with 4.12.2 of EN ISO 12100-2:2003 having a known failure mode, e.g. bring the machine to a stop.		P
5.4.6	Pneumatic and/or hydraulic control systems		P
5.4.6.1	General		P

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Clause	Requirement – Test	Result - Remark	Verdict
	Where pneumatic and hydraulic equipment forms part of a control system of a compressor unit this shall be in accordance with 4.10 of EN ISO 12100-2:2003 and the following shall apply.		P
5.4.6.2	Conditioning		P
	Compressed air for measuring, control and safety systems shall be conditioned for the purpose and shall be in accordance with 5.3.4.1.1 of EN 983:1996+A1:2008. Hydraulic systems for measuring, control and safety shall be provided with a filter system and shall be in accordance with 5.3.4.1.3 of EN 982:1996+A1:2008. Where the level of contamination is critical in pneumatic control systems then those levels shall be identified by air purity classification system in accordance with ISO 8573-1. Confirmation of the level of aerosol oil contaminants shall be in accordance with ISO 8573-2, for humidity ISO 8573-3 and for particles ISO 8573-4.		P
5.4.7	Pressure or fluid level drops		
	A shut down device shall be fitted to stop the compressor unit in case of the hydraulic fluid level or hydraulic or pneumatic pressure falling below the levels necessary to maintain safe operation. The shut down device shall be in accordance with 5.3.3.2 of EN 983:1996+A1:2008 for pneumatic systems and 5.3.3.2 of EN 982:1996+A1:2008 for hydraulic systems.		P
5.5	Thermal safety		P
	External surfaces, subject to extremes of temperature, exposed to personnel during normal operation of the machine and which may be accidentally touched shall be guarded, e.g. by insulation, where those temperatures cannot be controlled by design. For surface temperatures exceeding + 700C, see EN ISO 13732-1; for surface		P

EN 1012-1			
Clause	Requirement – Test	Result - Remark	Verdict
	temperatures below - 100C, see EN ISO 13732-3. When guarding is not possible there shall be an adequate warning or a symbol as identified by A.7 (hot surface) or A.10 (cold surface). To avoid the risk of hot surfaces due to overheating as a result of a lack of injected oil in the case of starting of oil injected air compressor units at ambient temperatures below 0 °C appropriate measures are required to decrease the oil viscosity before start up to ensure safe operation. The provisions of 5.11.2 shall be applied. In order to avoid 'hot-spots' the immersion heaters used for heating the lubricant shall have power dissipation not greater than 25 kW/m2. The heaters used shall be totally immersed in the oil at all times. To avoid the risk of fire hot piping shall not be in contact with wood or flammable material.		
5.6	Noise		P
	Design considerations shall be given to noise reduction in particular at the source, see EN ISO 11688-1, EN ISO 14163, and EN ISO 15667. Design shall be such that continuous full load operation is possible at the maximum specified ambient temperature, with all noise attenuating devices and measures in place including all doors and access covers closed. NOTE EN ISO 11688-2 gives useful information on noise generation mechanisms in machinery.		P
5.7	Materials and substances processed, used or exhausted		P
5.7.1	Micro-organisms, biological and microbiological substances		P
5.7.1.1	Condensate		P
	Drainage facilities shall be provided to minimize the accumulation of stagnant liquid,		P

EN 1012-1			
Clause	Requirement – Test	Result - Remark	Verdict
	which may promote the growth of micro-organisms. The drainage systems may be either manual or automatic types and shall allow for removal of accumulated liquid from piping and accessories such as water jackets, coolers, pulsation dampers and air receivers. The provisions of 7.2.2 i), j) and k) shall be applied. The compressor unit shall be equipped with, for example, drain traps to allow containment of condensate fluids and subsequent safe draining and disposal.		
5.7.1.2	Water-injected compressor units		P
	The choice of materials in the compressor unit should be designed to prevent the growth of bacteria in the water.		P
5.7.2	Breathing difficulties		P
5.7.2.1	Compressor units driven by internal combustion engines		P
	The relationship between the location of the exhaust outlet and the compressor inlet shall be such that in normal operation the exposure of the compressor inlet to exhaust fumes is minimized. In addition to this requirement the provisions of 7.2.2 d) and 7.3.2 e) and f) shall also apply.		P
5.7.2.2	Nitrogen and inert gases		P
	Where nitrogen or inert gases are processed by a compressor unit leakage can lead to displacement of breathing air. In all areas accessible to personnel within the compressor unit, the concentration of gases that can displace breathing air shall be such that the oxygen level is maintained within the limits identified in EN 12021. Examples to reduce the build-up of nitrogen or inert gases are: the provision of ventilation in the compressor enclosures; installation of a venting line, to discharge the leakage to a safe area. Where two or more compressor units of this		P

EN 1012-1			
Clause	Requirement – Test	Result - Remark	Verdict
	type are in operation the provisions of 7.2.2 h) shall be applied.		
5.8	Fire and explosion		P
5.8.1	Electrostatic phenomena		N/A
	In oil flooded rotary compressor units the air/oil separator and all isolated parts in contact with the compressed air shall be electrically bonded to the containing vessel.		N/A
5.8.2	Oil-flooded rotary air compressor units		N/A
	To reduce the risk of over-heating and the consequent potential for fire or explosion due to a lack of lubrication the compressor's lubrication system shall be so designed that a sufficient quantity of lubricant is injected under all operating conditions, i.e. under normal use as well as under abnormal conditions and operating modes not covered by safety devices, e.g. faulty starting, emergency stop. To ensure a sufficient oil supply at least one of the following techniques shall be employed: oil filters in the main circuit shall have a bypass, which is opened by the differential pressure created across the filter as the filter becomes blocked; the opening pressure to the bypass shall be determined by the volume of oil required to maintain safe operation; the provision of an alarm and/or shut down device sensing the differential pressure across the oil filters in the main circuit; the operating pressure to the alarm and/or shut down device shall be determined by the volume of oil required to maintain safe operation; the provision of an alarm and/or shut down device sensing the oil pressure before entering the compressor; the alarm and/or shut down shall be activated once the oil pressure falls below the level required to maintain safe operation.		

EN 1012-1			
Clause	Requirement – Test	Result - Remark	Verdict
	The design of oil-flooded rotary air compressor units shall be such that the maximum temperature at the delivery flange of the compressor before the oil separator does not exceed 110 ° C under normal operating conditions. Oil-flooded rotary air compressor units shall have an automatic shut-down device to switch the compressor off in the event that the temperature of the compressor oil exceeds the safe limit. The shut-down device shall be actuated at a temperature not exceeding 120 ° C. Where temperatures higher than 120 ° C are employed then lubricants capable of operating at elevated temperatures shall be used. The following types of shut-down devices are acceptable: temperature sensing device acting via an electronic/electrical control or; temperature indicator/gauge switch. The temperature measurement sensor shall be located in the discharge air stream such that the correct oil/air mixture temperature measurement is assured.		
5.8.3	Oil-lubricated reciprocating air compressor units		P
	The design shall be such that the formation of oil-coke in the outlet of each compression stage is reduced to a minimum, and provision shall be made for inspecting and cleaning the air cooler. Provisions for inspection and cleaning may include removable covers or plugs. The following outlet temperatures shall not be exceeded under normal operating conditions when oils rated for these temperatures are used: 220 ° C for single-stage compressors, with a maximum allowable pressure up to 10 bar; 200 ° C for single-stage compressors,		P

EN 1012-1			
Clause	Requirement – Test	Result - Remark	Verdict
	with a maximum allowable pressure greater than 10 bar, 180 ° C for multi-stage compressors with maximum allowable pressure up to 10 bar, 160 ° C for multi-stage compressors with maximum allowable pressure greater than 10 bar. Temperatures higher than those specified above may be permissible when oils rated for higher temperature applications are used and/or special precautions have been taken to minimize the formation of oil-coke. Minimizing the formation of coke is achieved by such measures as reducing the oil carry-over into the top of the cylinder by the use of accurately designed and fitted piston rings. In addition to these requirements the provisions of 7.2.1.4 e) shall also be applied.		
5.8.4	Oil-lubricated reciprocating compressor units operating above 50 bar		N/A
	For oil-lubricated reciprocating compressor units operating above 50 bar the following additional measures shall be taken into consideration: design for low compression temperatures and moderate pressure ratios; specify the lubricant carefully; the incorporation of a gas filter to absorb reactive impurities or impurities having a catalytic action; ensure that any lubricant injected into cylinders is free from air or gas bubbles.		
5.8.5	Compressor units driven by combustion engines		P
	The refuelling point on a combustion engine-driven air compressor unit shall be located away from any hot surfaces. The refuelling point shall be so designed as to minimise any spillage which shall be contained within the structure holding the compressor/engine by the use, for example, of a catchment tray fitted under the engine. Provision shall be		P

EN 1012-1			
Clause	Requirement – Test	Result - Remark	Verdict
	made for the collected spillage to be easily drained off.		
5.9	Ergonomic principles		P
5.9.1	General		P
	Consideration shall be given to ergonomic design principles to include elements such as instruments which shall be located so as to be easily visible from the position in which the controls related to those instruments are operated. Controls and instruments shall be designed and arranged to assist the operator to understand their function and hence avoid operator error. See EN 13861 and EN 614-1 for the application of ergonomic principles to machinery. Manual controls and other frequently used devices shall be arranged to be easily reached and operated without excessive effort. See EN 61310-3 for the location of actuators on machinery. Start and stop devices shall be easy to operate and shall be clearly marked in accordance with EN ISO 13850 and IEC 60417-DB-12M. Where separate start/stop controls are used then the start control shall be identified as given in A.11 and the stop control as given in A.12. Where the start/stop control is combined into one device then this shall be identified as given in A.13. The compressor unit shall be designed and constructed to permit safe handling of fluids during filling, purging, venting, recovery and draining. See EN 614-1 for the interactions between operators and machinery during maintenance and repair.		P
5.9.2	Manual handling of compressor units		P
	The general provisions for easy and safe handling of compressor units and their heavy parts shall be in accordance with 5.5.5 of EN ISO 12100-2:2003 and EN 1005-2 including the specific items identified as follows:		P

EN 1012-1			
Clause	Requirement – Test	Result - Remark	Verdict
	a) Off-road portable compressor units shall meet the following requirements: 1) for machines with a gross mass over 750 kg a parking brake system shall be fitted; 2) for machines with a gross mass less than 750 kg where a parking brake system is not fitted then 7.3.2 i) applies; NOTE Portable compressor units used on-road are also subject to regulations related to motor vehicles and their trailers. b) When the lifting of a compressor unit is required it should preferably have only one lifting point. The design of a lifting bail or bails shall be based on: 1) a minimum vertical load of 2,5 times the machine gross mass which can occur due to acceleration during the lifting; 2) any additional load due to unequal distribution of machine mass. c) Lashing points (tie down) for portable and skid mounted compressor units shall be provided to allow safe securing to a vehicle on which the compressor unit may be transported. Lashing points (tie down) shall be marked according to A.20.		
5.9.3	Portable and skid-mounted compressor units		N/A
	If the load on the tow bar at the point where it is lifted is more than 50 kg, a mechanism shall be provided for lifting the tow bar. Refuelling points shall be easily accessible. NOTE Portable compressor units used on-road are also subject to regulations related to motor vehicles and their trailers.		N/A
5.10	Breaking down of machinery parts and other functional disorders		P
5.10.1	Break-up during operation		P
	Components and assemblies shall be designed for adequate strength taking into consideration the maximum allowable pressure, cyclic load and temperature. The shape of parts under cyclic pressure variation shall be chosen to reduce stress		P

EN 1012-1			
Clause	Requirement – Test	Result - Remark	Verdict
	concentrations and stress levels. Materials selected shall have sufficient ductility and fatigue resistance for the specified and foreseeable stress level that occur. The pressure bearing parts of the compressor/compressor unit made from spheroidal graphite cast iron shall be in accordance with EN 13445-6 including verification of material properties and pressure testing. Pressure containing properties other than for spheroidal graphite cast iron shall be verified by the application of pressure testing identified in 6.1. Materials used shall be compatible with the specified lubricants or other fluids and with the gases being processed. Precautions shall be taken to ensure that the inter-connection of the compressor and the piping system are designed to avoid transmission of unacceptable loads to the piping system. The inter-connection may for instance be formed from flexible piping rated to accept the pressure of the compressed media and the forces generated such as vibration, thermal expansion and foreseeable external forces, e.g. impacts. To prevent the unintended release of stored energy from joints between connecting elements within a compressor unit, e.g. flanged pipes and compressor unit outlet point, seals and gaskets shall be made from materials selected to withstanding the extremes of pressure and temperature to be encountered. Pressurised components, such as the head and cylinder of a reciprocating compressor or the casing of a rotary compressor, where pressure is not a significant design requirement shall have sufficient strength, rigidity and stability to meet the static and dynamic operational effects of the compressor.		

EN 1012-1			
Clause	Requirement – Test	Result - Remark	Verdict
5.10.2	Low temperature operation		P
	Compressors shall be provided with the means of attaching devices to prevent damage from freezing during off-load or non-operational periods. These devices shall be available when compressors are used at temperatures below 0 °C, e.g. heating equipment which may be by direct heating of the coolant/lubricant functions or space heating under the enclosure of a compressor unit. The provisions of 7.2.1.4 a), b), g) and k) shall be applied.		P
5.10.3	Liquid shock		P
	Liquid shock can result in almost complete destruction of the compressor unit and can therefore be the cause of the ejection of parts, the liquid causing the shock or the media processed and leakage of coolant or lubricant. In order to prevent liquid shock either the compressor has to be of a type without internal compression or the intake of liquid in amounts likely to cause the shock shall be avoided. Where liquid resulting from injection, priming or condensation can be present or be formed upstream or inside the compressor, adequate separators, traps and draining facilities shall be installed. If this equipment is not part of the compressor unit then the provisions of 7.2.2 k) shall be applied.		P
5.10.4	Coolant system		
5.10.4.1	General		P
	Precautions shall be taken to prevent detectable pressure rise in the coolant system caused by gas leakage. The cooling system shall be provided with either a means of discharging the coolant due to the excess pressure to a safe area or a means to detect the pressure increase and then bring the compressor unit to a controlled stop.		P

EN 1012-1			
Clause	Requirement – Test	Result - Remark	Verdict
5.10.4.2	Compressor units driven by combustion engines		P
	Provision shall be made to monitor and shut-down a combustion engine driven compressor unit where overheating of the engine can cause either a breakdown of machinery parts or the risk of fire. The temperature and/or coolant level sensing device shall provide a signal to initiate for example the direct shut-off of the fuel supply to the engine or a managed shut down through an electronic control unit if fitted.		P
5.11	Pressure relief – fragmentation		P
5.11.1	General		P
	A pressure relief device or devices shall protect pressure-containing parts if their maximum allowable pressure can be exceeded. A separate pressure relief valve is not required in those cases where the maximum allowable pressure in a separate compartment can only be exceeded due to external pressure supplies. Where a pressure relief valve is not supplied then the provisions of 7.2.1.4 i) shall apply. It shall be determined that, under all foreseeable conditions, the design shall not result in maximum allowable pressure of any compressor compartment being exceeded. Where the maximum allowable pressure is exceeded then this shall not be by more than 10 % and only as a momentary transition. Selection of the pressure relief device shall take into account the operational requirements of pressure and flow rate during the 10 % momentary transition phase. Devices to prevent the maximum allowable pressure from being exceeded shall be: a) pressure relief valves; or b) bursting discs and buckling pins; or c) pressure sensing devices, whose performance level is determined with		P

EN 1012-1			
Clause	Requirement – Test	Result - Remark	Verdict
	reference to 4.5 of EN ISO 13849-1:2008. Such devices shall employ 'redundancy' in accordance with 4.12.3 of EN ISO 12100-2:2003. There shall be at least two of them and they shall be protected against unauthorized adjustment. These devices may provide any one of the following actions: 1) stopping of the prime mover; 2) isolating the pressure system from its supply by shut-off devices; 3) opening of a control valve to exhaust the excess pressure.		
5.11.2	Design specifications of pressure relief devices		P
	Where a pressure relief valve is intended as a safety function device designed to protect pressure equipment against the allowable limits being exceeded, it shall be in accordance with EN ISO 4126-1.		P
5.11.3	Turbo compressor units		P
	Turbo compressor units with atmospheric suction which, by design, cannot attain a pressure of more than 110 % of the maximum allowable pressure are not required to be fitted with a pressure relief device.		P
5.11.4	Multi stage compressor units		P
	All stages and intermediate sections of multi stage compressor units shall be equipped with pressure relief devices set for the respective design pressures to ensure that each stage design pressure cannot be exceeded. If it can be shown that none of the stages can be exposed to pressures higher than the final stage under all foreseeable circumstances including failure mode conditions, and each stage and intermediate section is designed for the maximum		P

EN 1012-1			
Clause	Requirement – Test	Result - Remark	Verdict
	allowable pressure of the final stage, then only the final stage requires a pressure relief valve.		
5.11.5	Application of pressure relief devices at the cooling medium side		P
	Volumes on the cooling media side of a compressor that can be isolated and potentially subject to temperature rises, or in some cases temperature fall, shall be subject to protective measures. Those protective measures may for example include the use of expansion chambers connected to the discharge side of pressure relief devices or where acceptable direct discharge to a safe area to avoid the build-up of pressures in excess of the maximum allowable pressure for the cooling media side.		P
5.12	Information and warning devices		P
	A suitable pressure indicator shall be provided either on the compressor unit or remotely to display the pressure: existing at the final outlet of a compressor; in each separate stage of diaphragm compressors with a maximum allowable pressure exceeding 3 bar; on the pressure side of each separate stage of positive displacement compressors having a shaft input power of more than 20 kW; of lubricant systems equipped with oil pumps on compressors having an input power of more than 75 kW; at the inlet of a compressor having inlet pressure above atmospheric. For additional information on pressure gauges see EN 837-2. Where pressure transducers are used in conjunction with an electronic display the accuracy of the reading shall be equal to or better than the equivalent pressure gauge identified in EN		P

EN 1012-1			
Clause	Requirement – Test	Result - Remark	Verdict
	837-2.		
6	Verification of safety requirements and/or protective measures		P
6.1	Pressure testing		P
	The components or assemblies forming the pressurized gas side and coolant side of the compression space shall be tested in accordance with 10.2.3 of EN 13445-5:2009. For parts pressurised above 2000 bar a test pressure equivalent to 1,3 times the maximum allowable pressure shall be applied. The safe testing practices shall be in accordance with 10.2.3 of EN 13445-5:2009. For compressor produced in batches and designed to operate at maximum allowable pressure not greater than 16 bar, then sample testing is allowed if the energy content of the component does not exceed 200 bar litres.		P
6.2	Noise		P
6.2.1	General		P
	The noise emission values, i.e. the A-weighted emission sound pressure level at the workstation and the Aweighted sound power level, shall be measured, reported, declared and verified in accordance with EN ISO 2151. Compliance with 5.6 may be verified through the comparison of the noise emission values with those for other machines of the same family, of similar size and performance characteristics.		P
6.2.2	Sound power level of compressor units for use outdoors		P
	The sound power level of compressor units for use outdoors is subject to a specific European regulation. Asan exception to 6.2.1, the determination of the sound power level for such compressor units shall comply with this regulation.		P

EN 1012-1			
Clause	Requirement – Test	Result - Remark	Verdict
6.3	Stability of portable compressor units		N/A
	The safe road towing stability of a portable compressor unit shall be verified by practical tests. The test shall be conducted on a portable compressor unit loaded as intended for use, e.g. including fuel, hoses and tools. Tyre pressures shall be adjusted as specified in the instructions for use. The portable compressor unit shall be towed on a representative highway road surface for use at intended road speeds up to the maximum rated speed as given in the information for use.		N/A
6.4	Structure of verification		P
	Table 2 — Structure of verification Safety requirements / Visual check / Functional check / Measurement / Reference to clauses of this standard or to other standards 5.2 Mechanical safety 5.2.1 Guards: x / / x 5.2.1.2 Cutting and severing, friction and abrasion: x / x / / EN 953 5.2.1.3 Bodily contact: x / x / / EN 953 5.2.1.4 Ejection of parts 5.2.1.5 Entry to inlet ducts and enclosures; Drawing-in, trapping: x / x / x / EN ISO 13857, EN ISO 12100-2, EN 547-1 5.2.2 Fluid injection: x / x 5.2.3 Loss of stability: x / x 5.2.4 Slip, trip and fall: x / x / x / EN ISO 12100-2, EN ISO 14122-1, EN ISO 14122-2, EN ISO 14122-3, EN ISO 14122-4 5.3 Electrical safety 5.3.2 Protection from overload: x / x / / EN 60204-1, EN 60204-11 5.3.3 Protection from live parts: x / x / / EN 60204-1, EN 60204-11 5.3.4.2 Fluid, corrosive action: x / x 5.4 Control systems 5.4.2 Emergency stop: x / x / / EN ISO 13849-1, EN ISO 13850, EN 60204-1 5.4.3 Manual reset: x / x / / EN ISO 13849-1, EN 60204-1 5.4.4 Start/restart: x / x / / EN ISO 13849-1 5.4.5 External influences on electrical equipment: / x / / 5.4.6 Pneumatic and/or hydraulic control systems 5.4.6.2 Conditioning: / x / x / ISO 8573-2, ISO 8573-3, ISO 8573-4 5.4.7 Pressure or fluid level drops: / x / /		P

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Clause	Requirement – Test	Result - Remark	Verdict

Table 2 (continued)

Safety requirements	Visual check	Functional check	Measurement	Reference to clauses of this standard or to other standards
5.5 Thermal safety	x	x	x	EN ISO 13732-1 EN ISO 13732-3
5.6 Noise		x	x	6.2 EN ISO 2151
5.7 Materials and substances processed, used or exhausted				
5.7.1 Micro-organisms, biological and microbiological substances	x	x		
5.7.2 Breathing difficulties	x	x		EN 12021
5.8 Fire and explosion				
5.8.1 Electrostatic phenomena	x	x		
5.8.2 Oil-flooded rotary air compressor units		x	x	
5.8.3 Oil-lubricated reciprocating air compressor units		x	x	
5.8.4 Oil lubricated reciprocating compressor units operating above 50 bar		x	x	
5.8.5 Compressor units driven by combustion engines	x			
5.9 Ergonomic principles				
5.9.1 General	x	x		EN 614-1 EN 1388-1 EN 61310-3 EN 13855 IEC 60417-DB-12M
5.9.2 Manual handling of compressor units			x	EN ISO 12100-2 EN 1005-2
5.9.3 Portable and skid-mounted compressor units	x		x	
5.10 Breaking down of machinery parts and other functional disorders				
5.10.1 Break-up during operation	x	x	x	6.1 EN 13445-8
5.10.3 Liquid shock	x	x		
5.10.4 Coolant system		x	x	

Table 2 (continued)

Safety requirements	Visual check	Functional check	Measurement	Reference to clauses of this standard or to other standards
5.11 Pressure relief – fragmentation				
5.11.1 General		x		EN ISO 13849-1 EN ISO 12100-2
5.11.2 Design specifications of pressure relief devices		x		EN ISO 4126-1
5.11.3 Turbo compressor units		x	x	
5.11.4 Multi stage compressor units		x	x	
5.11.5 Application of pressure relief devices at the cooling medium side		x		
5.12 Information and warning devices	x	x		

7	Information for use		P
7.1	General requirements		P
	The requirements for 'information for use' are in accordance with Clause 6 of EN ISO 12100-2:2003. Documentation drawn up by the manufacturer shall be supplied with each compressor/compressor unit to cover its intended use. It shall lay down procedures for safe installation, use, maintenance and disposal and shall warn against known dangerous practices, misuses and residual risks. The text shall be simple, adequate, complete and be suitable for the personnel responsible for the compressor/compressor unit. Where a compressor unit may be used		P

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Clause	Requirement – Test	Result - Remark	Verdict
	by non-professional user then information for use should be written in a form that is readily understood by the non-professional user. The documentation supplied shall be appropriate to the complexity of the compressor/compressor unit and shall consist of: a) instruction handbook, including safety relevant instructions for both the user and operator; NOTE The Instruction handbook shall be kept permanently with the compressor and be available for the operator. b) service instruction, comprising the instructions for the tasks to be carried out by specialised personnel; c) specification of spare parts to be used, where these affect the safe use of the compressor unit. The information identified may appear in more than one document.		
7.2	Accompanying documents (in particular, instruction handbook)		P
7.2.1	Instruction handbook		P
7.2.1.1	General		P
	The requirements of the instruction handbook shall be in accordance with 6.5 of EN ISO 12100-2:2003 and the following where applicable. An indication that the instruction hand book should be read shall be placed on the compressor unit and visible from the control panel. The marking shall be as identified in A.1.		P
7.2.1.2	Data plate information		P
	The same information as on the data plate.		P
7.2.1.3	Information relating to installation and commissioning of the compressor/compressor unit		P
7.2.1.3.1	Over-current protection		P
	Over-current protection of the power circuit, where this is not supplied, then a statement		P

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Clause	Requirement – Test	Result - Remark	Verdict
	shall be made that the user has to make provision for the installation of the over-current protection of the power circuit. Information relevant to this provision shall be given, e.g. current, voltage, phases. The instructions shall make reference to the over-current protection being in accordance with 7.2 of EN 60204-1:2006.		
7.2.1.3.2	Electrical disconnecting device		P
	Electrical disconnecting device, where this is not supplied then a statement shall be made that the user has to make provision for the installation of the electrical disconnecting device of the power circuit. Information relevant to this provision shall be given, e.g. current, voltage, phases. The instructions shall make reference to the supply disconnection device being in accordance with 5.3 of EN 60204-1:2006.		P
7.2.1.4	Information relating to the compressor/compressor unit		P
	a) Intended media; b) Inlet, intermediate and discharge temperatures; c) Inlet, intermediate and discharge pressures; d) Maximum pressure ratio; e) Specification of lubricants and filters concerning quality, quantity and recommended frequency of replacement; f) Specification of hydraulic transmission fluids; g) Limiting pressures and temperatures of the lubrication system; h) Maximum and, if applicable, minimum speed; i) Pressure relief devices and other protective devices, where these are not supplied then a statement shall be made that the user has to make provision for the installation of the pressure relief devices and other protective devices. Information		P

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Clause	Requirement – Test	Result - Remark	Verdict
	relevant to this provision shall be given, e.g. pressure, flow rate; j) Compressor unit in a potentially explosive atmosphere: 1) as this standard gives no requirements specific to the design of compressors for use in a potentially explosive atmosphere a warning shall be given that the compressor shall not be used in such applications unless suitable additional precautions are taken; k) Information on operation of compressors at an ambient temperature below 0 ° C: 1) precautions to prevent ice and snow interfering with the operation of the machine, in particular that pressure relief devices, intake air filters of the compressor and of the cooling air may be blocked; 2) actions to be taken to prevent freezing of cooling water systems, water traps, valves and fittings; 3) measures to avoid the freezing of accumulations of condensate; 4) actions to be taken to protect the control system against being inoperative; 5) the specification of lubricants for low temperatures or measures to be taken to keep the lubricating system warm; l) Warnings shall be given that high oil viscosity during cold start up, clogged oil filters or valve malfunction can result in oil starvation; m) To prevent the risk of oil fires occurring information shall be given on: 1) the choice of oil; 2) the operation and maintenance of the compressor; 3) that information on reducing the risk of oil fires shall give details for: 4) regular and complete oil changes; 5) ensuring that the oil cooling arrangements are kept clean and protective devices maintained in working order;		

EN 1012-1			
Clause	Requirement – Test	Result - Remark	Verdict
	6) regular check and maintenance of oil level; n) Where openings are provided in flywheel guards when required for barring over the compressor and to provide access to timing marks, wheel hub and any other part which may require attention instructions shall be given to inform the operator that openings shall be closed when the compressor is in operation. A sign stating "Access for maintenance only keep closed" shall be provided in a prominent position and close to the movable guard where the guard is not self closing; o) Steps necessary to avoid transmission of unacceptable loads to the piping system at the inter-connection of the compressor unit and the piping system shall be identified, e.g. the use of flexible hoses.		
7.2.2	Information relating to the use of the compressor/compressor unit		
	a) Operation with lids and doors shut if the compressor unit is designed to be operated in this mode; b) Identify when the compressor unit is under automatic or remote control and the actions necessary to prevent starting automatically or from a remote position when the compressor is being serviced, maintained or inspected, e.g. locking of the main electrical isolator or in the case of steam driven systems a means of isolating the steam inlet valve to a steam turbine and locking this in the “off” position; c) Indication of automatic or remote control of the compressor unit using the sign as given in A.6; d) Location of excessively hot or cold surfaces; e) Risk of inhalation of harmful gases, mists and fumes; f) Risk of coke formation in the delivery		P

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Clause	Requirement – Test	Result - Remark	Verdict
	piping causing a fire or explosion (reciprocating compressor); g) Instructions for routine servicing and simple repairs together with drawings and diagrams, when required, and appropriate safety procedures; h) Warnings shall be given that in all areas accessible to personnel, the concentration of processed gases that can displace breathing air shall be kept within acceptable levels. Reference shall be included for the user to see EN 12021 for acceptable levels of contaminants in breathing air; i) Water cooled and water injected compressor units: 1) water supplied for water-injected compressors should be of potable quality and treated where necessary to prevent harmful bacteria from entering the compressed air, maintenance regimes should be stipulated that will assist in this and prevent persons from coming in contact with harmful bacteria; 2) the user should be advised as to the risks associated with water cooled compressors that utilise open circuit cooling towers, e.g. growth of Legionella pneumophila bacteria; j) How contaminated condensates are contained effectively and disposed of safely; k) The need for separators, traps and draining facilities are required to process liquids produced by the compressor before putting the compressor unit into use as these are not supplied; l) The safe limits of angles for cables or chains shall be clearly indicated on the machine and in the information for use; m) The requirement for pressure relief valve maintenance and testing at regular intervals to confirm their correct operation at their specified setting.		

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Clause	Requirement – Test	Result - Remark	Verdict
7.3	Specific types of compressors		P
7.3.1	General		P
	In addition the information for use shall contain the following information for specific types of compressors:		P
7.3.2	Portable and skid-mounted air compressor units		N/A
	a) All necessary instructions for correct operation, inspection, lifting and transportation; b) A warning that all hoses and fittings shall be suitable for site use at the maximum allowable pressure of the portable compressors; c) A recommendation that for pressures above 7 bar, delivery hoses should be fitted with a safety cord, e.g. wire rope; d) Information on the greatest permissible inclination from the horizontal; e) Warning against the use of an internal combustion engine-driven compressor in a confined space. In addition a warning according to A.9 shall be applied to the compressor unit; f) Warning shall be given that where a combustion engine driven compressor unit is to be used to provide breathing air then the engine exhaust outlet shall be arranged to be downwind of the compressor inlet. In addition information shall be given on the air treatment equipment and the adoption of safe systems of work necessary to provide breathing air; g) Before towing a portable compressor: 1) the jockey wheel or support stand is raised; 2) the coupling is securely fastened to the towing vehicle; 3) a safety device is installed to stop the compressor if the towing connection fails while towing; 4) lighting leads are correctly connected;		N/A

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Clause	Requirement – Test	Result - Remark	Verdict
	5) parking brake to be disengaged, where fitted; h) The appropriate purging of associated piping and equipment; i) Where a parking brake is not fitted the use of wheel chocks shall be recommended when parked and in use. NOTE Portable compressor units used on-road are also subject to regulations related to motor vehicles and their trailers.		
7.3.3	Entry to inlet ducts and enclosures		P
	Where access is to be gained through openings in air compression inlet ducts, intended for internal service, maintenance or inspection, instructions shall be given to indicate the safe operation of the interlock/entry procedure taking into account measures provided in accordance with 5.2.1.2. Where service, maintenance or inspection activities require access to the inside of an enclosure, instructions shall be given to indicate safe entry procedures taking into account measures provided in accordance with 5.2.1.2. Warnings shall be given of the hazards of opening and entering intake ducts and compressor/compressor unit enclosures.		P
7.4	Service instructions		P
7.4.1	General		P
	The Service instructions shall identify the work that shall be performed by specialist personnel, which is in addition to the routine checks, cleaning and replacements identified in 7.2.2 g). The Service instructions shall include: a list of spare parts for safety critical use; drawings and diagrams; list of parts and consumables that need periodic inspection or replacement; instructions for fault analysis; schedule for periodic inspection and		P

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Clause	Requirement – Test	Result - Remark	Verdict
	replacement of parts and consumables; instructions on how to enable service work and subsequent testing to be carried out safely on compressor units in multiple installations; instructions on how to safely start, stop and isolate any unit, independently of the other compressor units, in a multiple installation; instruction on the use of a restraint attached to the outside of an opening and to the maintenance personnel of a length sufficient only to allow access to the item being inspected or serviced, e.g. intake filter assembly. the restraint used and the attachment shall be inspected before each use for effectiveness; address of maintenance agent(s) approved by the manufacturer. NOTE In addition to the service instructions provided with all machines the manufacturer will have available, instructions in one language that his authorized maintenance agents understand, identifying all procedures for carrying out major servicing and repairs of the compressor/compressor unit. The manufacturer shall provide a list giving information on all relevant parts used for service with an unambiguous identification, and indicating the location of the part on the compressor.		
7.4.2	Precautions for service/maintenance		P
	The following minimum information is to be provided so that service and maintenance actions may be carried out safely: disconnection from all energy supplies; measures against reconnection, including the need to display a sign using A.3 and A.8; neutralising of residual energy; testing of the safe state of the machine (absence of energy); precautions to be taken if the compressor		P

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Clause	Requirement – Test	Result - Remark	Verdict
	unit is required to be operational during service/maintenance. Other specific information such as the requirement to remove lubricants, cooling water supplies or condensate shall also be given as required and in accordance with the complexity of the compressor unit. When reviewing the information to be provided this shall be in accordance with 7.1.4, 7.1.5 and 7.2 of EN 626-1:1994+A1:2008. Where access is required for ease of service or maintenance and this will be achieved by the use of ladders or platforms this information shall be provided.		
7.5	Markings, signs and written warnings		P
7.5.1	Generally applicable		P
	Signs and warnings fixed to the machine shall be durable and their requirements shall be in accordance with Clause 7 of EN 61310-2:2008. Where the relevant hazard exist appropriate symbols from Annex A shall be applied to the machine and a list of those symbols with an explanation of their meaning included in the instructions for use. The direction of rotation shall be marked on the compressor by means of an arrow, as given in A.15. If relevant a sign to recommend the use of hearing protectors, as given in A.2 shall be displayed.		P
7.5.2	Compressor unit enclosures		P
	A warning sign in accordance with A.7 for touchable hot surfaces and A.10 for touchable cold surfaces shall be provided. These warnings shall be affixed on access points to such surfaces in enclosures (see also 5.6).		P
7.5.3	Off-road portable and skid-mounted air compressor units		N/A
	Suitable warning signs shall be attached to the compressor unit: a) to operate only with doors and lids closed,		N/A

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Clause	Requirement – Test	Result - Remark	Verdict
	as given in A.4; b) that the outlet cocks of the compressor shall not be opened unless a hose is attached, as given in A.5; c) for hot surfaces, as given in A.7; d) stating the correct fuel at the point of refuelling; e) marking of input point for fuel, as given in A.16; f) marking of input point for oil, as given in A.17; g) marking of input point for coolant, as given in A.18; h) marking of the specified tyre pressure; i) marking of lashing and lifting points, as given in A.19. NOTE Portable compressor units used on-road are also subject to regulations related to motor vehicles and their trailers.		
7.5.4	Markings (in particular, data plate)		P
7.5.4.1	Generally applicable		P
	Markings, including data plates, shall be permanently attached and clearly visible. Compressor units shall have a data plate(s) with at least the following information: a) business name and full address of the manufacturer and, where applicable, his authorised representative; b) mandatory marking2); c) year of manufacture (that is the year in which the manufacturing process is completed); d) designation of series or type, if any; e) serial or identification number, if any; f) rating information to include the following; 1) maximum allowable pressure at the outlet of the compressor, expressed in bar; 2) maximum rotational shaft speed as rotational speed of prime mover interface or compressor; 3) the gross mass of the compressor unit, expressed in kg (also included in other		P

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Clause	Requirement – Test	Result - Remark	Verdict
	information for use as required and as identified in 7.2.1.2).		
7.5.4.2	Electrically driven		P
	Additional marking on the data plate to be applied: Total of rated power of all installed motors. Any additional information given shall be in accordance with 16.4 of EN 60204-1:2006.		P
7.5.4.3	Portable and skid-mounted air compressors		N/A
	Additional marking on the data plate to be applied: nominal power expressed in kilowatts (kW); mass of the most usual configuration, in kilograms (kg); and, where appropriate: maximum drawbar pull provided for at the coupling hook, in Newtons (N); maximum vertical load provided for on the coupling hook, in Newtons (N). NOTE Portable compressor units used on-road are also subject to regulations related to motor vehicles and their trailers.		N/A
7.6	Noise		P
7.6.1	A-weighted emission sound pressure level and A-weighted sound power level declaration		P
	The instructions shall include: the value of the A-weighted emission sound pressure level at the workstation; the value of the associated uncertainty shall be given in accordance with Clause 8 of EN ISO 2151:2008; the value of the A-weighted sound power level where the A-weighted emission sound pressure level at the workstation exceeds 80 dB(A); the value of the associated uncertainty shall be given in accordance with Clause 8 of EN ISO 2151:2008; the reference number of the noise test code, EN ISO 2151:2008.		P

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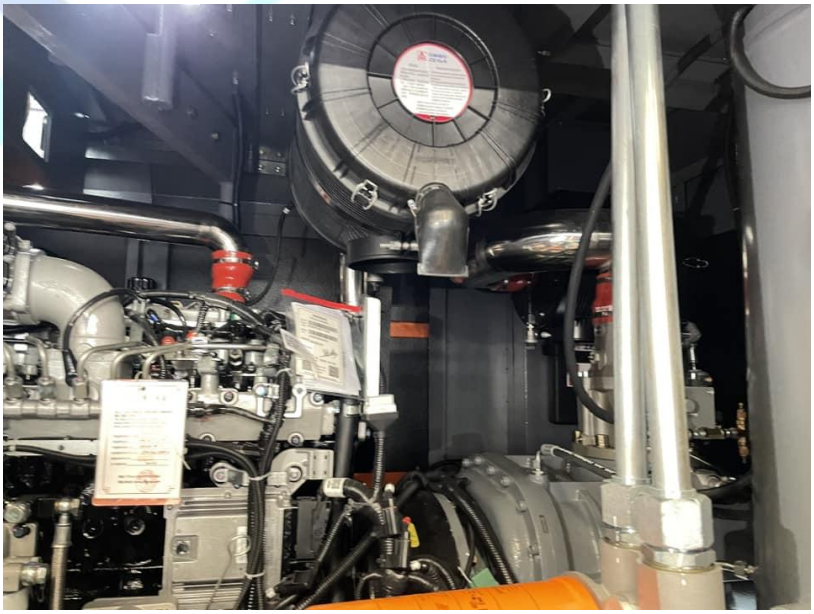
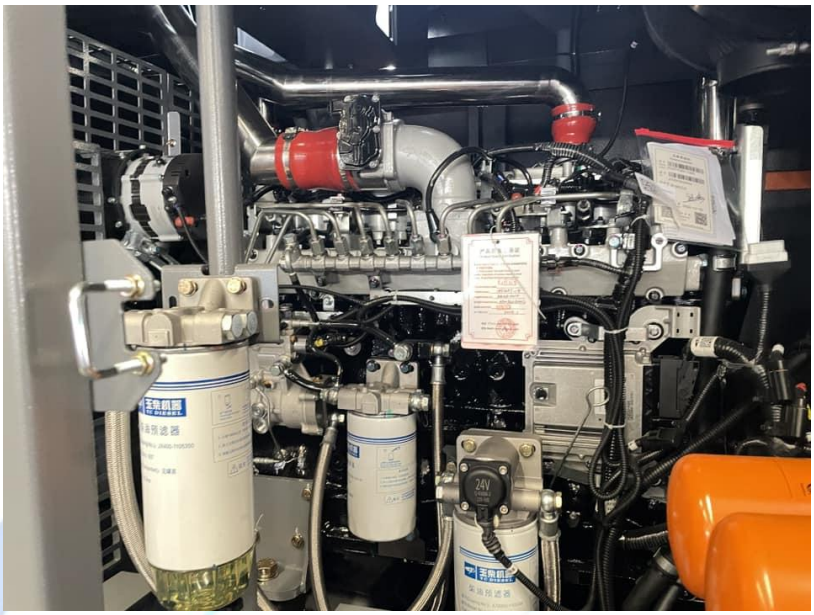
Clause	Requirement – Test	Result - Remark	Verdict
	Exceptionally for compressor units for use outdoors the value of the declared A-weighted sound power level shall be a single number, i.e. the sum of the measured value and the value of the associated uncertainty, according to the relevant regulation.		
7.6.2	Hearing protection		P
	Information on the use of hearing protectors shall be provided.		P
7.7	Dismantling		P
	Information on safe dismantling, disabling and disposal shall be provided. This will include safe disposal of all fluids used in the compressor unit such as lubricants, coolants and refrigerant gases, and shall be in accordance with 7.1.4 of EN 626-1:1994+A1:2008. Compressor units containing materials which may be classified as hazardous substances when scrapped and where specific disposal methods are required then this information shall be given.		P

Product picture


DANGER
WARNING
WARNING
WARNING
WARNING
Death or serious injury can occur from inhaling compressed air without using proper safety equipment.
Do not permit air from this equipment to contact foodstuff.except in full compliance with your national standards and regulations.
Keep clear of unguarded moving parts.





— End of report —