TEST REPORT

EN ISO 8528-13:2016—Reciprocating internal combustion engine driven alternating current generating sets Part 13: Safety
EN 60204-1:2006/AC:2010—Safety of machinery-Electrical equipment of machines-Parts1 : General Requirements

Report	
Report reference No ……..…..:	**WW-2017741-02**
Tested by ……..:	**Wu Jianjun**
Checked by……..:	**Zhang Xuesong**
Approved by……:	**Bai Yajun**
Date of issue……:	**2017-07-24**
Number of pages (Report)…….:	**75**
Testing laboratory	
Name.....:	Hangzhou Wanve Certification Technology Service Co.,Ltd
Address.....:	Room 3-401, No.1181 Bin'an Road, Binjiang District, Hangzhou, Zhejiang, 310052, China
Testing location.....:	Same as above
Client	
Name .....:	TAIZHOU NEWLAND MACHINERY CO.,LTD
Address……:	1390# WEST GONGREN ROAD,JIAOJIANG DISTRICT, TAIZHOU,ZHEJIANG
Test specification	
Standard.....:	EN ISO 8528-13:2016 EN 60204-1:2006/AC:2010
Test procedure .....:	CE
Procedure deviation.....:	N.A.
Non-standard test method.....:	/
Test report form/blank test report	
Test report form No……:	WANVE EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010
Master TRF……:	Hangzhou Wanve Certification Technology Service Co.,Ltd
Copyright blank test report……:	This report is based on a blank test report prepared by WANVE using information obtained from the TRF originator

Test item	
Description …….. ……..……:	Diesel generator set
Trademark ……..:	/
Model and/or type reference……:	DG7500SE
Manufacturer……..:	TAIZHOU NEWLAND MACHINERY CO.,LTD
Rating(s)……..:	Rated Power:5.0kW, Rated Voltage: 230/400V Rated Current: 21.7/7.2A, Rated Frequency:50/60Hz
Remark……:	See below item “General product information”
Testing	
Date of receipt of test item……...:	2017-06-14
Date(s) of performance of test…..:	2017-07-20 to 2017-07-21

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

General remarks

This test report shall not be reproduced except in full without the written approval of the testing laboratory.

The test results presented in this report relate only to the object tested.

"(see remark #)" refers to a remark appended to the report.

"(see appended table)" refers to a table appended to the report.

Throughout this report a comma is used as the decimal separator.

Brief description of the tested sample(s):DG7500SE

Testing environment ： Ambient temperature : 27.30℃ humidity:68%

NAMEPLATE

Low Power Diesel Generator Set CE

DG7500SE

Max.power (kW):	max. 5.5	Rated Power (kW):	COP 5.0
Power Factor:	1.0	Performance Grade:	G3
Rated Voltage (V):	230/400	Rated Frequency (Hz):	50/60
Rated Current (A):	21.7/7.2	Quality Class:	A
The degree of protection:	IP 23M	Net Weight (kg):	156
Year of manufacture:	2017	Serial No.:	Engraved on crankcase

TAIZHOU NEWLAND MACHINERY CO.,LTD

1390# WEST GONGREN ROAD,JIAOJIANG DISTRICT,TAIZHOU,ZHEJIANG

LABEL

General product information:

I. Model：DG2500(E),DG3000(E),DG6000(E),DG7000(E),DG8000(E),DG11000(E),DG12000(E), DG15000(E),DG4500SE,DG6500SE,DG7500SE,DG8500SE,DG11000SE,DG12000SE,DG15000SE

II. Details of all the differences from the certified product is the type and output power.

Specifications

	Generator set Model:	DG2500(E)	DG3000(E)	DG6000(E)
Engine	Model：	170F	178F	186FA
	Type：	Single-cylinder,vertical,4-stroke air-cooled diesel engine	Single-cylinder,vertical,4-stroke air-cooled diesel engine	Single-cylinder,vertical,4-stroke air-cooled diesel engine
	Displacement：	211	296	418
	Max. Power(kW)：	2.8	4.1	6.5
	Rated Power（kW）：	2.5	3.7	5.9
	Bore × Stroke (mm)：	70×55	78×62	86×72
	Condensation Ratio：	20：1	20：1	19:1
	Starting system：	Manual or electric	Manual or electric	Manual or electric
	Ignition System：	Direct injection	Direct injection	Direct injection
	Fuel oil tank volume (L)：	12.5	12.5	12.5
	Lube oil capacity (L)：	0.75	1.1	1.65
Generator	Max. Power（kW)：	2.0	3.0	5.0
	Rated Power （kW）：	1.8	2.8	4.6
	Rated Voltage（V）：	230/400	230/400	230/400
	Rated Current（A）：	7.8/2.6	12.2/4.1	20/6.6
	Rated Frequency（Hz）：	50/60	50/60	50/60
	Power Factor：	1	1	1
	Insulation Grade：	B	B	B
	Performance Grade：	G2	G3	G3
	Quality Class ：	A	A	A
	IP Grade：	IP23M	IP23M	IP23M
Whole sets	Net Weight/Gross Weight(kg)：	52	64	84
	Dimension(mm)（L*W*H）	660*480*550	700*480*590	700*470*600

	Generator set Model:	DG7000(E)	DG8000(E)	DG11000(E)
Engine	Model:	188FA	192FC	198FA
	Type:	Single-cylinder,vertical,4-stroke air-cooled diesel engine	Single-cylinder,vertical,4-stroke air-cooled diesel engine	Single-cylinder,vertical,4-stroke air-cooled diesel engine
	Displacement:	438	498	633
	Max. Power(kW):	7.5	8.5	9.9
	Rated Power（kW）:	7.0	8.0	9.0
	Bore × Stroke (mm):	88×75	92×75	98x84
	Condensation Ratio:	19:1	19:1	20.5:1
	Starting system:	Manual or electric	Manual or electric	Manual or electric
	Ignition System:	Direct injection	Direct injection	Direct injection
	Fuel oil tank volume (L):	12.5	12.5	12.5
	Lube oil capacity (L):	1.65	1.65	1.65
Generator	Max. Power（kW):	5.5	6.5	8.0
	Rated Power （kW）:	5.0	6.0	7.5
	Rated Voltage（V）:	230/400	230/400	230/400
	Rated Current（A）:	21.7/7.2	26.1/8.7	32.6/10.8
	Rated Frequency（Hz）:	50/60	50/60	50/60
	Power Factor:	1	1	1
	Insulation Grade:	B	B	B
	Performance Grade:	G3	G3	G3
	Quality Class :	A	A	A
	IP Grade:	IP23M	IP23M	IP23M
Whole sets	Net Weight/Gross Weight(kg):	85	85	147
	Dimension(mm)（L*W*H）	700*470*600	700*470*600	760*530*680

	Generator set Model:	DG12000(E)	DG15000(E)	DG4500SE
Engine	Model:	2V86F	2V92FB	178FA
	Type:	Two-cylinder, vertical,4-stroke air-cooled diesel engine	Two-cylinder, vertical,4-stroke air-cooled diesel engine	Single-cylinder,vertical,4-stroke air-cooled diesel engine
	Displacement:	840	997	296
	Max. Power(kW):	12	16	4.1
	Rated Power（kW）:	11	15	3.7
	Bore × Stroke (mm):	2*86×72	2*92×75	78×62
	Condensation Ratio:	19:1	19:1	20：1
	Starting system:	electric	electric	electric
	Ignition System:	Direct injection	Direct injection	Direct injection
	Fuel oil tank volume (L):	30	30	16
	Lube oil capacity (L):	2.5	2.5	1.65
Generator	Max. Power（kW):	9.0	11	3.0
	Rated Power （kW）:	8.5	10	2.8
	Rated Voltage（V）:	230/400	230/400	230/400
	Rated Current（A）:	36.9/12.3	43.5/14.4	12.2/4.1
	Rated Frequency（Hz）:	50/60	50/60	50/60
	Power Factor:	1/0.8	1/0.8	1
	Insulation Grade:	B	B	B
	Performance Grade:	G3	G3	G3
	Quality Class :	A	A	A
	IP Grade:	IP23M	IP23M	IP23M
Whole sets	Net Weight/Gross Weight(kg):	184	184	136
	Dimension(mm)（L*W*H）	880*650*890	880*650*890	850*560*760

	Generator set Model:	DG6500SE	DG7500SE	DG8500SE
Engine	Model:	186FA	188FA	192FC
	Type:	Single-cylinder,vertical,4-stroke air-cooled diesel engine	Single-cylinder,vertical,4-stroke air-cooled diesel engine	Single-cylinder,vertical,4-stroke air-cooled diesel engine
	Displacement:	418	456	498
	Max. Power(kW):	6.5	7.5	8.8
	Rated Power（kW）:	5.9	7.0	8.0
	Bore × Stroke (mm):	86×72	88×75	92×75
	Condensation Ratio:	19:1	19:1	19:1
	Starting system:	electric	electric	electric
	Ignition System:	Direct injection	Direct injection	Direct injection
	Fuel oil tank volume (L):	16	16	16
	Lube oil capacity (L):	1.65	1.65	1.65
Generator	Max. Power（kW):	5.0	5.5	6.5
	Rated Power （kW）:	4.6	5.0	6.0
	Rated Voltage（V）:	230/400	230/400	230/400
	Rated Current（A）:	20/6.6	21.7/7.2	26.1/8.7
	Rated Frequency（Hz）:	50/60	50/60	50/60
	Power Factor:	1	1	1
	Insulation Grade:	B	B	B
	Performance Grade:	G3	G3	G3
	Quality Class :	A	A	A
	IP Grade:	IP23M	IP23M	IP23M
Whole sets	Net Weight/Gross Weight(kg):	155	156	160
	Dimension(mm)（L*W*H）	950*560*760	950*560*760	950*560*760

	Generator set Model:	DG11000SE	DG12000SE	DG15000SE
Engine	Model:	198FA	2V86F	2V92FB
	Type:	Single-cylinder,vertical,4-stroke air-cooled diesel engine	Two-cylinder,vertical,4-stroke air-cooled diesel engine	Two-cylinder, vertical,4-stroke air-cooled diesel engine
	Displacement:	633cc	840	997
	Max. Power(kW):	9.9	12	16
	Rated Power（kW）:	9.0	11	15
	Bore × Stroke (mm):	98×84	2*86×72	2*92×75
	Condensation Ratio:	20.5:1	19:1	19:1
	Starting system:	electric	electric	electric
	Ignition System:	Direct injection	Direct injection	Direct injection
	Fuel oil tank volume (L):	30	30	30
	Lube oil capacity (L):	1.65	2.5	2.5
Generator	Max. Power（kW):	8.0	9.0	11
	Rated Power （kW）:	7.5	8.5	10
	Rated Voltage（V）:	230/400	230/400	230/400
	Rated Current（A）:	32.6/10.8	36.9/12.3	43.5/14.4
	Rated Frequency（Hz）:	50/60	50/60	50/60
	Power Factor:	1	1/0.8	1/0.8
	Insulation Grade:	B	B	B
	Performance Grade:	G3	G3	G3
	Quality Class :	A	A	A
	IP Grade:	IP23M	IP23M	IP23M
Whole sets	Net Weight/Gross Weight(kg):	220	260	265
	Dimension(mm)（L*W*H）	1110*735*740	1230*750*840	1230*750*840

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
BS EN ISO 8528-13:2016			
1	**Scope**		
	This part of ISO 8528 specifies the safety requirements for reciprocating internal combustion (RIC) engine driven generating sets up to 1 000 V consisting of an RIC engine, an alternating current (AC) generator including the additional equipment required for operating, e.g. Control gear, switch gear, auxiliary equipment.	Alternating current (AC) generator	P
	It is applicable to generating sets for land and marine use (domestic, recreational and industrial application). It is not applicable to generating sets used on board of seagoing vessels and mobile offshore units as well as on aircraft or to propel road vehicles and locomotives. NOTE This part of ISO 8528 does not apply to arc welding equipment (IEC 60974 series).	Land use	P
	The special requirements needed to cover operation in potentially explosive atmospheres are not covered in this part of ISO 8528. The hazards relevant to RIC engine driven generating sets are identified in Annex A.		P
	This part of ISO 8528 deals with the special requirements of test and safety design which should be observed in addition to the definitions and requirements in ISO 8528-1, ISO 8528-2, ISO 8528-3, ISO 8528-4, ISO 8528-5 and ISO 8528-6, where applicable. It specifies safety requirements in order to protect the user from danger.		P
2	**Normative References**		
3	**Terms and definitions**		
4	**General**		
	If the installation of a generating set can create hazards in addition to those covered by this part of ISO 8528, the safety requirements and/or protective measures related to these additional hazards are the responsibilities of the installer, if necessary with the agreement of the manufacturer of the generating set. The installer will be responsible for ensuring compliance for the additional hazards arising because of the installation.	No need installation	N/A
5	**Hazards**		

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	The hazards relevant to RIC engine driven generating sets that shall be considered in order to prevent personal injury are listed in Annex A		P
6	**Safety Requirements**		
6.1	**General**		
	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 ISO 12100 for relevant but not significant hazards, which are not dealt with by this part of ISO 8528.		P
6.2	**Starting system**		
6.2.1	Requirements		
	Starting systems can be triggered manually or automatically. Electrical starting systems normally operate at voltages of 24 V or below. Electrical starting systems above 24 V are not dealt with in this part of ISO 8528 and the installer of the engine shall ensure safe operation after connecting the engine to the driven machinery. For engines with compressed air starting, the starting pneumatic system shall comply with the installation requirements and with the operation and safety information specified in the manuals provided by the starting system components suppliers. Crank handle starting systems shall meet the requirements specified in ISO 11102-1 and ISO 11102-2. In addition, the following requirements apply: starting handles shall have sufficient clearance from the mounting surface to ensure safe turning; diesel engines with a manual starter shall have a decompression facility which shall not be required to be hand-held during cranking. The only permissible hand starting systems are crank handle (as defined above) and recoil starting devices as described in ISO 14314. The marking required in ISO 14314:2004, 7.3 shall not apply.	Electrical starting The voltages of battery is 12V	P
6.2.2	Verification		
	Compliance with the requirements shall be verified by inspection and testing of the starting systems.		P

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
6.3	**Stopping**		
6.3.1	Requirements		
6.3.1.1	Normal stopping		
	All generating sets shall have a normal stopping device which can be manually or automatically actuated. Stopping controls shall remain in the stop position when operated. This shall operate by a device ensuring the cutting off of the fuel or the ignition (for spark ignition engines) supply. This device should include an air supply cut-off.	A normal stop control has been provided. Cutting off the fuel.	P
6.3.1.2	Stopping in case of failure		
	Generating sets except low power generating sets shall be provided with an automatically actuated stopping device in case of failure.	Low power generating sets.	N/A
	This device shall monitor one or more signals of the generating set and if these signals are out of the allowable range it shall trigger the automatic stop. The main signals used to actuate automatic stopping may include, but not be limited to, the following: a) for the RIC engine 1) overspeed, 2) low lubricating oil pressure, 3) high coolant temperature, and 4) low coolant level; b)for the generator 1) excessive overvoltage, and 2) overload. These signals or other measures used to actuate automatic stopping shall be specified depending on the application.	Low lubricating oil level stop Overload switch off	P
6.3.2	Verification		
	Normal stopping shall be verified by inspection and testing of the stopping device in manual and in automatic modes (if provided in the application).		P
	Automatic stopping in case of failure shall be verified by testing the action of typical failure modes in operating conditions (an appropriate method shall be used to create typical failure conditions, e.g. manual triggering, short-circuiting of contacts).		N/A
6.4	**Emergency stopping**		
6.4.1	Requirements		
	Emergency stopping devices are required for remote	Low power generating	N/A

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	controlled generating sets and generating sets with an enclosure or container accessible by persons. In accordance with the risk assessment in ISO 12100:2010, 6.3.5.2, an emergency stopping device is not required for low power generating sets, as it shall not lessen the risk by reducing the stopping time. .	Sets	
	Emergency stopping devices shall be actuated manually. As for normal stopping, emergency stopping shall operate by a device ensuring the cutting off of the fuel supply or ignition (for spark ignition engines). This device should include an air supply cut-off.	No emergency stopping devices	N/A
	Emergency stopping devices shall also meet the requirements of ISO 13850, category 0, and the reset shall not initiate a restart or any hazardous conditions.	No emergency stopping devices	N/A
	Manually actuated emergency stopping devices shall be located inside and outside the enclosure or container in which a generating set is located and which is accessible for personnel to carry out maintenance or control operations when generating sets are in operation.	No emergency stopping devices	N/A
6.4.2	Verification		
	Emergency stopping devices shall be verified by inspection and testing in operating conditions.	No emergency stopping devices	N/A
6.5	**Control devices**		
6.5.1	**Design, safety and mechanical strength**		
6.5.1.1	Requirement		
	Control devices for the RIC engine of the generating set shall meet the following requirements: — hand controls shall be designed to withstand 1,2× the maximum actuating forces given in Table 1;	12N for choke lever 60 N for fuel switch	P

Operation by	**Spacing**(mm)	**Maximum actuating**(N)
Finger tip	10	10
Finger grasp		
— toggles	20	50
— knobs	20	50
Hand		
— upward	50	400
— fore-aft	50	300

Table 1 — Clearance between controls

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	—for handles, knobs, grips, levers and similar devices, requirements and tests shall be in accordance with IEC 60335-1:2013, 22.12; —controls shall act positively and smoothly and without delay or unexpected action and be in accordance with ISO 2261; — the surface temperature of the controls that shall be manually actuated while the engine is running shall be within the following limits in accordance with ISO 13732-1 for a contact time of 10 s, — 55 ° C for metallic surfaces, and — 70 ° C for non metallic surfaces; — sharp edges or corners on, or adjacent to manual controls shall be removed. Edges shall have a chamfer of at least 0,5 mm.		
6.5.1.2	Verification		
	Control devices of the RIC engine shall be verified by inspection and testing. Control devices of the generating sets shall be verified in accordance with IEC 60204-1:2009, 10.1and 10.2. For surface temperature measurement of the control devices (RIC engines and generating sets), the following method shall be conducted: a)the generating set shall be operated at its rated power until the surface temperatures stabilize; b)the test shall be conducted in a well-ventilated location not directly exposed to sunshine; c)if the test is conducted at an ambient temperature outside of the nominal (20 ± 3) ° C the reported temperatures shall be corrected by the Formula (1): Corrected temperature=reported temperature -ambient temperature + 20	The generator operated at 5.05kW until the surface temperatures stabilize.	P
6.5.2	**Identification**		
6.5.2.1	Requirements		
	The controls devices of the RIC engines shall be identified according to the function they perform or their function shall be explained in the operating manual. They shall be identified according to IEC 61310-2. Colour coding shall be according IEC 60073. The marking on the engine controls shall be legible		P

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	throughout the engine life. Identification should preferably be by symbols according to ISO 7000 or ISO 8999 or, if there are no suitable symbols, by words placed on the control or adjacent to it. Design, location and marking principles shall be in accordance with IEC 61310-1. Emergency shut-off control handles or buttons shall be prominently located and shaped as well as being coloured red, in order to be identified among the other controls. The control devices on electrical equipment shall comply with the requirements of IEC 60204-1:2009, 10.1 and 10.2 with the exception as given in Table B.1.		
6.5.2.2	Verification		
	Compliance with the requirements shall be verified by inspection.		P
6.5.3	**Accessibility**		
6.5.3.1	Requirement		
	Controls should preferably be grouped. Controls should be located within reach of the operator. Access shall be provided according to ISO 15534-2. The spacing between controls shall be sufficient to allow operation without unintentional actuation of adjacent controls. For the minimum clearances between controls recommended for the given maximum actuating force, see Table 1		P
6.5.3.2	Verification		
	Compliance with the requirements shall be verified by inspection and measurement.		P
6.6	**Monitoring devices**		
6.6.1	Requirement		
6.6.1.1	Instrument identification		
	Monitoring instruments shall be identified on or adjacent to them, preferably by a symbol according to ISO 8999 or a descriptive wording for the system being monitored.		P
6.6.1.2	Instrument visibility		
	Monitoring instruments should be visible to the operator. They shall be illuminated for night time or indoor operation so that they are legible from the operator’s position where the application requires it.		P
6.6.1.3	Instrument colour code		

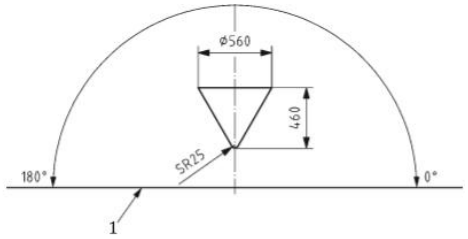
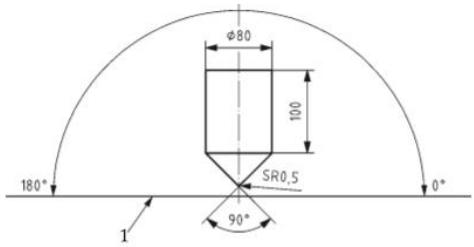
EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	Monitoring instruments and monitoring systems should preferably be colour coded according to IEC 60073. Red is recommended for malfunction or unsafe situation; green for a satisfactory situation or to indicate a system is operating. The instruments for the monitoring of the electrical equipment shall comply with IEC 60204-1:2009, 10.3.		P
6.6.2	Verification		
	Compliance with the requirements shall be verified by inspection.		P
6.7	**Warning devices**		
6.7.1	Requirements		
	Warning devices, signs, markings and colours shall meet the requirements of ISO 11429.		P
6.7.2	Verification		
	Compliance with the requirements shall be verified by inspection.		P
6.8	**Guarding**		
6.8.1	**General**		
6.8.1.1	Requirements		
	The following clauses give the requirements for the common hazards related to guarding and any generating set or installation shall comply with these requirements.		P
	Guards shall be designed in accordance with ISO 14120.		P
	Fixing systems of fixed guards shall remain attached to the guards or to the generating set when the guards are removed. This requirement is limited to fixed guards that need to be removed during normal maintenance operations as described in instructions of use.	No guard for moving parts needs to be detached for normal operation and/or for maintenance	N/A
	For fixed installed generating sets the need of guarding shall be agreed between generating set manufacturer and installer considering that persons shall be protected during operating and routine servicing Because it is not possible to envisage the layout of fixed installation, the overall requirements for this situation are not dealt with in this part of ISO 8528. Therefore, for fixed installations, the need for additional guarding to protect persons during operation and routine servicing shall be established after discussion between the generating set manufacturer, user and installer. NOTE The provider of additional guarding for fixed	Not fixed installed generating sets	N/A

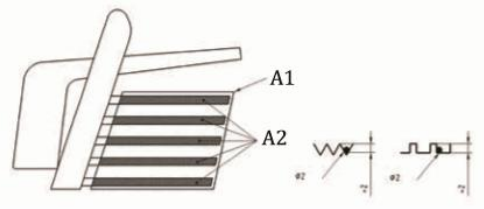
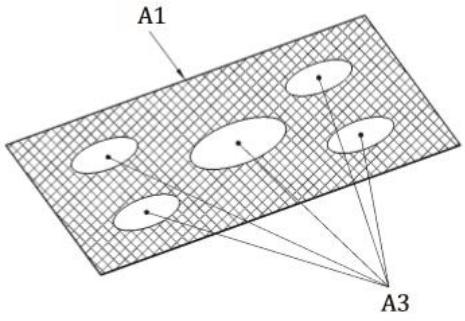
EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	installations that is outside the scope of this part of ISO 8528 is responsible for ensuring its suitability.		
6.8.1.2	Verification		
	Compliance with the requirements is verified by inspection.		P
6.8.2	**Guarding against mechanical hazards**		
6.8.2.1	Requirements		
	Moving parts of generating sets, e.g. fan, belt, chains, etc. shall be so arranged or enclosed as to prevent direct involuntary access during normal use, i.e. during maintenance, monitoring or control operations described in the manual of use. If the guard is constructed of open-mesh material the openings shall be sized as follows: a) Guards that are less than 100 mm from a hazard shall meet the requirements of IEC 60034-5:2006, Clause 8, with the 12 mm test probe. b) Guards that are 100 mm or more from a hazard shall meet the opening requirements of ISO 13857:2008,Table 4.	Moving parts are covered appropriately. No guard for moving parts needs to be detached for normal operation and/or for maintenance	P
6.8.2.2	Verification		
	.Compliance with the requirements shall be verified by measurement and if necessary by using a 12 mm test probe.		P
6.8.3	**Guarding against hot surfaces**		
6.8.3.1	**General**		
	The necessity to guard hot surfaces depends on its surface temperature, its location and if a person is likely to touch it.	A guard be provided	P
	The temperature of the guards shall not exceed the threshold temperature. If this cannot be avoided, then display a warning.	not exceed but a warning provide	P
6.8.3.2	**Requirements for generating sets except low power generating sets**		N/A
	A risk assessment shall be carried out by the generating sets manufacturer to determine the surfaces with a burn hazard and identify appropriate protective measures in order to prevent accidental contact in normal conditions of use, i.e. during control, monitoring and maintenance operations described in the manual of	Low power generating sets	N/A

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	use. At least the following areas shall be considered.		
	a) The surfaces which can be reached when probed by the cones in accordance with Figure 1 and Figure 2 shall not have a temperature higher than the following: 1) 80 ° C for metallic surfaces; 2) 94 ° C for non metallic surfaces.		N/A
	b) The surfaces, except exhaust engine parts, which do not meet the requirements set in a) shall be guarded to meet a). When the guard does not permit the reduction of the temperature below the temperature limits, a warning marking shall be fixed on or near this guard to warn the generating sets user of the presence of a burn danger.		N/A
	c) Any engine exhaust surface more than 10 cm2 which can be reached when probed by the cones, shall be equipped with a guard to limit the most severe burn risks by direct contact. The guard shall meet the requirements specified in a). When the guard does not permit the reduction of the temperature below the limits threshold, a warning marking shall be fixed on or near this guard to warn the generating sets user of the presence of a burn danger.		N/A
	d) An enclosure with access doors for maintenance or control operations shall not be considered as protection against contact with an engine exhaust.		N/A
6.8.3.3	**Verification for generating sets except low power generating sets**		
	a) The accessibility of the identified hot surfaces during control and monitoring operations shall be verified by applying the test cones in accordance with Figure 1 and Figure 2: 1) when the distance between the identified hot area and the nearest control is in excess of 100 mm, cone A as shown in Figure 1 shall be used; 2) for distances less than 100 mm between the identified hot area and the nearest control, cone B as shown in Figure 2 shall be used; 3) for cone A with the axis of the cone anywhere 0° and 180° to the horizontal and with the point of the cone in a downward to horizontal direction, move	low power generating sets	N/A

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	the cone towards the hot surface. The cone shall not be moved in an upwards direction. When moving the cone, determine if contact is made with the hot surface area(s) with the cone tip or conical surface of the cone; 4) Cone B shall be moved in any direction.		
	b) For maintenance operations, the hot surfaces to be considered are those more than 10 cm2 located at less than 300 mm of a maintenance or control point and/or of access path for operators.	low power generating sets	N/A
	c) The generating set shall be operated at its rated power until the surface temperatures stabilize.	low power generating sets	N/A
	d) The test shall be conducted in a well-ventilated location not directly exposed to sunshine.	low power generating sets	N/A
	e) If the test is conducted at an ambient temperature outside of the nominal (20 ± 3) ° C the reported temperatures shall be corrected by Formula (1): Corrected temperature=reported temperature -ambient temperature + 20	low power generating sets	N/A
6.8.3.4	**Requirements for low power generating sets**		
	a) The accessible surfaces in the close proximity of controls shall not have a temperature higher than the following: 1) 80 ° C for metallic surfaces; 2) 94 ° C for non metallic surfaces.	See Appended Table:6.8.3	P
	b) The carrying handles of generating sets and the accessible surfaces in their close proximity shall not have a temperature higher than the following: 1) 50 ° C for metallic surfaces; 2) 70 ° C for non metallic surfaces.	See Appended Table:6.8.3	P
	c) The engine exhaust, with potential burn hazards during the operating, but also during cooling period following a generating sets stopping, shall be equipped with a guard to limit the most severe burn risks by accidental contact. The dimension of guard clearance shall ensure that such exhaust surface cannot be reached when being probed by test cones in accordance with Figure 1 and Figure 2. Any exhaust surface less than 10 cm2 does not need to be equipped with protection. Accessible engine exhaust components more than 10 cm2 and their guards shall not have surface temperatures higher than 94 ° C for non-metallic surfaces materials or	See Appended Table:6.8.3	P

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	80 ° C for metallic surfaces. When a guard does not permit the reduction of the temperature below the limits threshold, a warning marking shall be fixed, in addition, on or near this guard to warn the generating sets user of the presence of a burn danger.		
	d) Accessible hot surface parts more than 10 cm2 except for these services described in a), b) or c) with a temperature higher than 94° C for non-metallic surfaces or 80 ° C for metallic surfaces, shall be located inside the frame contour and a warning marking shall be fixed, in addition, on or near the parts to warn the low power generating sets user of the presence of a burn danger.	See Appended Table:6.8.3	P
	e) An enclosure with access doors for maintenance or control operations shall not be considered as protection against contact with an engine exhaust.		N/A
6.8.3.5	**Verification for low power generating sets**		
	a) The accessibility of the identified hot surfaces during control and monitoring operations shall be verified by applying the test cones in accordance with Figure 1 and Figure 2: 1) when the distance between the identified hot area and the nearest control is in excess of 100 mm, cone A as shown in Figure 1 shall be used; 2) for distances less than 100 mm between the identified hot area and the nearest control, cone B as shown in Figure 2 shall be used; 3) for cone A with the axis of the cone anywhere 0° and 180° to the horizontal and with the point of the cone in a downward to horizontal direction, move the cone towards the hot surface. The cone shall not be moved in an upwards direction. When moving the cone, determine if contact is made with the hot surface area(s) with the cone tip or conical surface of the cone; 4) Cone B shall be moved in any direction;		P

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	 **Key** 1 horizontal plane **Figure 1 — Cone A**  **Key** 1 horizontal plane **Figure 2 — Cone B**		
	b) When the accessible hot surfaces are less than 10 cm2 they shall be verified in accordance with 6.8.3.1. 1) The surfaces temperatures shall be verified by measurement, 2) The generating set shall be operated at its rated power until the surface temperatures stabilize, 3) The test shall be conducted in a well-ventilated location not directly exposed to sunshine, 4) If the test is conducted at an ambient temperature outside of the nominal (20 ± 3) ° C the reported temperatures shall be corrected by Formula (1): Corrected temperature=reported temperature -ambient temperature + 20		P
	A guard shall be provided to prevent accidental contact with any engine exhaust component during normal operation; any hot surface smaller than 10 cm2 does not require guarding. The determination of area for interrupted surfaces shall be made as follows.		P
	If a marked surface (with area A1) consists of multiple separate surfaces of which the sum of the areas (A2) exceeds 80 % of A1, then A1 shall be considered as one		P

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	uninterrupted area (see Figure 3). Surfaces whose structure does not allow a ball with 2 mm diameter to penetrate more than 2 mm below highest parts of the structure shall be considered as part of A1 (see Figure 3).  **Key** A1 marked surface A2 sum of area >80 % of A1 **Figure 3 — Example of a surface consisting of multiple separate surfaces**		
	If a marked surface (with area A1) includes holes of which the sum of the areas (A3) is less than 20 % of the area of marked surface (A1) it shall be considered as one uninterrupted area (see Figure 4).  **Key** A1 marked surface A3 sum of areas of the holes **Figure 4 — Example of a surface with holes** The recorded area of the marked surface(s) shall not be larger than 10 cm2.		P
6.9	**Stability for low power generating sets**		
6.9.1	Not in operation		
6.9.1.1	Requirements		
	Generating sets shall exhibit proof of suitable stability when not in operation. Test shall be conducted with fuel filled to the maximum capacity specified in the manufacturer’s instructions.		P

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
6.9.1.2	Verification		
	Compliance shall be checked by placing the unit on a surface which is tilted 15° in all directions. The unit shall neither overturn nor spill fuel. Units with flaps or doors are tested both with the flaps and doors closed and then with them open. The unit shall satisfy requirements under the worst of conditions.		P
6.9.2	In operation		
6.9.2.1	Requirements		
	Generating sets shall be suitable for operation on mounting surfaces inclined up to 4°.		P
6.9.2.2	Verification		
	Compliance is checked by operating the unit in four positions set at 90° intervals around the vertical axis on a rough concrete surface inclined up to 4°. The unit shall not change its position by more than 10 mm even after 30 min of operation at no-load and at rated power.	The generator change its position 8mm.	P
6.10	**Lighting**		
6.10.1	Requirement		
	Except for low generating sets and if installed, the lighting of a generating set shall illuminate the control levers, monitoring devices and corresponding walkways with an intensity of at least 20 lux.	No lighting	N/A
6.10.2	Verification		
	Compliance with the requirements shall be verified by measurement or technical documentation.		N/A
6.11	**Handling**		
6.11.1	Requirements		
	Generating sets above 140 kg shall have provisions for lifting attachments to attach lifting devices to lift the generating set or parts of it according to the manufacturers' instructions.	156kg>140kg	P
	The lifting attachments shall be designed to withstand at least 1,5 times the mass lifted by lifting attachments. The lifting attachments shall be located to allow at least 20 mm clearance between lifting rope or chain or belt and any generating set components, unless the components are designed to withstand the contact during a lifting operation without	Tested with 1.5 times of the product mass: 120kg No shape change	P

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	permanent deformation or damage to the rope, chain or belt. NOTE: Typically, generating sets are either designed with handles or use the frame for carrying purposes. Therefore, it is not possible to prescribe the exact number or layout of handles. As a basis for providing means of carrying the generating set it is considered that a 140 kg set should be provided with the means of carrying by 4 persons.		
	The access to the lifting attachments shall allow an easy attachment of the lifting hook or shackle.		P
	Lifting attachments shall be so located that lifting ropes, chains or belts converge over the centre of gravity (if no cross beam is used) when the generating set or its lifted component is in the normal position specified by the manufacturer.		P
	Generating sets below 140 kg intended for transportation by persons shall have carrying handles or an adequate frame design to transport it according to the manufacturers' manual.		N/A
	The handles shall be designed to withstand at least 2,5 times the mass lifted divided by the number of carrying handles.		N/A
6.11.2	Verification		
	Compliance with the requirements of 6.11.1 regarding the number and the location of the lifting attachments shall be verified by inspection.		P
	The strength of the lifting attachments to withstand the mass to be lifted shall be verified by testing or calculation.		P
6.12	Mechanical strength		
6.12.1	Requirements		
	Low-power generating sets shall be designed in such a way as to be able to withstand robust handling within the framework of normal operation. All parts, damage to which may impair safety, shall have sufficient mechanical strength. The generating set shall satisfy the tests defined below.		P
	a) Subjected to impact using an impact tester. Blows are applied to the generating set by means of the spring-operated impact tester according to	The spring hammer test is OK.	P

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	IEC 60068-2-75. The spring is adjusted in such a way as to cause the hammer to strike with an impact energy of 1, 0 J ± 0,05 J. The release mechanism springs are adjusted in such a way as to exert just sufficient pressure to keep the release jaws in the engaged position. The apparatus is cocked by pulling the cocking knob until the release jaws engage with the groove in the hammer shaft. Blows are applied by pushing the release cone against the sample in a direction perpendicular to the surface of the sample at the point to be tested. Pressure is slowly increased so that the cone moves back until it is in contact with the release bars, which then move to operate the release mechanism and allow the hammer to strike. The entire sample, under no-running conditions, is rigidly held and three blows are applied to every point of the enclosure which is likely to be weak. Blows are also applied to protective devices, handles, levers, knobs, etc.		
	b) Free-fall test. Before testing the generating set shall be in the usual carrying/transporting condition. It is dropped from a height of 20 cm on to a concrete floor. This test is performed once.	dropped from a height of 20 cm on to a concrete floor, no damage.	P
6.12.2	Verification		
	After completing both tests, the sample shall exhibit no damage which would impair mechanical or electric safety.		P
6.13	**Fire protection**		
6.13.1	General		
	The design shall consider hazards from flammable liquids or gases with regard to routing of pipes, location of reservoir, leakage, filling and draining. The possibility of contact with energy sources that could result in a hazard should be minimized.		P
6.13.2	Requirements		
	For the RIC engine, the basic requirements of ISO 6826 shall be met. The orifices and the filling devices of the		P

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	generating set shall meet the requirements of ISO 6826:1997, 6.2. The piping for flammable liquids shall meet the requirements of ISO 6826:1997, 7.3 and the draining valves the requirements of ISO 6826:1997, 7.6.		
	For fuel tanks, the following additional requirements apply. Design requirements: ---fuel tanks shall be designed as to ensure that no leaks develop under normal operating conditions; ---filler necks in fuel tanks shall be arranged and designed in such a way as to ensure that fuel cans or other devices with spouts can be directly inserted and no fuel can come into contact with hot parts.	No leaks	P
	Strength requirements: ---the tank shall be secured to withstand normal handling; ---the tank shall be strong enough to withstand impact during normal handling or be protected from impact.		P
	For low power generating sets, the following additional temperature requirement applies. — Any parts of the generating set which are in direct contact with its supporting surface shall not exceed a temperature of 90 ° C.	See Appended Table:6.8.3	P
6.13.3	Verification		
	Compliance with the requirements shall be verified by inspection and examination of the engine manufacturer documentation.		P
	For low power generating sets, compliance with the fuel tank strength requirements shall be satisfied by testing in accordance with 6.12.1 a).		P
	For low power generating sets, the temperature measurement shall be done in the same operating conditions as specified in 6.8.3.5.		P
6.14	**Hoses, pipes and electrical harnesses of the RIC engine**		
6.14.1	Requirements		
	Hoses, pipes and electric harnesses, as well as fittings and connectors, shall be designed and made of material to withstand expected pressure, voltage, temperature, abrasion, corrosion, etc. Excessive hose and electric cable length shall be avoided to prevent misuse and obstruction. Hoses and electric harnesses shall be routed and		P

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	retained so that it is unlikely they will be used as hand holds or footsteps. Hoses and electric harnesses shall not interfere with the accessibility of service points. Hoses and pipe assemblies that can leak flammable liquids or gases onto hot surfaces, shall either be guarded to prevent the liquid going onto the hot surface or be dimensioned to be able to contain twice the operating pressure. In case of fuel pipes, 1,2 times the maximum operating pressure is sufficient.		
6.14.2	Verification		
	Compliance with requirements shall be verified by inspection and examination of the documentation provided by component manufacturers.		P
6.15	**Electrical equipment**		
6.15.1	**Generator sets**		
6.15.1.1	**Degree of protection**		
	These requirements do not apply to the safety extra low voltage circuits		P
6.15.1.1.1	Protection against solid foreign objects and protection of persons against access to hazardous parts inside the enclosure		
6.15.1.1.1.1	Requirements (minimum degree of protection)		
	a) For generating sets except low power generating sets —generating set : IP2X, —operator interface : IP3X, —live parts on the inside of doors : IP1X, and —switching and control devices : IP4X. NOTE If inside of doors: IP2X b) For low power generating sets — generating set : IP2X, and — operator interface : IP3X.	IP23M	P
6.15.1.1.1.2	Verification		
	The degree of protection shall be verified on the generating set in accordance with the test method and acceptance criteria of IEC 60529.		P
6.15.1.1.2	Protection of the equipment inside the enclosure against harmful effects due to the ingress of water		
6.15.1.1.2.	Requirements (minimum degree of protection)		

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
1			
	a) For generating sets except low power generating sets — generating set : IPX1M, and — operator interface：IPX3M b) For low power generating sets — generating set and operator interface : IPX3M		P
6.15.1.1.2.2	Verification		
	The test method for each degree of protection shall be in accordance with IEC 60529 in operation condition with no load. The test sample for the test shall be in a clean and new condition with all parts in place and mounted in the manner stated by the manufacturer. The degree of protection shall be verified in accordance with the acceptance criteria following a) or b). a) Generating sets except low power generating sets shall comply with the acceptance criteria of IEC 60529. b) For the lower power generating sets. After the test against ingress of water, a dielectric test shall be performed in accordance with IEC 60335-1: 2013, 16.3, Table 7, and the creepage distance shall comply with IEC 60335-1:2013, 29.2, Table 17.	the test against ingress of water, no water in it. the creepage distance is 6.0mm.	P
6.15.1.2	Insulation		
6.15.1.2.1	Requirements		
	The insulation of output circuit shall comply with IEC 60204-1.		P
6.15.1.2.2	Verification		
	Insulation of output circuit shall be verified according to IEC 60204-1:2009, 18.3, 18.4. In addition, for generators equipped with safety extra low-voltage circuits for the output that may be in direct contact of persons with its live parts during the operation, such as the output for battery charging outside the generating sets, or extra low-voltage circuits for control circuits inside generating sets, the generating set windings for these circuits shall be electrically isolated from other windings. The voltage test according to IEC 60034-1:2010, 9.2 shall	500V applied between live parts and earthing terminal. Insulation resistance>1MΩ	P

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	be performed between the main and/or excitation windings at: 2UN + 2000 V for generating set windings of safety extra low voltage circuit 2 UN + 1000 V for generating set windings of extra low voltage circuit where, UN is the rated output voltage of the generating set		
6.15.1.3	Protective bonding circuit		
6.15.1.3.1	Requirements		
	The protective bonding circuit shall comply with IEC 60204-1.		P
6.15.1.3.2	Verification		
	The function of the protective bonding circuit shall be verified according to IEC 60204-1:2009, 18.2.		P
6.15.1.4	Clearances, creepage distances and solid insulation		
6.15.1.4.1	Requirements		
	Creepage distances and clearances shall not be less than the values, in mm, in IEC 60335-1:2013, Clause 29	Creepage distances:6.0mm Clearances:5.5mm	P
6.15.1.4.2	Verification		
	Compliance shall be checked by measurement of the clearances and verification on the basis of manufacturing documents.		P
6.15.2	Other electrical equipment		
	Electrical equipment used to operate the generating set shall meet the requirements of Annex B.		P
6.16	**Noise**		
6.16.1	Requirements		
	When designing the generating set, the available information and technical measures to control noise at source shall be taken into account, see for example, ISO/TR 11688-1. The main sources of airborne noise on generating sets include the following: the engine; the cooling system fan if provided; the exhaust system.		P
6.16.2	Verification		
	Airborne noise shall be measured as specified in ISO 8528-10:1998, Clause 9 at 75 % of rated power (PRP), except for low power generating sets to ISO 8528-8:2016, 3.3 (COP) and determined according to ISO	sound pressure level is 84 d(B)	P

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	8528-10:1998, Clause 13 for the sound power level and according to ISO 8528-10:1998, Clause 14 for the emission sound pressure level.		
6.17	**Access systems**		
6.17.1	Requirements		
	Surfaces of all access system (e.g. walkways and platforms, etc.), if required, shall be slip resistant under the expected use to minimize the possibility of foot slippage.	Generating set is floor supported.	N/A
	Access systems shall be level and free from obstructions and protrusions to prevent injury. The structure shall be sufficiently sturdy and stable to support any expected load without undue deformation or loss of integrity.		N/A
	Access systems shall be designed according to ISO 14122-2:2001 and ISO 14122-2:2001/Amd1:2010.		N/A
6.16.2	Verification		
	Compliance with the requirements shall be verified by test or calculation.		N/A
6.18	**Access to service points**		
6.18.1	Requirements		
	Openings intended for maintenance purposes shall comply with ISO 15534-2.		N/A
6.18.2	Verification		
	Compliance with the requirements shall be verified by inspection and measurement.		N/A
6.19	**Gaseous and particulate exhaust emissions**		
6.19.1	Requirement		
	The exhaust shall be directed away from the generating set control panel.	The exhaust directed away from the generating set control panel.	P
	For generating sets intended to be used indoors, the exhaust shall be directed outside. NOTE This is the responsibility of the installer, see 7.1.	Stated in the manual: not used in door.	N/A
6.19.2	Verification		
	Compliance with the requirements shall be verified by Inspection.		P
6.20	**Drainage**		
6.20.1	Requirements		
	Provisions shall be made to allow drainage of fuel, coolant and lubrication oil without any spillage. This can		N/A

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	be achieved by		
	permanently installed pipework to a collection point, or		N/A
	providing access for collection containers to allow direct drainage, or		N/A
	access to drain plugs without the need to remove guards.		P
6.20.2	Verification		
	Compliance with the requirements shall be verified by inspection.		P
7	**Operating and maintenance instructions**		
7.1	Requirements		
	Operating and maintenance instruction shall comply with ISO 12100:2010, 6.4.5 and shall provide adequate information to enable the generating set to be operated safely and give clear advice concerning its installation, use and maintenance. Extensive use should be made of photographs and/or diagrams		P
	operating and maintenance instructions shall include, but not be limited, to the following: a) general description, in particular description of the generating set nameplate, and explanation of the adjustment points that shall not be modified; b) general information concerning the toxicity of exhaust gases, fuel and oil; c) information concerning the limitation of use at locations where the risk of fire may be high; d) filling with fuel and oil; e) starting and stopping; f) correct use of batteries; g) indications about the hot surfaces and their guards when provided; h) routine maintenance instructions; i) correct disposal of residual fluids; j) indication that the installation and major repair work shall be carried out only by specifically trained personnel; k) information on installation precautions, e.g. exhaust system, intake system, cooling system, drainage, fuelling, electrical connection, noise and access; l) if necessary advice on the need of personal protection	See manual instruction.	P

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	equipment; m) in the case of generating sets provided for use by laymen the supplied instructions shall meet the requirements as defined in Annex C; n) the operation manual shall contain information on sound power level from the generating set and the emission sound pressure level at the operator’s position(s) as follows: 1) A-weighted sound power level (LwA in accordance with ISO 8528-10:1998) emitted by the machine, together with uncertainty of stated values where the equivalent continuous A-weighted emission sound pressure level at the operator’s station(s) exceeds 80 dB. The declaration of this value shall have the format of a single number declaration as defined in ISO 4871. 2) A-weighted emission sound pressure level (LpA) at the operator’s station (at a distance of 1 m where no operator station is existing) where this exceeds 70 dB, together with uncertainty of stated values; where this level does not exceed 70 dB, this fact shall be indicated. The declaration of this value shall have the format of a dual-number declaration as defined in ISO 4871. 3) For indoor generating sets for which the ambient noise levels depend on the conditions of installation, it is not possible to specify these ambient noise levels in the operating and maintenance instructions. In this case, the operating and maintenance instructions shall include a warning about the dangers of airborne noise and on the need for performing, after the installation, acoustic measurements to determine the sound pressure level in the conditionsspecified in 6.16.2 and for implementing appropriate protective measures if necessary.		
7.2	Verification		
	Compliance with the requirements shall be verified by examination of the operating and maintenance instructions and then by inspection of the generating set.		P

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
8	**Safety labels**		
8.1	Requirement		
	The labels shall be clearly visible, legible and indelible. The symbols shall be labelled according to ISO or IEC relevant standards. Safety labels shall be present on a generating set to inform the user of potential danger if these risks have been identified by the manufacturer. Low power generating sets shall be labelled with at least the following safety labels: a) read the operator’s instruction manual; b) exhaust gas is poisonous; do not operate in an unventilated area [Carbon monoxide (CO) danger]; c) not to refuel when operating Safety labels shall be, for example, as shown below.		P
8.2	Verification		
	The conformity of the safety labels shall be verified by inspection.		P
9	**Marking**		
9.1	Requirement		
	Generating sets shall be marked legibly and indelibly with the following minimum information: ---the name and address and trademark of the manufacturer and where applicable his authorized representative; ---the designation of the machinery “Generating set” or “ Low-power generating set “ ---the designation of series or type1) ---the serial number; ---the year of construction, that is the year in which the manufacturing process is completed; ---mass in kilograms; ---the rated power, in kilowatts, with the prefixes COP, PRP, LTP or ESP in accordance with SO 8528-1:2005, Clause 13; ---the performance class in accordance with ISO 8528-1:2005; ---the rated power factor; 1) The designation of the series or type is to allow the technical identification of the product and this can be achieved a combination of letters and/or numbers and	See Nameplate	P

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	can be combined with the technical designation of the Machinery. — the rated frequency, in hertz; — the rated voltage, in volts; — the rated current, in amperes; — for low power generating sets: —the quality class in accordance with ISO 8528-8:2016, 7.3.2; —the maximum power, in kilowatts, with the prefix MAX in accordance with ISO 8528-8:2016, 3.4; —the degree of protection provided by the generating set (at least IP23M). NOTE Information related to the maximum side altitude above sea level (m) and the maximum site ambient temperature (C°) are not relevant for the rating plate but can be made available in a technical documentation.		
9.2	Verification		
	The conformity of the markings shall be verified by inspection.		P

Annex A	List of hazards		P
Annex B	Application of IEC 60204-1:2009 for generating sets		
	In accordance with IEC 60204-1:2009, Annex F, this Annex specifies and completes the general requirements of IEC 60204-1 which are applicable to the electric equipment of the generating sets.		P
1	**Scope**		
	This part of IEC 60204 is applicable to the electrical equipment or parts of the electrical equipment that operate with nominal supply voltages not exceeding 1 000 V for alternating current (a.c.) and not exceeding 1 500 V for direct current (d.c.), and with nominal supply frequencies not exceeding 200 Hz.		P
2	Normative references		
3	Definitions		
4	**General requirements**		
	It is impracticable for manufacturers of generating sets to specify the type of system earthing on the load side. The following shows the types of system earthling (TN, TT, IT) and the corresponding types of system earthing for generating sets.		P

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	Types of system earthing (Generating sets & Load): TN system; TT system; IT system Types of system earthing (Generating sets only): Neutral bonded; Neutral unbonded/Neutral high-impedance bonded NOTE Requirements for types of system earthing covered by this standard are applicable only to generating sets of the corresponding types of system earthling.		
4.1	General considerations		
4.2	Selection of equipment		
4.2.1	General		
	Electrical components and devices shall: ---be suitable for their intended use, and ---electrical components important to safety (for example receptacle, circuit protector, conducting wire) shall comply with the safety requirements stipulated in the applicable ISO, IEC or national standards.	See main components list	P
4.2.2	Electrical equipment in compliance with the IEC 60439 series		
4.3	**Electrical supply**		
	Contrary to IEC 60204-1, the following requirements apply to generating sets. Electrical equipment of generating sets, which is supplied by the generator of the generating sets itself, shall work without any failure under the rated conditions of the generating sets according to ISO 8528-1:2005, Clause 7 and ISO 8528-5:2013, Clause 16. For low power generating sets, ISO 8528-8:2016, Clause 7 applies.		P
	If not otherwise agreed, the electrical equipment which is not supplied by the generator of the generating set shall meet the requirements according IEC 60204-1:2009, 4.3.		P
	In case the generator supplies electrical equipment of machinery, the supply requirements according to IEC 60204-1:2009, 4.3.1 apply. The requirements shall be agreed between user and manufacturer especially in view of the transient behaviour during load changes.		P
4.4	**Physical environment and operating conditions**		

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
4.4.1	**General**		
4.4.2	**Electromagnetic compatibility(EMC)**		
4.4.3	**Ambient air temperature**		
4.4.4	**Humidity**		
	Instead of the values given in IEC 60204-1:2009, generating sets shall meet the limit values according to ISO 8528-1:2005, Clauses 10 and 11.		N/A
	Low power generating sets shall meet the limit values according ISO 8528-8:2016, Clause 7. Deviations from those values shall be agreed between manufacturer and user.	See Appendix ISO 8528-8	P
	Deviations from those values shall be agreed between manufacturer and user.		N/A
4.4.5	Altitude		
4.4.8	Vibration ,shock,and bump		
4.5	**Transportation and storage**		
	Electrical equipment shall be designed to withstand, or suitable precautions shall be taken to protect against, the effects of transportation and storage temperatures within a range of －25 ° C to +55 ° C and for short periods not exceeding 24 h at up to +70 ° C. Suitable means shall be provided to prevent damage from humidity, vibration, and shock. A special agreement can be necessary between the supplier and the user (see Annex B). NOTE Electrical equipment susceptible to damage at low temperatures includes PVC insulated cables		P
4.6	**Provisions for handling**		
	Heavy and bulky electrical equipment that has to be removed from the machine for transport, or that is independent of the machine, shall be provided with suitable means for handling by cranes or similar equipment.		N/A
4.7	Installation		
	Electrical equipment shall be installed in accordance with the electrical equipment supplier's instructions.		P
5	**Incoming supply conductor terminations and devices for disconnecting and switching off**		
5.1	**Incoming supply conductor terminations**		
	Contrary to IEC 60204-1 for generating sets, dependent from the demanded protection measure, a connection		N/A

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	between neutral conductor and protective bonding circuit may be required. If generating sets are used as standby-to-mains-units, an electrical and/or mechanical interlocking system is necessary to avoid parallel operation (see ISO 8528-4). If generating sets are operating parallel to the mains or other generating sets, additional equipment for synchronising and protection including any controls or instrumentation shall be provide if needed (see ISO 8528-4).		
5.2	**Terminal for connection to the external protective earthing system**		
	The generating sets shall have a terminal for the connection of an external protective conductor and/or a functional grounding near the associated phase conductor terminal, or on a suitable place at the generating set frame. The requirements for this terminal shall be according to IEC 60204-1:2009, 5.2. If the use of this terminal at delivery of the generating sets is unknown, it shall be delivered and marked with the symbol 5019 of IEC 60417-DB-12M:2002.	The equipment has the external protective earthing system.	P
5.3	**Supply disconnecting (isolating) device**		
	For generating sets in single operation, which provide power supply to various electrical equipment through a plug-type device, the electrical disconnection through the plug-type device up to 32 A or a protection switch above 32 A at the generating sets with manual operation is permitted. For generating sets in single operation, standby-to mains operation or parallel-to mains operation, which provides power to a consumer net, ISO 8528-4:2005, 5.2 applies.		N/A
	Electrical equipment which is necessary for the operation of the generating set and which is not only supplied by the generator shall be equipped with a separate disconnecting device.		N/A
	For generating sets used for stand-by operation a separate disconnecting device for secondary machines should be necessary.		N/A
5.4	**Devices for switching off for prevention of unexpected start-up**		

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	Such devices are only necessary for generating sets with a remote starting device or an automatic starting device if there is any danger of an unexpected start. An emergency stop button should be used as such a device.		N/A
5.5	**Devices for disconnecting electrical equipment**		
	Devices shall be provided for disconnecting (isolating) electrical equipment to enable work to be carried out when it is de-energised and isolated. Such devices shall be: - appropriate and convenient for the intended use; - suitably placed; - readily identifiable as to which part(s) or circuit(s) of the equipment is served (for example by durable marking in accordance with 16.1 where necessary). Means shall be provided to prevent inadvertent and/or mistaken closure of these devices either at the controller or from other locations (see also 5.6). The supply disconnecting device (see 5.3) may, in some cases, fulfil that function. However, where it is necessary to work on individual parts of the electrical equipment of a machine, or on one of a number of machines fed by a common conductor bar, conductor wire or inductive power supply system, a disconnecting device shall be provided for each part, or for each machine, requiring separate isolation. In addition to the supply disconnecting device, the following devices that fulfil the isolation function may be provided for this purpose: - devices described in 5.3.2; - disconnectors, withdrawable fuse links and withdrawable links only if located in an electrical operating area (see 3.15) and relevant information is provided with the electrical equipment (see 17.2 b)9) and b)12)). NOTE Where protection against electric shock is provided in accordance with 6.2.2 c), withdrawable fuse links or withdrawable links for this purpose are intended for use by skilled or instructed persons.		P
5.6	**Protection against unauthorized, inadvertent and/or mistaken connection**		

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	The devices described in 5.4 and 5.5 that are located outside an enclosed electrical operating area shall be equipped with means to secure them in the OFF position (disconnected state), (for example by provisions for padlocking, trapped key interlocking). When so secured, remote as well as local reconnection shall be prevented. Where a non-lockable disconnecting device (for example withdrawable fuse-links, withdrawable links) other means of protection against reconnection (for example warning labels in accordance with 16.1) may be provided. However, when a plug/socket combination according to 5.3.2 e) is so positioned that it can be kept under the immediate supervision of the person carrying out the work, means for securing in the disconnected state need not be provided.	Socket used and under immediate supervision of person	P
6	**Protection against electric shock**		
6.1	**General**		
	The electrical equipment shall provide protection of persons against electric shock from: – direct contact (see 6.2 and 6.4); – indirect contact (see 6.3 and 6.4). The measures for this protection given in 6.2, 6.3, and, for PELV, in 6.4, are a recommended selection from IEC 60364-4-41. Where those recommended measures are not practicable, for example due to the physical or operational conditions, other measures from IEC 60364-4-41 may be used.		P
6.2	**Protection against direct contact**		
6.2.1	General		
	For each circuit or part of the electrical equipment, the measures of either 6.15.1.1 or 6.15.1.2 and, where applicable, IEC 60204-1:2009, 6.2.4 shall be applied. **Exception**: where those measures are not appropriate, other measures for protection against direct contact (for example by using barriers, by placing out of reach, using obstacles, using construction or installation techniques that prevent access) as defined in IEC 60364-4-41 shall be applied (see IEC 60204-1:2009, 6.2.5 and 6.2.6).	IP23M	P

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
6.2.3	Protection by insulation of live part		
	Live parts protected by insulation shall be completely covered with insulation that can only be removed by destruction. Such insulation shall be capable of withstanding the mechanical, chemical, electrical, and thermal stresses to which it can be subjected under normal operating conditions. NOTE Paints, varnishes, lacquers, and similar products alone are generally considered to be inadequate for protection against electric shock under normal operating conditions		P
6.2.4	**Protection against residual voltages**		
	Live parts having a residual voltage greater than 60 V after the supply has been disconnected shall be discharged to 60 V or less within a time period of 5 s after disconnection of the supply voltage provided that this rate of discharge does not interfere with the proper functioning of the equipment. Exempted from this requirement are components having a stored charge of 60 µC or less. Where this specified rate of discharge would interfere with the proper functioning of the equipment, a durable warning notice drawing attention to the hazard and stating the delay required before the enclosure may be opened shall be displayed at an easily visible location on or immediately adjacent to the enclosure containing the capacitances		P
	In the case of plugs or similar devices, the withdrawal of which results in the exposure of conductors (for example pins), the discharge time shall not exceed 1 s, otherwise such conductors shall be protected against direct contact to at least IP2X or IPXXB. If neither a discharge time of 1 s nor a protection of at least IP2X or IPXXB can be achieved (for example in the case of removable collectors on conductor wires, conductor bars, or slip-ring assemblies, see 12.7.4), additional switching devices or an appropriate warning device (for example a warning notice in accordance with 16.1) shall be applied.		P
6.2.5	**Protection by barriers**		
	For protection by barriers, 412.2 of IEC 60364-4-41 shall apply.		P
6.2.6	**Protection by placing out of reach or protection by obstacles**		

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	For protection by placing out of reach, 412.4 of IEC 60364-4-41 shall apply. For protection by obstacles, 412.3 of IEC 60364-4-41 shall apply. For conductor wire systems or conductor bar systems with a degree of protection less than IP2X, see 12.7.1.		P
6.3	**Protection against indirect contact**		
6.3.1	General		
	For each circuit or part of the generating set, at least one of the measures as prescribed in B.5.2.1.1 and B.5.2.1.2 shall be applied. ---measures to prevent the occurrence of a touch voltage (B.5.2.1.1); ---automatic disconnection of the supply before the duration of contact with a touch voltage canbecome hazardous (B.5.2.1.2).		P
6.3.2	Prevention of the occurrence of a touch voltage		
6.3.2.1	General		
	Measures to prevent the occurrence of a touch voltage include the following: – provision of class II equipment or by equivalent insulation; – electrical separation		P
6.3.2.3	Protection by electrical separation		
	Electrical separation of an individual circuit is intended to prevent a touch voltage through contact with exposed conductive parts that can be energized by a fault in the basic insulation of the live parts of that circuit. For this type of protection, the requirement of IEC 60364-4-41:2005, 413 apply.		P
6.3.3	**Protection by automatic disconnection of supply**		
	This measure consists of the interruption of one or more of the line conductors by the automatic operation of a protective device in case of a fault. This interruption shall occur within a sufficiently short time to limit the duration of a touch voltage to a time within which the touch voltage is not hazardous. Interruption times are given in IEC 60204-1:2009, Annex A.		N/A
	This measure necessitates co-ordination between the following: ---the type of supply and earthling system; ---the impedance values of the different elements of the		P

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	protective bonding system; ---the characteristics of the protective devices that detect insulation fault(s).		
	Automatic disconnection of the supply of any circuit affected by an insulation fault is intended to prevent a hazardous situation resulting from a touch voltage.		P
	This protective measure comprises both --- protective bonding of exposed conductive parts (see IEC 60204-1:2009, 8.2.3) ---and either: one of the following solutions (a or b). a) for neutral bonded generating sets, residual current protective device and overcurrent protective devices for the automatic disconnection of the supply on detection of an insulation fault. In case the generating set is intended to use for TN-C system, the residual current protective devise is not required. b) for neutral unbonded/neutral high-impedance bonded generating sets, insulation monitoring device and overcurrent protective devices for the automatic disconnection of the supply on detection of an insulation fault. The insulation monitoring device shall, in the case where the supply is not interrupted in the event of the first earth fault, initiate an audible and/or visual signal which shall continue as long as the first earth fault persists. Insulation monitoring devices are not required for generating sets not intended to be fixed installed for continuous use of the power supply. NOTE In large machines, the provision of an earth fault location system can facilitate maintenance.		P
	Residual current protective device and Insulation monitoring device shall correspond to ISO 8528-4:2005, 7.3.7.		P
	Overcurrent protective devices, residual current protective devices and insulation monitoring devices may not be integrated by the manufacturer in generating sets provided, however, that information on characteristics of these devices and their installation by the user (grounding of neutral, connection distance to the generating set) shall be included in the		P

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	use and instructions manual.		
	When a protection by differential current is needed or imposed as complementary protection, only residual differential devices not exceeding 30 mA shall be used.		P
	Overcurrent protective devices to initiate automatic disconnection of the supply on detection of an insulation fault shall be those correctly sized taking into account the impedance of the generator and the short circuit behaviour of the generating sets; the fuses are not allowed.		P
	The overcurrent protective device shall cause a reduction of voltage to a value lower or equal to 50 V in a time complying with values of IEC 60204-1:2009, Annex A or a disconnection of supply.		P
	For polyphase generators, this requirement shall be verified in case of short-circuit between two phase conductors and between a phase conduct and an eventual neutral conductor.		P
	For low power generating sets, this requirement shall be verified by a test of a short-circuiting with a resistance of 1,5 Ω behind the outputs of the generating set.		P
	These requirements shall be verified by visual checking, operation test and control of use and instructions manual.		P
6.4	**Protection by the use of PELV**		
6.4.1	**General requirements**		
	The use of PELV (Protective Extra-Low Voltage) is to protect persons against electric shock from indirect contact and limited area direct contact (see 8.2.5). PELV circuits shall satisfy all of the following conditions: a) the nominal voltage shall not exceed: • 25 V a.c. r.m.s. or 60 V ripple-free d.c. when the equipment is normally used in dry locations and when large area contact of live parts with the human body is not expected; or • 6 V a.c. r.m.s. or 15 V ripple-free d.c. in all other cases; NOTE Ripple-free is conventionally defined for a sinusoidal ripple voltage as a ripple content of not more than 10 % r.m.s.		N/A

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	b) one side of the circuit or one point of the source of the supply of that circuit shall be connected to the protective bonding circuit; c) live parts of PELV circuits shall be electrically separated from other live circuits. Electrical separation shall be not less than that required between the primary and secondary circuits of a safety isolating transformer (see IEC 61558-1 and IEC 61558-2-6); d) conductors of each PELV circuit shall be physically separated from those of any other circuit. When this requirement is impracticable, the insulation provisions of 13.1.3 shall apply; e) plugs and socket-outlets for a PELV circuit shall conform to the following: plugs shall not be able to enter socket-outlets of other voltage systems; 2) socket-outlets shall not admit plugs of other voltage systems.		
6.4.2	**Sources for PELV**		
	The source for PELV shall be one of the following: – a safety isolating transformer in accordance with IEC 61558-1 and IEC 61558-2-6; – a source of current providing a degree of safety equivalent to that of the safety isolating transformer (for example a motor generator with winding providing equivalent isolation); – an electrochemical source (for example a battery) or another source independent of a higher voltage circuit (for example a diesel-driven generator); – an electronic power supply conforming to appropriate standards specifying measures to be – taken to ensure that, even in the case of an internal fault, the voltage at the outgoing terminals cannot exceed the values specified in 6.4.1.		N/A
7	Protection of equipment		
7.1	**General**		
	This Clause details the measures to be taken to protect equipment against the effects of: – overcurrent arising from a short circuit; – overload and/or loss of cooling of motors; – abnormal temperature;		P

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	- loss of or reduction in the supply voltage; - overspeed of machines/machine elements; - earth fault/residual current; - incorrect phase sequence; - overvoltage due to lightning and switching surges.		
7.3	**Protection of motors against overheating**		
7.4	**Abnormal temperature protection**		
	Resistance heating or other circuits that are capable of attaining or causing abnormal temperatures (for example, due to short-time rating or loss of cooling medium) and therefore can cause a hazardous situation shall be provided with suitable detection to initiate an appropriate control response		N/A
7.7	**Earth fault/residual current protection**		
	In addition to providing overcurrent protection for automatic disconnection as described in 6.3, earth fault/residual current protection can be provided to reduce damage to equipment due to earth fault currents less than the detection level of the overcurrent protection. The setting of the devices shall be as low as possible consistent with correct operation of the equipment		N/A
7.8	**Phase sequence protection**		
	Where an incorrect phase sequence of the supply voltage can cause a hazardous situation or damage to the machine, protection shall be provided. NOTE Conditions of use that can lead to an incorrect phase sequence include: - a machine transferred from one supply to another; - a mobile machine with a facility for connection to an external power supply.		N/A
7.9	**Protection against overvoltages due to lightning and to switching surges**		
	Protective devices can be provided to protect against the effects of overvoltages due to lightning or to switching surges. Where provided: - devices for the suppression of overvoltages due to lightning shall be connected to the incoming terminals of the supply disconnecting device. - devices for the suppression of overvoltages due to		N/A

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	switching surges shall be connected across the terminals of all equipment requiring such protection		
8	**Equipotential bonding**		
8.1	**General**		
	This Clause provides requirements for both protective bonding and functional bonding. Figure 2 illustrates those concepts. Protective bonding is a basic provision for fault protection to enable protection of persons against electric shock from indirect contact (see 6.3.3 and 8.2). The objective of functional bonding (see 8.3) is to minimize: – the consequence of an insulation failure which could affect the operation of the machine; – the consequences of electrical disturbances to sensitive electrical equipment which could affect the operation of the machine. Normally functional bonding is achieved by connection to the protective bonding circuit, but where the level of electrical disturbances on the protective bonding circuit is not sufficiently low for proper functioning of electrical equipment, it may be necessary to connect the functional bonding circuit to a separate functional earthing conductor (see Figure 2).		P
8.2	**Protective bonding circuit**		
8.2.1	**General**		
	IEC 60204-1:2009, 8.2.1 is replaced as follows: The protective bonding circuit consists of the following: ---PE terminal(s) (see B.4.2); ---the protective conductors in the equipment of the machine including sliding contacts where they are part of the circuit; ---the exposed conductive parts and conductive structural parts of the electrical equipment; ---those extraneous conductive parts which form the structure of the machine.		P
	All parts of the protective bonding circuit shall be so designed that they are capable of withstanding the highest thermal and mechanical stresses that can be caused by earth-fault currents that could flow in that part of the protective bonding circuit.		P

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	Where the conductance of structural parts of the electrical equipment or of the machine is less than that of the smallest protective conductor connected to the exposed conductive parts, a supplementary bonding conductor shall be provided. This supplementary bonding conductor shall have a cross-sectional area not less than half that of the corresponding protective conductor.		P
	Except for low power generating sets, if an IT distribution system is used, the machine structure shall be part of the protective bonding circuit and insulation monitoring shall be provided. See B.5.2.1.2b).		P
	Exposed conductive parts of equipment in accordance with B.5.2.1.1 shall not be connected to the protective bonding circuit		P
8.2.2	Protective conductors		
	Protective conductors shall be identified in accordance with 13.2.2. Copper conductors are preferred. Where a conductor material other than copper is used, its electrical resistance per unit length shall not exceed that of the allowable copper conductor and such conductors shall be not less than 16 mm2 in cross-sectional area. The cross-sectional area of protective conductors shall be determined in accordance with the requirements of: - 543 of IEC 60364-5-54; or - 7.4.3.1.7 of IEC 60439-1, as appropriate. This requirement is met in most cases where the relationship between the cross-sectional area of the phase conductors associated with that part of the equipment and the cross-sectional area of the associated protective conductor is in accordance with Table 1 (see 5.2).		P
8.2.3	Continuity of the protective bonding circuit		
	All exposed conductive parts shall be connected to the protective bonding circuit in accordance with 8.2.1. Exception: see 8.2.5. Where a part is removed for any reason (for example routine maintenance), the protective bonding circuit for the remaining parts shall not be interrupted. Connection and bonding points shall be so designed that their current-carrying capacity is not impaired by		P

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	mechanical, chemical, or electrochemical influences. Where enclosures and conductors of aluminium or aluminium alloys are used, particular consideration should be given to the possibility of electrolytic corrosion. Metal ducts of flexible or rigid construction and metallic cable sheaths shall not be used as protective conductors. Nevertheless, such metal ducts and the metal sheathing of all connecting cables (for example cable armouring, lead sheath) shall be connected to the protective bonding circuit. Where the electrical equipment is mounted on lids, doors, or cover plates, continuity of the protective bonding circuit shall be ensured and a protective conductor (see 8.2.2) is recommended. Otherwise fastenings, hinges or sliding contacts designed to have a low resistance shall be used (see 18.2.2, Test 1). The continuity of the protective conductor in cables that are exposed to damage (for example flexible trailing cables) shall be ensured by appropriate measures (for example monitoring). For requirements for the continuity of the protective conductor using conductor wires, conductor bars and slip-ring assemblies, see 12.7.2.		
8.2.4	Exclusion of switching devices from the protective bonding circuit		
	The protective bonding circuit shall not incorporate a switching device or an overcurrent protective device (for example switch, fuse). No means of interruption of the protective bonding conductor shall be provided Exception: links for test or measurement purposes that cannot be opened without the use of a tool and that are located in an enclosed electrical operating area. Where the continuity of the protective bonding circuit can be interrupted by means of removable current collectors or plug/socket combinations, the protective bonding circuit shall be interrupted by a first make last break contact. This also applies to removable or withdrawable plug-in units (see also 13.4.5).		P
8.2.5	Parts that need not be connected to the protective bonding circuit		

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	It is not necessary to connect exposed conductive parts to the protective bonding circuit where those parts are mounted so that they do not constitute a hazard because: – they cannot be touched on large surfaces or grasped with the hand and they are small in size (less than approximately 50 mm × 50 mm); or – they are located so that either contact with live parts, or an insulation failure, is unlikely. This applies to small parts such as screws, rivets, and nameplates and to parts inside an enclosure, irrespective of their size (for example electromagnets of contactors or relays and mechanical parts of devices) (see also 410.3.3.5 of IEC 60364-4-41).		P
8.2.6	Protective conductor connecting points		
	All protective conductors shall be terminated in accordance with 13.1.1. The protective conductor connecting points shall have no other function and are not intended, for example, to attach or connect appliances or parts. Each protective conductor connecting point shall be marked or labelled as such using the symbol IEC 60417-5019 (DB:2002-10):  or with the letters PE, the graphical symbol being preferred, or by use of the bicolour combination GREEN-AND-YELLOW, or by any combination of these.		P
8.2.7	Mobile machines		
	On mobile machines with on-board power supplies, the protective conductors, the conductive structural parts of the electrical equipment, and those extraneous conductive parts which form the structure of the machine shall all be connected to a protective bonding terminal to provide protection against electric shock. Where a mobile machine is also capable of being connected to an external incoming power supply, this protective bonding terminal shall be the connection point for the external protective conductor. NOTE When the supply of electrical energy is self-contained within stationary, mobile, or movable items of equipment, and when there is no external supply connected (for example when an on-board battery charger is not connected), there is no need to connect such		N/A

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	equipment to an external protective conductor.		
8.2.8	Additional protective bonding requirements for electrical equipment having earth leakage currents higher than 10 mA a.c. or d.c.		
	NOTE 1 Earth leakage current is defined as “current flowing from the live parts of an installation to earth, in the absence of an insulation fault” (IEV 442-01-24). This current may have a capacitive component including that resulting from the deliberate use of capacitors. NOTE 2 Most adjustable speed electrical power drive systems that comply with relevant parts of IEC 61800 will have an earth leakage current greater than 3,5 mA a.c. A touch current measurement method is specified as a type test in IEC 61800-5-1 to determine the earth leakage current of an adjustable speed electrical power drive system. Where electrical equipment has an earth leakage current (for example adjustable speed electrical power drive systems and information technology equipment) that is greater than 10 mA a.c. or d.c. in any incoming supply, one or more of the following conditions for the associated protective bonding circuit shall be satisfied: a) the protective conductor shall have a cross-sectional area of at least 10 mm2 Cu or 16 mm2 Al, through its total run; b) where the protective conductor has a cross-sectional area of less than 10 mm2 Cu or 16 mm2 Al, a second protective conductor of at least the same cross-sectional area shall be provided up to a point where the protective conductor has a cross-sectional area not less than 10 mm2 Cu or 16 mm2 Al. NOTE 3 This can require that the electrical equipment has a separate terminal for a second protective conductor. c) automatic disconnection of the supply in case of loss of continuity of the protective conductor. To prevent difficulties associated with electromagnetic disturbances, the requirements of 4.4.2 also apply to the installation of duplicate protective conductors. In addition, a warning label shall be provided adjacent to the PE terminal, and where necessary on the nameplate of the electrical equipment. The information provided under 17.2 b)1) shall include information about the leakage		N/A

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	current and the minimum cross-sectional area of the external protective conductor.		
8.3	**Functional bonding**		
	Protection against maloperation as a result of insulation failures can be achieved by connecting to a common conductor in accordance with 9.4.3.1. For recommendations regarding functional bonding to avoid maloperation due to electromagnetic disturbances, see 4.4.2.		P
8.4	**Measures to limit the effects of high leakage current**		
	The effects of high leakage current can be restricted to the equipment having high leakage current by connection of that equipment to a dedicated supply transformer having separate windings. The protective bonding circuit shall be connected to exposed conductive parts of the equipment and, in addition, to the secondary winding of the transformer. The protective conductor(s) between the equipment and the secondary winding of the transformer shall comply with one or more of the arrangements described in 8.2.8.		N/A
9.4.3	Protection against maloperation due to earth faults, voltage interruptions and loss of circuit continuity		
10	**Operator interface and machine-mounted control devices**		
10.2	**Push-buttons**		P
10.3	**Indicator lights and displays**		P
10.4	**Illuminated push-buttons**		N/A
10.5	**Rotary control devices**		P
10.7	**Emergency stop devices**		N/A
	Only applicable if an emergency stopping is provided		
10.9	**Enabling control device**		N/A
11	**Control gear: location, mounting, and enclosures**		P
11.1	**General requirements**		
	All controlgear shall be located and mounted so as to facilitate: – its accessibility and maintenance; – its protection against the external influences or conditions under which it is intended to operate;		P

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	– operation and maintenance of the machine and its associated equipment		
11.2	**Location and mounting**		P
11.4	**Enclosures, doors and openings**		
	Enclosures shall be constructed using materials capable of withstanding the mechanical, electrical and thermal stresses as well as the effects of humidity and other environmental factors that are likely to be encountered in normal service. Fasteners used to secure doors and covers should be of the captive type. Windows provided for viewing internally mounted indicating devices shall be of a material suitable to withstand mechanical stress and chemical attack (for example toughened glass or polycarbonate sheet of not less than 3 mm thickness). It is recommended that enclosure doors be not wider than 0,9 m and have vertical hinges, with an angle of opening of at least 95°. The joints or gaskets of doors, lids, covers and enclosures shall withstand the chemical effects of the aggressive liquids, vapours, or gases used on the machine. The means provided to maintain the degree of protection of an enclosure on doors, lids and covers that require opening or removal for operation or maintenance shall: – be securely attached to either the door/cover or the enclosure; – not deteriorate due to removal or replacement of the door or the cover, and so impair the degree of protection. Where openings in enclosures are provided (for example, for cable access), including those towards the floor or foundation or to other parts of the machine, means shall be provided to ensure the degree of protection specified for the equipment. Openings for cable entries shall be easily re-opened on site. A suitable opening may be provided in the base of enclosures within the machine so that moisture due to condensation can drain away. There shall be no opening between enclosures containing electrical equipment and compartments		N/A

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	containing coolant, lubricating or hydraulic fluids, or those into which oil, other liquids, or dust can penetrate. This requirement does not apply to electrical devices specifically designed to operate in oil (for example electromagnetic clutches) nor to electrical equipment in which coolants are used. Where there are holes in an enclosure for mounting purposes, means may be necessary to ensure that after mounting, the holes do not impair the required protection. Equipment that, in normal or abnormal operation, can attain a surface temperature sufficient to cause a risk of fire or harmful effect to an enclosure material shall: – be located within an enclosure that will withstand, without risk of fire or harmful effect, such temperatures as can be generated; and – be mounted and located at a sufficient distance from adjacent equipment so as to allow safe dissipation of heat (see also 11.2.3); or – be otherwise screened by material that can withstand, without risk of fire or harmful effect, the heat emitted by the equipment. NOTE A warning label in accordance with 16.2.2 may be necessary		
11.5	**Access to control gear**		
	Doors in gangways and for access to electrical operating areas shall: – be at least 0,7 m wide and 2,1 m high; – open outwards; – have a means (for example panic bolts) to allow opening from the inside without the use of a key or tool. Enclosures which readily allow a person to fully enter shall be provided with means to allow escape, for example panic bolts on the inside of doors. Enclosures intended for such access, for example for resetting, adjusting, maintenance, shall have a clear width of at least 0,7 m and a clear height of at least 2,1 m. In cases where: – equipment is likely to be live during access; and – conducting parts are exposed, the clear width shall be at least 1,0 m. In cases where		N/A

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	such parts are present on both sides of the access way, the clear width shall be at least 1,5 m. NOTE These dimensions are derived from ISO 14122 series.		
12	**Conductors and cables**		P
13	**Wiring practices**		
13.1	**Connections and routing**		P
13.2	**Identification of conductors**		P
13.3	**Wiring inside enclosures**		
	Flame-retardant cable ducts are not required.		P
13.4	**Wiring outside enclosures**		P
13.5	**Ducts, connection boxes and other boxes**		N/A
14	**Electric motors and associated equipment**	See Appended Table: IEC 60034-1	P
18	**Verification**		
IEC 60204-1:2009 Annex			
A	Protection against indirect contact in TN-systems		N/A
B	Enquiry form for the electrical equipment of machines		P
C	Examples of machines covered by this part of IEC 60204		P
D	Current-carrying capacity and overcurrent protection of conductors and cables in the electrical equipment of machines		P
E	Explanation of emergency operation functions		N/A
F	Guide for the use of this part of IEC 60204		P
G	Comparison of typical conductor cross-sectional areas		N/A
Annex C	Instruction manual — Safety guide additional requirements for low-power generating sets for use by laymen		
	A generating set may cause hazards that are not recognized by the lay man and especially not recognized by children. Safe operation is possible with sufficient knowledge of the function of the generating set. In the operation manual, the following information on safety, operation and maintenance requirements should be considered as a minimum practise.		P
	a) General safety information This shall include identification and explanation of warning labels that appear on the generating set. The following directives shall be mentioned. 1) Protect children by keeping them at a safe distance from		P

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	the generating set. 2) Fuel is combustible and easily ignited. Do not refuel during operation. Do not refuel while smoking or near naked flames. Do not spill fuel. 3) Some parts of the internal combustion engine are hot and may cause burns. Pay attention to the warnings on the generating set. 4) Engine exhaust gases are toxic. Do not operate the generating set in unventilated rooms. When installed in ventilated rooms, additional requirements for fire and explosion protection shall be observed.		
	b) Electrical safety The following directives shall be mentioned. 1) Before use, the generating set and its electrical equipment (including lines and plug connections) should be checked to ensure that they are not defective. 2) The generating set shall not be connected to other power sources, such as the power company supply mains. In special cases where stand-by connection to existing electrical systems is intended, it shall only be performed by a qualified electrician who has to consider the differences between operating equipment using the public electrical network and operating the generating set. In accordance with this part of ISO 8528, the differences shall be stated in the instruction manual. 3) Protection against electrical shock depends on circuit breakers specially matched to the generating set. If the circuit breakers require replacement, they should be replaced with a circuit breaker having identical ratings and performances characteristics. 4) Due to high mechanical stresses, only tough rubber-sheathed flexible cable (in accordance with IEC 60245-4) or the equivalent should be used. 5) If the generating set complies with the protection feature “protection by electrical separation” in accordance with Annex B, B.5.2.1.1, earthing of the generator is not required. 6) When using extension lines or mobile distribution networks the resistance value shall not exceed 1,5 Ω For reference, the total length of lines for a cross section of 1,5		P

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	mm2 should not exceed 60 m; for a cross section of 2,5 mm2, this should not exceed 100 m (except the case the generating set complies with the protection feature "protection by electrical separation" in accordance with Annex B, B.5.2.1.1). 7) The choice of protection arrangement to be carried out depending on characteristic of the generator, running conditions and scheme of grounded liaisons determined by the user, the instructions and operation and instructions manual shall contain all information needed to the user to carry out correctly these protective measures according to the user (information for grounded, allowable lengths of connection cables, devices of complementary protection, etc.). — A warning reminding the user that he shall conform to regulations of electrical safety applicable to the place where the generating sets are used. — A warning on the requirements and the precautions to be respected by the user in the case of re-supply by generating sets of an installation, depending on existing protective measures in this installation and applicable regulations.		
	c) Before start-up Safe operation requires sufficient operator knowledge of the functions and positions of the controls and indicators or meters. 1) A description of the location, functions and positions of the controls and indicators or meters. 2) A pictorial representation of the labels on the generating set and further explanation of their meaning if necessary should be supplied. 3) Notes about necessary pre-operation checks, including the positioning of the generating set, shall be supplied.		P
	d) Starting the RIC engine 1) Special guidance should be given regarding the use of readily evaporating fuels as starting aids if their use is appropriate. 2) Engines with manual starting equipment (e.g. handle starting equipment, recoil starter) should		P

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	have notices warning against the dangers of injury caused by the sudden change of rotation direction of the engine.		
	e) Using the generating set Generating sets should only be loaded up to their rated power under the rated ambient conditions. If generating set use is under conditions which do not conform to the reference conditions as stipulated in ISO 8528-8:2016, 7.1 and if cooling of the engine or alternator is impaired, e.g. as a result of operation in restricted areas, a reduction in power is necessary. Information should be provided to inform the user of the necessary reduction in power due to use in higher temperatures, altitude and humidity than those given in the reference conditions.		P
	f) Maintenance Prior to commencing maintenance work it shall be ensured that untimely start-up is not possible. A schedule for routine and extended maintenance should be provided. The schedule should indicate which items can be performed by the layman and which items require the expertise of professional service personnel. Specifications should be given for the material necessary to perform maintenance that can be carried out by the layman.		P
	g) Instructions for transporting and storage		P

APPENDED TABLE: ISO 8528-3: 2005			
4.	**Other requirements and additional regulations**		
5	**Rating**		
5.1	General		
	The generator rating class shall be specified in accordance with the requirements of IEC 60034-1		P
	In case of generators for RIC engine driven generating sets, the continuous rating (duty type S1) or rating with discrete constant loads (duty type S10) shall be specified.	S1	P
5.2	Basic continuous rating (BR)		
	For the purposes of this part of ISO 8528, the maximum continuous rating based on duty type S1 is called the basic continuous rating (BR).		P

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
5.3	Peak continuous rating (PR)		N/A
6	**Limits of temperature and temperature rise**		
6.1	Basic continuous rating		
	The generator shall be capable of delivering its BR over the whole range of operating conditions (e.g. minimum to maximum coolant temperature with total temperature) not exceeding 40° C plus the temperature rises specified in Table 1 of IEC 60034-1	See Appended Table:IEC 60034-1	P
6.2	Peak continuous rating		N/A
7	**Rated power and speed characteristics**		P
8	**Voltage characteristics**		P
9	**Parallel operation**		N/A
10	**Special load condition**	See Appended Table: IEC 60034-1	P
11	**Effect of electromechanical frequency of vibrations when sets operate in parallel**		N/A
12	**Asynchronous generators with excitation equipment**		N/A
13	**Operating limit values**		
	Four performance classes are defined to describe the generator characteristics	G3	P
	Rated range of voltage setting	Limit: ±5%	P
	Steady-state voltage deviation	Limit: ±1%	P
	Transient voltage deviation on load increase	Limit: -18%	P
	Transient voltage deviation on load decrease	Limit: 20%	P
	Voltage recovery time	Limit:1.5s	N/A
	Voltage unbalance	Limit: 1%	N/A
14	**Rating plate**	The generator is associated with relevant generating set	N/A

APPENDED TABLE: ISO 8528-8:1995			
6	**Safety requirements and tests**		
6.1	Mechanical strength		
6.1.1	a) impact test using an impact tester of IEC 68-2-63: 1,0J±0,05J, three blow to every point of the enclosure which is likely to be weak		P
	b) free-fall test: dropped from a height of 20 cm on to a concrete floor, test once		P
	After testing, no damage impair mechanical or		P

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	electrical safety		
6.2	Mechanical stability		
6.2.1	Stability test when not in operation: place the unit on a surface tilted 15° in all directions, the unit is neither overturn nor spill fuel	Not overturn and spill fuel	P
6.2.2	Stability test when in operation: Operating the unit in four positions set at 90° interval around the vertical axis on a rough concrete surface inclined up to 4°, and		P
	Position is not changed more than 10 mm after 30 min operation at no load and at rated power		P
6.6	Electrical equipment		
6.6.2	Generator		
6.6.2.1	Rating and performance by IEC 34-1 concerning duty type S2, covering rated values, irregularities of waveform, symmetry of voltages, capability of unbalanced load, temperature rise, dielectric properties and short circuit strength	See Appended Table: IEC 60034-1	P
6.6.2.2	Irregularities of waveform of a.c. generators: for definitions and test conditions see IEC 34-1, clause 28 For low-power generating sets there are two classes: Class 1: THF < 8% Class 2: THF < 20% Compliance is checked by testing according to IEC 34-1:1994, 28.2	Class 1 THF: 5.3%	P
6.6.2.3	Low-voltage windings		
	In generators equipped with safety extra low voltage windings for battery charging or extra low voltage windings for control circuits, these are electrically isolated from other windings	extra low voltage windings isolated from other windings	P
	The voltage test according to IEC 34-1:1994, clause 17, is performed between the main and/or excitation windings at 2UN+2000V for safety extra low voltage; 2UN+1000V for extra low voltage	See Appended Table :9.2	P
6.6.2.4	Connection to stator or field		P
7	**Operating characteristics, power output, quality class and fuel consumption**		
7.1	Standard reference conditions:25° C, 100kPa, 30%		P

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
7.2	Start-up and operating conditions		
	Start-up and operate at ambient temperature between -15° C and 40° C		P
7.3	Determination of power output, quality class and voltage tolerances		
7.3.1	Upper limit values for voltage and frequency shall be measured with the generator on no-load	(See appended table: 7.3)	P
7.3.2	Set run for a minimum of 60 min at average permitted power and at the stated power factor		
	During the loading sequence, voltage and frequency parameters comply with class G1of ISO 8528-5, 16.1, 16.6, 16.7 and 16.10	(See appended table:7.3)	P
	Relevant measured values of the RIC engine are corrected if test condition deviate from the standard reference conditions by ISO 3046-1		N/A
7.4	Radio interference suppression		
	The design of the generating set in such a way that the limit of radio interference for the electrical parts according to CISPR Publication 14, and for the spark ignition internal combustion engine according to CISPR Publication 12 are met.	Declaration provided	P
	The installation of components for the suppression of radio interference voltages does not have a detrimental effect on the electrical and mechanical safety of the generating set.		P
	Compliance is checked in accordance with CISPR Publications 12 and 14.		P
9	Instruction manual—safety guide		
	A generating set may cause hazards that are not recognized by the layman and especially not recognized by children. Safe operation is possible with sufficient knowledge of the function of the generating set. In the operation manual for RIC engine-driven generating sets in accordance with this part of ISO 8528 that the following information on safety, operation and maintenance requirements are considered as minimum practice.		P
a)	General safety information		
	This includes identification and explanation of warning labels that appear on the generating set		P

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	The following directives are mentioned: 1) Protect children by keeping them at a safe distance from the generating set. 2) Fuel is combustible and easily ignited. Do not refuel during operation. Do not refuel while smoking or near naked flames. Do not spill fuel. 3) Some parts of the internal combustion engine are hot and may cause burns. Pay attention to the warning on the generating set. 4) Engine exhaust gases are toxic. Do not operate the generating set in unventilated rooms. When installed in ventilated rooms, additional requirement for fire and explosion protection are observed.		
59b)	Electrical safety		P
c)	Before start-up		P
d)	Starting the RIC engine		P
e)	Using the generating set		P
f)	Maintenance		P
g)	Instructions for transporting and storage		P

Appended Table: IEC 60034-1			
3.	**DEFINITIONS**		
3.10	Duty type of the motor ..... :	S1	P
3.17	Cooling method ..... :	Indirectly cooled by air	P
4.	**Duty**		
4.1	Declaration of duty		
	Purchasers declaration of duty		N/A
	If duty not declared, S1	S1	P
4.2	Duty types		
4.2.1	Duty type S1 – Continuous running duty		P
5.	**Rating**		
5.1	Assignment of rating		
	Rating assigned by manufacturer		
5.2	Classes of rating		
5.2.1	Rating for continuous running duty	S1	P
5.3	Selection of a class of rating		
	General purpose machine has rating for continuous running duty	S1	
5.4	Allocation of outputs to class of rating		

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	For duty S1 to S8, specified value(s) of constant load(s) is rated output(s)	S1, constant load	P
	For duty S9 and S10, reference value of load based on S1 taken as rated output		N/A
5.5	Rated output		
5.5.1	DC generators		
	Output at terminals (W) ……..:.		N/A
5.5.2	AC generators		
	Apparent power at the terminals (VA)……:	See copy of nameplate	P
	Power factor……..:	1.0	P
	The rated power factor for synchronous generators shall be 0,8 lagging (over-excited), unless otherwise specified by the purchaser (A2: 1999)	1.0 by generating set	N/A
5.5.3	Motors		
	The rated output is the mechanical power available at the shaft and shall be expressed in watts (W).		N/A
5.5.4	Synchronous condensers		
	Reactive Power at terminals (var)……..:		N/A
5.6	Rated voltage		
5.6.1	DC generators		
	For relatively small range of voltage, rated output and current applied at the highest voltage of the range		N/A
	unless otherwise specified (see also 7.3)		N/A
5.6.2	AC generators		
	For a relatively small range of voltage, rated output and power factor applied at any voltage within the range,		P
	Unless otherwise specified (see also 7.3)		N/A
5.7	Coordination of voltages and outputs		
	For machines with rated voltages above 1 kV, preferred rated voltages are selected according to rated output as stated in table 1		N/A
5.8	Machines with more than one rating		N/A
6.	**Site operating conditions**		
6.1	General		
	Unless otherwise specified machines shall be suitable for the following site operation conditions. For site operating conditions deviating from those		

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	values, corrections are given in clause 8		
6.2	Altitude		
	Not exceed 1000 m above sea level.		P
6.3	Maximum ambient air temperature		
	Not exceed 40 ℃		P
6.4	Minimum ambient air temperature		
	Not be less than –15 ℃ for any machine		P
	Not less than 0℃ if one or more exceptions apply		N/A
6.5	Water coolant temperature		
	Not exceeding +25℃ and not less than + 5℃		N/A
6.6	Storage and transport		
	Minimum specified temperature if different form that in 6.4(C)		N/A
6.7	Purity of hydrogen coolant		
	Operation at hydrogen content ≥ 95%		N/A
7.	**Electrical operating conditions**		
7.1	Electrical supply		
	Rated voltage of three-phase machines derived from IEC 60038		N/A
7.2	Form and symmetry of voltages and currents		
7.2.1	AC motors		N/A
7.2.2	AC generators		
	Three-phase AC generators		N/A
7.2.3	Three-phase synchronous machines		
	Maximum I_2/I_N value for continuous operation		N/A
7.2.4	DC motors supplied from static power converters		
	Complying with requirements		N/A
7.3	Voltage and frequency variations during operation		
	Figure 11 for generators and synchronous condensers		N/A
	Figure 12 for motors		N/A
	Zones A and B apply only to voltages when d.c. machines directly connected to a normally constant d.c. bus		N/A
	Machine capable of performing its primary function within Zone A		N/A
	Machine capable of performing its primary function with Zone B with deviations.		N/A
7.4	Three-phase a.c. machines operating on unearthed systems		N/A

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
7.5	Voltage (peak and gradient) withstand levels		N/A
8.	**Thermal performance and tests**		
8.1	Thermal class		
	A thermal class in accordance with IEC 62114 shall be assigned to the insulation systems used in machines	Class 130	P
	It is the responsibility of the manufacturer of the machine to interpret the results obtained by thermal endurance testing according to the appropriate part of IEC 60034-18		P
8.2	Reference coolant		
	The reference coolant for a given method of cooling the machine is specified in Table 4		
	Primary coolant	Air	P
	Method of cooling	Indirect	P
	Secondary coolant		N/A
	Table number	7	P
	Table referred to in column 5 specifies limits of		N/A
	Reference coolant		N/A
	If a third collant is used, temperature rise shall be measured above the temperature of the primary or secondary coolant as specified in Table 3.		N/A
8.3	Conditions for thermal tests		
8.3.1	Electrical supply		
	Comply with requirements		N/A
8.3.2	Temperature of machine before test		
	If the temperature of a winding is to be determined from the increase of resistance, the temperature of the winding measured by thermometer, when the resistance is measured before the thermal test, shall be practically that of the coolant at the time		P
	When a machine is to be tested on a short-time rating (duty type S2) its temperature at the beginning of the thermal test shall be within 5 K of the temperature of the coolant		N/A
8.3.3	Temperature of coolant		
	A machine may be tested at any convenient value of coolant temperature.		N/A
	Table 11 for indirect cooled windings		P

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	Table 14 for direct cooled windings		N/A
8.3.4	Measurement of coolant temperature during test		
	Mean of the readings of the temperature detectors taken at equal intervals of time during the last quarter of duration of the test		P
	To reduce errors due to the time lag of the change of temperature of large machines following variations in the temperature of the coolant, all reasonable precautions are taken to minimize such variations		P
8.3.4.1	Open machines or closed machines without heat exchangers (cooled by surrounding ambient air or gas)		
	Several detectors placed at different points around and halfway up the machine at 1 m to 2 m from it.		P
	Each detector is protected from radiant heat and draughts		P
8.3.4.2	Machines cooled by air or gas from a remote source though ventilation ducts and machines with separately mounted heat exchangers		
	Temperature of primary coolant measured where it enters the machine		N/A
8.3.4.3	Closed machines with machine-mounted or internal heat exchangers		
	Temperature of primary coolant measured where it enters the machine; for machines having watercooled or air-cooled heat exchangers, temperature of secondary coolant measured where it enters the heat exchanger		N/A
8.4	Temperature rise of a part of a machine		
	The temperature rise, $\triangle\theta$, of a part of a machine is the difference between the temperature of that part measured by the appropriate method in accordance with 8.5, and the temperature of the coolant measured in accordance with 8.3.4		P
	For comparison with the limits of temperature rise (see Table 7 or Table 8) or of temperature (see Table 12)	Table 7	P
	When possible, the temperature shall be measured immediately before the machine is shut down at the end of the thermal test, as described in clause 8.7		N/A

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	When this is not possible, e.g. when using the direct measurement of resistance method, see 8.6.2.3		P
	For machines tested on actual periodic duty (duty types S3 to S8) the temperature at the end of the test shall be taken as that at the middle of the period causing the greatest heating in the last cycle of operation 9but see also 8.7.3)		N/A
8.5	Methods of measurement of temperature		
8.5.1	General		
	Recognized method used……..:	Resistance method used	P
8.5.2	Resistance method		
	The temperature of the windings is determined from the increase of the resistance of the windings		P
8.5.3	Embedded temperature detector (ETD) method		N/A
8.5.4	Thermometer method		N/A
8.6	Determination of winding temperature		
8.6.1	Choice of method		
	Rated output (P_0) (W or VA)……..:	See copy of nameplate	
	In general, resistance method in accordance with 7.5.1 applied	Resistance method used	P
	For $P_0 \geq 5000$ kW (or kVA), the ETD method shall be used unless otherwise agreed		N/A
	For 200 kW (kVA) < P_0 < 5000 kW (kVA), the resistance method used, unless the ETD method is agreed		N/A
	For $P_0 \leq 200$kW (kVA) the resistance method used, unless the superposition method is agreed	Resistance method used	P
	For $P_0 \leq 600$ W (VA), when the windings are nonuniform or severe complications are involved in making the necessary connections, the temperature may be determined by means of thermometers. Temperature rise limits in accordance with Table 7 shall apply		N/A
	The thermometer method is recognized in the following cases:		N/A
8.6.2	Determination by resistance method		
8.6.2.1	Measurement		
	One of the following methods shall be used		P
	Direct measurement at the beginning and the end of the test, using an instrument having a suitable range		N/A
	Measurement by d.c. current/voltage in the d.c		N/A

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	windings, by measuring the current in and the voltage across the winding, using an instrument having a suitable range		
	Measurement by d.c. current/voltage in the a.c windings by injecting direct current into the windings when de-energized		P
	Superposition method		N/A
8.6.2.2	Calculation		
	Temperature(θ 1) of winding (cold) at moment of initial resistance measurement(℃):	See Appended Table:6.8.3	P
	Temperature(θ a) of coolant at end of test (℃):	See Appended Table:6.8.3	P
	Resistance (R_1) of winding (cold) at temperature θ 1(Ω):	See Appended Table:6.8.3	P
	Resistance (R_2) of winding (hot) at end of test/ at temperature θ a(Ω):	See Appended Table:6.8.3	P
	Reciprocal of temperature cocefficient(K):	235	
	The temperature rise, θ2-θa, may be obtained from the equation: $θ2-θa=(R_2 - R_1) \times (k + θ1)/ R_1 + θ1 - θa$	See Appended Table:6.8.3	P
8.6.2.3	Correction for stopping time		
8.6.2.3.1	General		
	Direct measurement resistance method requires a quick shutdown		P
8.6.2.3.2	Short stopping time		
	Initial reading obtained within time interval specified in table 5……:	Within 30s	P
8.6.2.3.3	Extended stopping time		
	Initial reading obtained within twice the time interval specified in table 5……:		N/A
8.6.2.3.4	Windings with one coil-side per slot		
	Direct measurement only used if machine comes to stop within time interval specified in table 5.		N/A
8.6.3	Determination by ETD method		N/A
8.6.4	Determination by the thermometer method		
8.7	Duration of thermal test		
8.7.1	Rating for continuous running duty		
	The test shall be continued until thermal equilibrium has been reached		P
8.7.2	Rating for short-time duty		N/A
8.7.3	Rating for periodic duty		N/A

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
8.7.4	Rating for non-periodic duty and for duty with discrete constant loads		N/A
8.8	Determination of the thermal equivalent time constant for machines of duty type S9		N/A
8.9	Measurement of bearing temperature		N/A
8.10	Limits of temperature and of temperature rise		
	Limits given for operation under site operating conditions specified in clause 6 and at rating for continuous running duty (reference conditions), followed by rules for the adjustment of those limits when operating at site under other conditions and on other ratings.	See Appended Table:6.8.3	P
	Further rules give adjustments to the limits during thermal testing when conditions at the test site differ from those at the operating site		P
	The limits are stated relative to the reference coolant specified in Table 4		P
	A rule is given to allow for the purity of hydrogen coolant		N/A
8.10.1	Indirect cooled windings		
	Temperature rises not exceed the limits given in Table 7 (air coolant) or Table 8 (hydrogen coolant)	Table 7	P
	temperature rise limit according to Table 7 or 8 (K) ……:	Limit 80K (Class 130)	P
	Measured/calculated temperature rise according to 8.6 (K) ……:	See Appended Table:6.8.3	P
	For other operating site conditions, for ratings other than continuous running duty, and for rated voltages greater than 12000 V, the limits shall be adjusted according to Table 9.		N/A
	In the case of thermometer readings made in accordance with 8.6.1, the limit of temperature rise shall be according to Table 7		N/A
	If, for windings indirectly cooled by air, conditions at the test site differ form those at the operating site, the adjusted limits given in Table 11 shall apply at the test site		N/A
	If the adjusted limits given in Table 11 lead to permissible temperatures at the test site which the manufacturer considers to be excessive, the testing procedure and the limits are agreed		N/A

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	No adjustments at the test site are given for windings indirectly cooled by hydrogen, because it is very unlikely that they will be tested at rated load anywhere other than at the operating site		N/A
8.10.2	Direct cooled windings		
	Temperatures not exceeding limits of table 12		N/A
	For other operating site conditions limits adjusted according to table 13		N/A
	For test site conditions differing from operating site conditions, limits adjusted according to table 14		N/A
	If the adjusted limits given in table 14 lead to temperatures at the site which the manufacture considers to be excessive, the testing procedure and the limits are agreed		N/A
8.10.3	Adjustments to take account of hydrogen purity on test		
	Hydrogen content between 95 – 100 %		N/A
8.10.4	Permanently short-circuited windings, magnetic cores and all structural components (other than bearings) whether or not in contact with insulation		
	Temperature rise/temperature not be detrimental to the insulation of that part or to any other part adjacent to it		N/A
8.10.5	Commutators and sliprings, open or enclosed and their brushes and brushgear		
	Temperature rise or temperature not be detrimental to the insulation of that part or any adjacent part		P
	The temperature rise or temperature not exceed that at which combination of brush grade and commutator or slipring material can handle current over the full operating range		P
9.	**Other performance and tests**		
9.1	Routine tests		P
9.2	Withstand voltage test		
	A test voltage applied between the windings under test and the frame of the machine, with the core and the windings not under test connected to the frame.		P
	The withstand voltage test be carried out immediately after thermal test		P
	Tests applied only to a new and completed machine with all its parts in place under conditions equivalent to normal working conditions		P
	Tests shall be carried out at the manufacturer’s works or		P

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	after erection on site		
	Polyphase machines with rated voltage above 1 kV having both ends of each phase individually accessible, the test voltage be applied between each phase and the frame, with the core and the other phases and windings not under test connected to the frame		N/A
	The test voltage shall be of power frequency and as near as possible to a sine wave form.	See appended table 9.2	P
	The final value of the voltage is in accordance with Table 16.		P
	However, for machines with a rated voltage 6 kV or greater, when power frequency equipment is not available, then by agreement a d.c. test may be carried out at voltage 1,7 times the r.m.s. value given in Table 16		N/A
	The test is commenced at a voltage not exceeding half of the full test voltage. The voltage shall then be increased to the full value, steadily or in steps of not more than 5% of the full value, the time allowed for the voltage increase from half to full value being not less than 10 s. The full test voltage shall then be maintained for 1 min in accordance with the value as specified in Table 16. There shall be no failure (see IEC 60060-1) during this period		P
	During the routine testing of quantity produced machines, the one-minute test may be replaced:		
	for machines up to 200 kW (or kVA) and rated for UN<1 kV, by a test of approximately 1 s at 120% of the normal test voltage in Table 16		N/A
	The high-voltage test at full voltage made on the windings on acceptance is not repeated.		N/A
	Second test is made at the request of the purchaser, after further drying if considered necessary, the test voltage is 80% of the voltage specified in Table 16		N/A
	To determine the test voltage from Table 16 for d.c. motors supplied by static power converters, te direct voltage of the motor or the r.m.s. phase to phase value of the rated alternating voltage at the input terminals of the static power converter shall be used, whichever is the greater		N/A

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	Completely rewound windings are tested at the full test voltage for new machines		N/A
	When a user and a repair contractor have agreed to carry out withstand voltage tests in cases where windings have been partially rewound or in the case of an overhauled machine, the following procedure is recommended:		
	a) Partially rewound windings are tested at 75% of the test voltage for a new machine. Before the test, the old part of the winding shall be carefully cleaned and dried;		N/A
	b) Overhauled machines, after cleaning and drying, are subjected to a test at a voltage equal to 1,5 times the rated voltage, with a minimum of 1000V if the rated voltage is equal to or greater than 100 V and a minimum of 500 V if the rated voltage is less than 100 V		N/A
9.3	Occasional excess current		
9.3.1	General		
9.3.2	Generators		
	AC generators having rated outputs not exceeding1200 MVA shall be capable of withstanding a current equal to 1,5 times the rated current for not less than 30 s		N/A
	AC generators with rated outputs above 1200 MVA capable of withstanding a current equal to 1,5 times the rated current for at least 15s or a period agreed.		N/A
9.3.3	AC motors (except commutator motors and permanent magnet motors)		N/A
9.3.4	Commutator machines		N/A
9.4	Momentary excess torque for motors		N/A
9.5	Pull-up torque for motors		N/A
9.6	Safe operating speed of cage induction motors		N/A
9.7	Overspeed		
	Machines shall be disigned to withstand the speeds specified in Table 18		N/A
	An over speed test is not normally considered necessary but can be performed when this is specified and has been agreed. (For turbine-type a.c. generators, see also IEC 60034-3.)		N/A
	And overspeed test is considered as satisfactory if no permanent abnormal deformation is		N/A

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	apparent subsequently, and no other weakness is detected which would prevent the machine from operating normally, and provided the rotor windings after the test comply with the required dielectric tests.		
	The duration of any overspeed test shall be 2 min		N/A
	Due to settling of laminated rotor rims, laminated poles held by wedges or by bolts etc., a minute permanent increase in the diameter is natural, and not to be considered as an abnormal deformation indicating that the machine is not suitable for normal operation		N/A
	During commissioning of a hydraulic-turbine driven synchronous generator, the machine shall be driven at the speed it can reach with the overspeed protection operating, so as to ascertain that the balance is satisfactory up to that speed		N/A
9.8	Short-circuit current for synchronous machines		
	Peak value of the short-circuit current (including turbine-type machines not covered by IEC 60034-3), in the case of short circuit on all phases during operation at rated voltage, not exceed 15 times the peak value or 21 times the r.m.s. value of the rated current		N/A
	Verification may be carried out by calculation or by means of a test at a voltage of 0,5 times the rated voltage or above		N/A
9.9	Short-circuit withstand test for synchronous machines		N/A
9.10	Commutation test for commutator machines		N/A
9.11	Total harmonic Distortion (THD) for synchronous machines		
9.11.1	General		
	The requirement of this subclause apply only to synchronous machines having rated output of 300 kW (or kVA) or more, intended for connection to power networks operating at nominal frequencies of 16.67 Hz to 100 Hz inclusive, with a view to minimizing interference between power lines and adjacent circuits	<300kW	N/A
9.11.2	Limits		N/A
9.11.3	Tests		

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	THD limit (%) ……:		N/A
	THD measured (%) ……:		N/A
10.	**Rating plates**	The generator is associated with relevant generating set.	N/A
11.	**Miscellaneous requirements**		
11.1	Earthing of machines		
	Machine be provided with an earthing terminal or other device to permit the connection of protective conductor or an earthing conductor		P
	The symbol ⏚ or legend shall identify		P
	Machine shall neither be earthed nor be provided with terminal when		
	1) Fitted with supplementary insulation, or		N/A
	2) Intended for assembly in apparatus having supplementary insulation, or;		N/A
	3) Rated voltges up to 50 V a.c. and are intended for use on SELV (Safety Extra Low Voltage) circuits.		N/A
	In the case of machines having rated voltages greater than 50 V a.c. or 120 V d.c., but not exceeding 1000 V a.c. or 1500 V d.c., the terminal for the earth conductor is situated in the vicinity of the terminals for the line conductors being placed in the terminal box, if one is provided		P
	Machines having rated outputs in excess of 100 kW (or kVA) have in addition an earth terminal fitted on the frame		N/A
	Machines for rated voltages greater than 1000 V a.c. or 1500 V d.c. have an earth terminal on the frame, for example an iron strap, and in addition, a means inside the terminal box for connecting a conducting cable sheath, if any		N/A
	The earth terminal is designed to ensure a good connection with the earth conductor without any damage to the conductor or terminal.		P
	Accessible conducting parts which are not part of the operating circuit have a good electrically conducting connection with each other and with the earth terminal		P
	When all bearings and the rotor winding of a machine are insulated, the shaft is electrically		N/A

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	connected to the earth terminal, unless the manufacturer and the purchaser agree to alternative means of protection		
	When an earth terminal is provided in the terminal box, it is assumed that the earth conductor is made of the same metal as the live conductors		N/A
	When an earth terminal is provided on the frame, the earth conductor may, by agreement, be made of another metal (e.g. steel). In this case, in designing the terminal, proper consideration is given to the conductivity of the conductor		P
	The design of the earth terminal to accommodate an earth conductor of cross-sectional area in accordance with Table 19		P
	If an earth conductor larger than the size given in the table is used, it is recommended that it should correspond as nearly as possible to one of the other sizes listed		N/A
	For other cross-sectional areas of live conductors, the earth or protective conductor shall have a cross-sectional area at least equivalent to :		
	that of the live conductor for cross-sectional areas less than 25 mm2;		P
	25 mm2 for cross-sectional areas between 25 mm2 and 50 mm2;		N/A
	50% of that of the live conductor for crosssectional areas exceeding 50 mm2		N/A
	The earth terminal is identified in accordance with IEC 60445		P
11.2	Shaft-end key(s)		
	When a machine shaft end is provided with one or more keyways, each is provided with a full key of normal shape and length.	Associated with the output shaft of engine driven	N/A
12.	**Tolerances**		
	Tolerances shall be as specified in Table 20		N/A
13.	**Electromagnetic compatibility (EMC)**		N/A
14.	**Safety**		
14.1	Rotating complying with the requirements of IEC 60204-1 or IEC 60204-11		P
	In the case of rotating machines incorporated in		N/A

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict
	household and similar electrical appliances, IEC 60335-1		
	Unless otherwise specified in this standard, and be designed and constructed as far as possible in accordance with internationally accepted best design practice, appropriate to the application		N/A

Appended Table: 6.8.3 temperature rise measurements						
	t1 (° C) ..... :				18.00	
	t2 (° C) ..... :				29.30	
	Voltage (V)..... :				230.32	
	Current (A) ..... :				21.79	
	Active power (kW) ..... :				5.05	
	Frequency (Hz) ..... :				50.32	
	DC Voltage (Vdc)..... :				/	
	DC current (Adc)..... :				/	
	Operating period (min) ..... :				Steady condition	>60min
temperature rise dT of part/at:					dT (℃)	Required dT (℃)
AC circuit breaker					34.50	20-75.5
Control panel					37.00	20-80
Check lever					32.80	20-75.5
Recoil starting handle					36.39	20-75.5
Carrying handle					40.90	20-50
frame					41.59	20-80
Muffler protector frame					119.00	---*
Fuel tank					37.70	20-80
Support					67.20	20-90
Generator winding temperature rise measurements:						
temperature rise dT of winding:	R1 (W)	R2 (W)	dT (K)	Time(s)	allowed dT (K)	Insulation class
AC winding	0.3018	0.3854	66.70	15	80	130
Aux winding	1.2309	1.5903	70.53	27	80	130
*: If temperature limit cannot be avoided, then display a warning.						

EN ISO 8528-13:2016 & EN 60204-1:2006/AC:2010			
Clause	Requirement – Test	Result - Remark	Verdict

Appended Table: 7.3 Operating characteristics			
Frequency behaviour (steady-state, Dynamic)			P
Rate frequency, f_r (Hz) ..... :		50	
No load frequency, $f_{i.r}$ (Hz) ..... :		53.27	
Initial frequency, farb (Hz) ..... :		50.01	
Frequency droop, δf_{st}		6.54	Limit < 5%
Transient frequency difference from initial frequency δf_d	(100 % sudden power decrease)$f_{d,max}$ (Hz)	54.70	
	(sudden power increase) $f_{d,min}$ (Hz)	43.87	
	(100 % sudden power decrease) δf_d^+ (%)	9.38	Limit < +12%
	(sudden power increase) δf_d^- (%)	-12.28	Limit < -(10+δf_{st})%
Transient frequency difference from rated frequency δf_{dyn}	(100 % sudden power decrease) $f_{d,max}$ (Hz)	54.68	
	(sudden power increase)$f_{d,min}$ (Hz)	44.37	
	(100 % sudden power decrease) δf_{dyn}^+ (%)	9.34	Limit < +12%
	(sudden power increase) δf_{dyn}^- (%)	-11.28	Limit < - 20%
Voltage behaviour(Steady-state, Dynamic)			P
Steady condition, for all power between noload and rated output at rated power factor	Rated voltage (V)	230	
	Maximum voltage$U_{st,max}$ (V)	240.0	
	Minimum voltage$U_{st,min}$ (V)	230.8	
	Steady-state voltage deviation δU_{st}	±2.01	Limit≤± 2.5%
Transient voltage deviation	(100 % sudden power decrease)$U_{dyn,max}$ (V)	250.14	
	(sudden power increase)$U_{dyn,min}$ (V)	209.52	
	(100 % sudden power decrease)δU_{dyn}+ (%)	8.76	Limit≤+25%
	(sudden power increase)δU_{dyn}- (%)	-8.90	Limit≤-20%

Appended Table :9.2 Electric strength		P
item	test voltage applied between	Breakdown
New generator	1500V between AC winding and enclosure	No
	1500V between DC winding and enclosure	/
	1500V between Aux winding and enclosure	No
After the test of protection against ingress of water	750V between AC winding and enclosure	No
	750V between DC winding and enclosure	/
	750V between Aux winding and enclosure	No

**********The End**********