TEST REPORT

EN ISO 11148-7: 2012

Hand-held non-electric power tools - Safety requirements

- Part 7: Grinders

Report reference No.	: 130301100SHA-001
Tested by (+ signature)	: Jonathan Chu
Approved by (+ signature)	: Michael Shen
Date of issue	: 18 April, 2013
	Amendment 1:April 22,2015
Testing laboratory	: Intertek Testing Services Shanghai Ltd.
Address	: Building No.86, 1198 Qinzhou Road (North), Shanghai 200233, China
Testing location/procedure	: TL ☒ RMT ☐ SMT ☐ WMT ☐ TMP ☐
Address	: As above
Applicant	: Ningbo Steed Tools Co., Ltd
Address	: Dongcheng Village, Zhanqi Town, Yinzhou District, Ningbo,Zhejiang,China
Test specification:	
Standard	: EN ISO 11148-7: 2012
Test procedure	: CE-MD
Non-standard test method	: N/A
Test Report Form No	: TTRF EN ISO 11148_7A
TRF Originator	: Intertek Shanghai
Master TRF	: 2013-04
Test Item Description	: Air cut off tool
Trademark	: N/A
Model and/or type reference	: AT-6027TB, NST-6027F,**AT-6027N**
Manufacturer	:Same as applicant
Rating(s)	:Max. air pressure: 6,3 bar AT-6027TB: rated speed: 20000/min, ϕ76mm NST-6027F: rated speed: 20000/min, ϕ76mm **AT-6027N: rated speed: 20000/min, ϕ76mm**

Test case verdicts

Test case does not apply to the test object.....: N/A

Test item does meet the requirement .....: P(Pass)

Test item does not meet the requirement .....: F(Fail)

Testing

Date of receipt of test item .....: 10 April, 2015

Date(s) of performance of test .....: 10 April, 2015 – 22 April, 2015

General remarks

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

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

"(See Enclosure #)" refers to additional information 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.

Determination of the test results includes consideration of measurement uncertainty from the test equipment and methods.

General product information:

The products covered by this report are hand-held air cut off tools.

Amendment 1:

This report based on report ref. no. 130301100SHA-001dated on 18 April, 2013 issued by Intertek Testing Services Shanghai Limited including following changes and/or additions:

1. Add new model AT-6027N in the report.

Copy of marking plate (representative)

Air cut off tool
AT-6027N
Max. air pressure:6,3bar
Air inlet: 1/4inch
Rated speed: 20000/min
Cutting wheel: ϕ76mm
Series No.: [xxxxxxxx]
BJ: 2015

Ningbo Steed Tools Co., Ltd
Dongcheng Village, Zhanqi Town, Yinzhou District, Ningbo,Zhejiang,China
Authorised representative in EU:
Name: [xxxx] Adresse: [xxxxxxxx]

Rotation arrow marked on fixed guard

Summary of testing:

All tests are carried out in according to the EN ISO 11148-7:2012 and the test results meet the requirements specified in the above-mentioned standards.

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Clause	Requirement - Test	Result - Remark	Verdict
4	**Safety requirements and/or protective measures**		
4.1	**General**		
	The machine shall comply with the following safety requirements and/or protective measures and be verified in accordance with Clause 5. In addition, the machine shall be designed in accordance with the principles of ISO 12100 for the relevant, but not necessarily significant, hazards, which are not dealt with by this part of ISO 11148.		P
	The measures adopted to comply with the requirements of Clause 4 shall take account of the state-of-the-art.		P
	It is recognized that optimizing the design with respect to some safety measures can result in a degradation of performance against other safety requirements. In such cases, it is required to find a balance between the various requirements in order to achieve a grinder design that satisfies each requirement, so far as is reasonably practicable, and remains fit for purpose.		P
4.2	**Mechanical safety**		
4.2.1	**Surfaces, edges and corners**		
	Accessible parts of grinders, except the insert tool, shall not have sharp edges or angles or rough or abrasive surfaces; see ISO 12100:2010, 6.2.2.1.		P
4.2.2	**Supporting surface and stability**		
	The grinder shall be so designed that they can be laid aside and remain in a stable position on a plane surface.		P
4.2.3	**Hydraulic fluid ejection**		
	Hydraulic systems of the grinder shall be enclosed so as to provide protection against high- pressure fluid ejection.	Pneumatic	N/A
4.2.4	**Speed control**		
	The rated speed of the grinder shall not be exceeded under the conditions marked on the grinder. It shall be possible to measure rotational speed using a tachometer.		P
	The speed control device of a grinder shall be designed to prevent incorrect assembly. The speed control device shall be manufactured from no-corrodible material.		P
4.2.5	**Power tool construction**		
	The grinder shall be so designed and constructed as to prevent the loosening or loss of components during expected use, including rough handling and occasional dropping, which can cause its safety functions to be compromised.		P
4.2.6	**Attachment of abrasive product**		

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Clause	Requirement - Test	Result - Remark	Verdict
	The grinder shall be designed to prevent the abrasive product from coming loose, for instance unscrewed by inertia and spun off, after the stop command has been given.		P
4.2.7	**Spindles**		
	Spindles shall be designed so that they locate and secure the abrasive product.		P
	All grinders shall incorporate means to hold the spindle where a grinding wheel is being mounted or removed. For threaded spindles, the direction of the spindle threads shall be such that the clamping device, collet or wheel with threaded hole shall tend to tighten during grinding.		P
	In order to decrease vibrations, for spindles which locate a plain bore wheel, the diameter shall have a maximum total indicator reading of 0,05mm to the true axis of the spindle (see Figure 1).		P
	For spindles with a threaded portion intended for locating abrasive products with threaded bores, the pitch diameter of the thread shall have a maximum total indicator reading of 0,1mm to the true axis of the spindle.		N/A
	The diameter of the part, which locates the abrasive product, shall have a tolerance of e8 or narrower (but not press fit).		P
	Spindles shall have a suitable means of receiving a tachometer.		P
4.2.8	**Flanges**		
4.2.8.1	**General**		
4.2.8.1.1	**Flange design**		
	Flanges shall be designed so that they provide for, or aid in, securing and driving the abrasive products, which are intended to be used with the grinder. Grinders not designed for use with certain wheels are not required to have flanges capable of mounting such wheels.		P
	The driving flange shall be integral with the spindle or shall be mounted on the spindle in a manner that provides sufficient rotational driving action to prevent slipping of the abrasive product.		P
	A piloting diameter (see Figure 2) shall locate the abrasive product radially to the shaft of the tool. The flange assembly shall have the piloting diameter on either the driving or the outer flange or on the shaft itself. It is not permitted to have piloting diameters on two parts simultaneously.		P
4.2.8.1.2	**Chamfer and overlap**		
	Flanges, both driving and outer, shall be designed to prevent pieces of the abrasive product from splintering due to high edge pressure arising during clamping. The most common design is with a chamfer or recess, as shown in Figure 3.		P

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Clause	Requirement - Test	Result - Remark	Verdict
	The dimensions, C and G, in Figure 3, of flanges for all wheel types shall be in accordance with standard's requirement.	C=7mm G=2mm	P
4.2.8.1.3	**General tolerance of clamping surface**		
	The clamping surface, C (see Figure 3), of the flanges shall run true with a tolerance giving a total indicator reading of maximum 0,1% of the diameter at the position of the indicator. The indicator shall be positioned near the outside diameter.		P
4.2.8.1.4	**General tolerance of flanges**		
	The part of the flanges, which locates and guides the abrasive products with unthreaded holes, shall have an out-of-centre tolerance lower than 0,2mm (see Figure 2).		P
4.2.8.1.5	**Material of flanges**		
	The steel in the flanges shall have a minimum tensile strength of 430N/mm^2. Other materials may be used, in which case the flange shall be tested and fulfill the requirements of 5.4 The material should also provide necessary ductility.		P
4.2.8.2	**Type 1 wheels**		
	Flanges in a set shall have the same contact diameter and shall have equal contact surface.		N/A
	For type 1 wheels, the flange diameter, df, shall be: df≧0,33D Where D is the outside diameter of the abrasive wheel.		N/A
	Both flanges shall be relieved to equal diameters and shall conform to the dimensions shown in Figure 3.		N/A
	Exception: machines specifically designed for, and used only with, diamond and reinforced (segmented) wheels shall use flanges of not less than one fourth of the wheel diameter.		N/A
4.2.8.3	**Type 6 and 11 wheels**		
4.2.8.3.1	**Unthreaded wheels**		
	For type 6 and 11 unthreaded wheels, the flange diameter, df, shall be in accordance with standard's requirement.		N/A
	The backing flange (diameter df2) may have a larger contact surface than the outer flange, if this arrangement fulfills the requirement of absorbing the grinding forces (see Figure 4).		N/A
4.2.8.3.2	**Threaded wheels**		
	For type 6 and 11 threaded wheels, the flange diameter shall be not less than one third of the maximum diameter of the wheel. Flanges shall not be recessed, unless the abrasive product has a riveted anchor plate (see Figure 5 and 6).		N/A
4.2.8.4	**Type 27, 28 and 42 flap wheels and flap discs**		

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Clause	Requirement - Test	Result - Remark	Verdict
	With the exception of the alternative designs of flanges described in 4.2.8.6, type 27, 28 and 42 wheels and flap discs shall be used with the flange assemblies illustrated in Figures 7 a) and 7 b).		N/A
	The overlap of the backing and outer flange clamping surfaces shall be at least equal to dimension C shown in Figure 3.		N/A
	Abrasive products of types 27, 28 and 42 are allowed to use a backing flange with a diameter larger than that of the outer flange [see Figure 7 b)].		N/A
	The flange diameter, df, shall be in accordance with standard's requirement.		N/A
4.2.8.5	**Type 41 wheels**		
	For type 41 grinding wheels (also known as type 1 cutting-off wheels), the flanges in a set shall have the same external diameter, df: df≧0,33D Where D is the outside diameter of the abrasive wheel.		P
	The outer flange may have a larger recess than the backing flange (see Figure 8).		N/A
4.2.8.6	**Alternative design for type 27, 28 and 42 wheels and flap discs**		
	Alternative flanges are permitted providing they can properly locate the wheel (regardless of thickness) and transmit the necessary torque from the spindle to the abrasive wheel. Verification shall be carried out according to 4.2.8.7		N/A
	The flange system shall be able to accommodate type 27, 28 and 42 wheels and flap discs.		N/A
	The following are the dimensional restrictions. - The backing flanges shall have a diameter that is equal to, or larger than, the diameter of the outer flange. - The outer flange shall fit into the depressed area of type 27, 28 and 42 wheels and flap discs and clamp the abrasive wheel only at the flat bottom part of the recess; it shall not interfere with or contact the inside corner radius of the recess. - The piloting diameter shall be located at one part only.		N/A
4.2.8.7	**Testing of flanges**		
	Flanges shall be tested for deformation under load according to 5.4		P
	Alternative flange designs for 27, 28 and 42 wheels and flap discs, as described in 4.2.8.6, shall be subjected to the test described in 5.8 in order to verify their ability to maintain the correct location of the abrasive wheel during use.		N/A
4.2.9	**Guards**		
4.2.9.1	**General**		

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Clause	Requirement - Test	Result - Remark	Verdict
	Grinders shall be equipped with guards to protect against: - accidental contact with the abrasive product, - ejection of fragments of the abrasive product, and - sparks and debris.		P
	Guard are mandatory for use with all types of abrasive products of diameter 50mm and above.		P
	Guards are not mandatory, but are recommended, for cones, plugs and wire brushes with a diameter of less than 50mm.		N/A
	The guards shall fulfill the following requirements. a) They shall be designed so that, in case of an abrasive product burst, the guard reduces the risk of injury to the operator and remain attached to the grinder. b) They shall be located so that the risk of accidental contact between the operator and the abrasive product during intended use is minimized. c) The clearance between the inside of the guard and periphery of a new abrasive product shall be: - maximum 8mm and minimum 3mm for a nominal diameter ≦ 125mm. - maximum 10mm and minimum 6mm for a nominal diameter > 125mm.	4,5mm	P
	Guards shall be so constructed that wheel mounting and removal can be carried out without removing the wheel guard from the grinder.		P
	If material other than steel plate is used, it shall be equally suitable for all working conditions.		N/A
	Guards for specific wheel types shall meet the additional specifications in 4.2.9.2 to 4.2.9.8, as applicable.		P
	The minimum thickness of the guards, for abrasive products with a maximum operating speed less than or equal to 80 m/s, are found in the Tables 2 to 9.		P
	Types or designs (including material and thickness) of guards other than those mentioned in this subclause may be used, if they provide the same, or better, protection and if they are tested and fulfill the requirements according to 5.5.		N/A
4.2.9.2	**Type 1, 4, and 5 wheels (other than cutting-off wheels)**		
	A guard for grinders using types 1, 4 and 5 wheels shall enclose the top and both sides of the grinding wheel to at lease 180^0 (see Figure 9). Enclosure of the spindle end, the nut, and the outer flange is not required (see Figure 10).		N/A

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Clause	Requirement - Test	Result - Remark	Verdict
	Exception: small types 1, 4 and 5 wheels of 100mm (4 in) in diameter or less do not require a guard cover. The guard shall have a lip on the outer edge, which curls inward to deflect wheel fragments and which provides the necessary strength to meet the requirements of 4.2.9.1. The lip shall extend beyond the face of the wheel all along the 180^0 coverage (see Figure 11).		N/A
4.2.9.3	**Type 6 and 11 wheels**		
	A guard for vertical or angle grinders using wheel types 6 and 11 shall cover the wheel's plane of rotation toward the operator for at least 180^0, shall cover the side of the wheel toward the driving flange for 180^0, and shall have a skirt which is adjustable to within 3mm (1/8 inch) of the face of the wheel (see Figure 12).		N/A
4.2.9.4	**Type 16, 18, 18R and 19 abrasive products**		
	For abrasive products of types 16, 18, 18R and 19, the guard shall cover at least the length of the abrasive product and at least 180^0 of the periphery (see Figure 13).		N/A
4.2.9.5	**Type 27, 28, 41 and 42 wheels and flap discs**		
	The guards for grinders using wheels types 27, 28, 41 and 42 and flap discs shall: - cover the wheel's plane of rotation toward the operator for at least 180^0, - cover the side of the wheel toward the driving flange for at least 180^0, and - have a lip on the outer edge which curls inward to deflect wheel fragments and to provide necessary strength, or a curtain segment with a minimum height of a quarter of the diameter. See Figure 14 and Figure 15.	180^0	P
4.2.9.6	**Superabrasives wheel type D4, D5 and D6**		
	Guards with a front lip or a curtain segment shall be used for types D4, D5 and D6 wheels (see Figure 15 and 16). Guards for type D6 wheels with a diameter larger than 150mm shall fulfill the requirements of EN 12418.		N/A
4.2.9.7	**Flap wheels of type D2**		
	For flap wheels, at least 180^0 of the abrasive wheel periphery and the side towards the grinder shall be covered by the guard (see Figure 17).		N/A
4.2.9.8	**Wire Brushes**		
	Guards shall be provided on all hand-held brushing machines. These guards shall be the same as those used on grinders for radial and cup wheel. Where these guards are not usable for certain brush shapes, suitable guards shall be devised after consultation with the brush manufacturer.		N/A
4.2.9.9	**Material of guards**		

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Clause	Requirement - Test	Result - Remark	Verdict
	Guards shall be made of steel plate in accordance with EN 10111 and EN 10130, with a tensile strength of 270 N/mm^2 to 450 N/mm^2 and a minimum elongation of 28% (gauge length 50mm) or of other material with comparable characteristics.		P
4.3	**Thermal safety**		
	Surface temperatures of parts of the grinder, which are held during use or which can be inadvertently touched shall follow the provisions of ISO 13732-1 and ISO 13732-3.		P
	Pneumatic grinders shall be designed to minimize the cooling effects of exhaust air on the handles and other gripping zones.		P
4.4	**Noise reduction**	See Clause 5.2	P
4.5	**Vibration**	See Clause 5.3	P
4.6	**Materials and substances processed, used or exhausted**		
4.6.1	**Exhaust air or gas**		
	Pneumatic grinders shall be designed in such a way that exhaust air is directed so as not to cause a hazard to the operator and so that any other effects, such as blowing dust and reflected air from the workpiece onto the operator, are minimized.		P
4.6.2	**Dust and fumes**		
	So far as is reasonably practicable, the grinder shall be designed to facilitate the collection and removal or suppression of airborne dust particles and fumes generated by the work process. The instructions handbook shall include sufficient information to enable adequate control of the risks from dust and fumes.		P
4.6.3	**Lubricants**		
	When specifying lubricants, the manufacturer shall take environmental and occupational health aspects into account.		P
4.7	**Ergonomics**		
4.7.1	**Design of the handle**		
	Gripping areas of the grinder shall be designed to provide a convenient, effective means for the operator to exercise full control over the grinder.		P
	Handles and other parts used for gripping the grinder shall be designed to ensure that the operator is able to grip the grinder correctly and to perform the expected work. Handles shall suit the functional anatomy of the hand and the dimensions of the hands of the operator population. Further guidance on ergonomic design principles can be found in EN 614-1		P

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Clause	Requirement - Test	Result - Remark	Verdict
	Angle and vertical grinders shall have provision for mounting a second handle, when the power output is over 0,5kW.		N/A
	Grinders having a mass greater than 2 kg (including the inserted tool) shall be capable of being supported by two hands whilst being lifted or operated.		N/A
	The strength of a removable handle and method used to fix it shall be appropriate to the intended principal use. Verification shall be carried out in accordance with 5.7.		N/A
4.7.2	**Suspension device**		
	Provision shall be made, where appropriate, to enable the attachment to the grinder of a suspension device in order to reduce, where practicable, the physical strain placed on the operator by the mass of the grinder. The fitting of a suspension device shall not introduce an additional hazard.	No suspension device used	N/A
4.8	**Controls**		
4.8.1	**Start-and-stop device**		
	Grinders shall be equipped with a single control device to start and/or stop them. It shall be adapted to the handle or to the part of the grinder being gripped, so that it can be held comfortable in the run position, and so that the operator can activate it without releasing the grip on the handles.		P
	Start-and-stop devices shall be so designed that the inserted tool ceases to be powered when the start-and-stop device is released. Without manual effort when completely released, the device shall move to the stop position, i.e. shall be of the hold-to-run type.	Hold to run type	P
	Start-and-stop devices shall be in the stop position or immediately move to the stop position when the grinder is connected to the energy supply.	In the stop position	P
	It shall not be possible to lock the start-and-stop device in the running position.	No lock in the running position	P
4.8.2	**Unintentional start**		
	The start-and-stop device shall be so designed, positioned or guarded that the risk of unintentional start is minimized. Verification shall be carried out in accordance with 5.6.	Switch trigger with lock-off button.	P
	Lock-off start-and-stop devices are required for: - angle grinders intended for wheels with a nominal diameter exceeding 125mm; - straight grinders intended for wheels with a nominal diameter exceeding 100mm; - vertical grinders intended for wheels with a nominal diameter exceeding 100mm.	Switch trigger with lock-off button.	N/A
4.8.3	**Actuating forces**		

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Clause	Requirement - Test	Result - Remark	Verdict
	For grinders that are intended to be started frequent or are intended to be used for precision work, the actuating force shall be small.		P
	For grinders that are normally used in operations of long duration, the force required to keep the start device in the run position should be small.		P
	For further information on trigger forces for control devices see EN 894-3.		P
5	**Verification**		
5.1	**General conditions for tests**		
	Tests according to this part of ISO 11148 are type tests		P
5.2	**Noise**		
	The noise-emission values shall be measured and declared in accordance with ISO 15744.	**Max. of all models:** **L_{pA}: 77 dB(A)** **K_{pA}: 3 dB(A)** **L_{wA}: 88 dB(A)** **K_{wA}: 3 dB(A)**	P
	Compliance with 4.4 may be verified through the comparison of the noise emission values with those for other machines of the same family or with machines of similar size and performance characteristics.		P
5.3	**Vibration**		
	For angle and vertical grinder, the vibration total value shall be measured and reported in accordance with ISO 28927-1. For straight grinder, the vibration total value shall be measured and reported in accordance with ISO 28927-4. For grinders intended to be used with wire brushes, the vibration total value shall be measured and reported in accordance with ISO 20643.	**Max. of all models:** **2,38 m/s^2** **K= 1,5 m/s^2**	P
	The vibration-emission value and its uncertainty shall be declared in accordance with EN 12096.		P
	Compliance with 4.5 may be verified through the comparison of the vibration-emission values with those for other machines of the same family or with machines of similar size and performance characteristics.		P
5.4	**Test of deformation of flanges**		
	Flanges shall be tested according to the following procedure: - the abrasive product shall be replaced on the grinder by a steel disc having the same dimensions and shape as the abrasive product; - the clamping nut shall be tightened with a test torque, as specified in Table 8; - a feeler gauge of a thickness of 0,5mm shall be used to test whether or not the flanges are in contact with the disc all around the circumference.		P

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Clause	Requirement - Test	Result - Remark	Verdict
	The flange is not accepted if the feeler gauge can be pushed underneath the flange by more than 1mm or by more than one fifth of the rim of the clamping area, C, whichever is the smaller value. An example of C can be found in Figure 3.		N/A
5.5	**Test of guards**		
5.5.1	Burst tests for guards are mandatory for all type of wheels, except for superabrasive wheels.		P
	Guards shall be tested according to the following procedure: - the guard shall be mounted on a grinder, which shall be fixed in a stable position; - three guards shall be tested; at each test, a new abrasive product shall be brust; - the burst shall be cause by altering the abrasive product so that it breaks into three approximately equally sized pieces at the test speed; - the test speed shall be in accordance with Table 9; - the abrasive product used in the test shall have the same shape, mass and strength as the largest abrasive product which is able to be fitted to the grinder with the guard under test.		P
5.5.2	Acceptance criteria: - all fragments shall be contained or deflected through an arc of 180^0 (small granules are not considered fragments) (see Figure 18); - the guard shall not be separated from the grinder. No fasteners or mounting hardware may enter the no-fragment zone. Deformation of the guard and/or movement in the mounting is acceptable.		P
	If all three guards satisfy the acceptance criteria, the design shall be considered acceptable.		P
	If one of the three guards fails, three additional guards shall be tested. If all three of the second set satisfy the criteria, the guard design shall be considered acceptable.		N/A
5.6	**Unintentional start**		
	Compliance with 4.8.2 shall be established for all types of start/stop devices using the following test.		
	The grinder shall be connected to the energy supply and placed in any possible position and pulled over the horizontal plane by its hose.		P
	Operation of the start-and-stop device shall (then) not occur.		P
	Additionally, those grinders for which lock-off start-and-stop to start are required shall be checked by visual inspection to verify that the device is present and effective.		N/A
5.7	**Power tool construction**		

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Clause	Requirement - Test	Result - Remark	Verdict
	Compliance with 4.2.5 shall be verified by dropping a sample grinder three times onto a concrete surface from a height of 1 m without affecting its operational and safety functions. The sample shall be positioned so as to vary the point of impact.		P
5.8	**Test of alternative flanges**		
5.9	**Structure of verification of safety requirements**		
	Table 10 — Structure of verification	Satisfy the table 10	P
6	**Information for use**		
6.1	**Marking, signs and written warnings**		
	Grinders shall be marked visibly, legibly and indelibly with the following information:		
	- name and full address of the manufacturer and, where applicable, his/her authorized representative		P
	- designation of series or type		P
	- serial number or batch number;		P
	- year of construction, that is the year in which the manufacturing process is completed;		P
	- rated speed, expressed in revolutions per minute		P
	- for pneumatic grinders: the rated air pressure marked as (max.)		P
	- for hydraulic grinders: the nominal pressure and flow; the maximum allowable setting for the pressure relief valve		N/A
	Grinders shall be permanently marked with a graphical symbol in accordance with Annex C showing that the operator's instructions shall be read before work starts.		P
	The direction of rotation shall be permanently marked in accordance with Annex C.		P
6.2	**Instruction handbook**		
6.2.1	**General**		
	For the information to be provided to the user, the content of Clause 6 together with ISO 12100:2010, 6.4.5.2 and 6.4.5.3, apply.	See copy of manual	P
	The information provided by the manufacturer is an important, but not exclusive, basis for safe use of the tool. It shall provide sufficient information for the end user to perform an initial risk assessment.		P
	The hazards identified in 6.2.2.4 to 6.2.2.13 are foreseeable in the general use of hand-held grinders. The information provided with the tool shall state that the user or the user's employer shall assess the specific risks that can be present as a result of each use.		P
	The instruction handbook shall contain information relating to at least the following:		P
	- name and address of the manufacturer or supplier or any other agent responsible for placing the grinder on the market;		P

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Clause	Requirement - Test	Result - Remark	Verdict
	- designation of the series or type;		P
	- operating instructions; see 6.3;		P
	- information on noise emission; see 6.4.2;		P
	- information on vibration transmitted to the hands of the operator; see 6.4.3		P
	- maintenance instructions; see 6.5		P
	- explanations of any symbols marked on the grinder; see Annex C;		P
	- information about residual risks and how to control them		P
6.2.2	**Operator's instructions**		
6.2.2.1	**General**		
	The instructions and warnings stated in 6.2.2 to 6.2.5 shall be given with all grinders unless the risk assessment shows that they are not relevant to a particular grinder. Words of equivalent meaning may be used.		P
6.2.2.2	**Statement of use**		
	The operator's instructions shall include a description of the correct use of the grinder and shall make reference to the appropriate inserted tools. The operator's instructions shall state that any other use is forbidden. Foreseeable misuse of the grinder, which experience has shown can occur, shall be warned against.		P
6.2.2.3	**Allowance for user**		
	The operator's instructions shall be written primarily for professional users. Where a tool can be used by nonprofessional users, additional information for use shall be provided		P
6.2.2.4	**General safety rules**		
	- For multiple hazards, read and understand the safety instructions before installing, operating, repairing, maintaining, changing accessories on, or working near the grinder. Failure to do so can result in serious bodily injury.		P
	- Only qualified and trained operators should install, adjust or use the grinder.		P
	- Do not modify this grinder. Modifications can reduce the effectiveness of safety measures and increase the risks to the operator.		P
	- Do not discard the safety instructions; give them to the operator.		P
	- Do not use the grinder if it has been damaged.		P
	Tools shall be inspected periodically to verify that the ratings and markings required by this part of ISO 11148 are legibly marked on the tool. The employer/user shall contact the manufacturer to obtain replacement marking labels when necessary.		P

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Clause	Requirement - Test	Result - Remark	Verdict
6.2.2.5	**Projectile hazards**		
	- Be aware that the failure of the workpiece or accessories, or even of the inserted tool itself can generate high-velocity projectiles.		P
	- Always wear impact-resistant eye protection during the operation of the grinder or when changing accessories on the tool. The grade of protection required should be assessed for each use.		P
	- Ensure that the workpiece is securely fixed.		P
	- Ensure safe clamping of the abrasive product to the grinder.		P
	- Check that maximum operating speed of the abrasive product, converted to revolutions per minute, is equal to, or greater than, the rated speed of the spindle.		P
	- Ensure that the guard is in place, is in good condition and is correctly mounted; ensure that the guard is regularly inspected.		P
	- Check regularly that the speed of the grinder is not higher than that marked on it. These speed checks shall be carried out without the abrasive product mounted and in accordance with the instructions given by the manufacturer.		P
	- Check that the flanges, as specified by the manufacturer, are used and are in good condition, e.g. free from cracks and burrs, ad are plane.		P
	- Check that the spindle and spindle threads are not damaged or worn.		P
	- Ensure that sparks and debris resulting from use do not create a hazard.		P
	- Disconnect the grinder from the energy supply before changing abrasive product and servicing.		P
6.2.2.6	**Entanglement hazards**		
	Choking, scaling and/or lacerations can occur if loose clothing, personal jewellery, neckware, hair or gloves are not kept away from the tool and accessories.		P
6.2.2.7	**Operating hazards**		
	- Avoid contact with the rotating spindle and inserted tool to prevent cutting of hands and other body parts.		P
	- Use of the tool can expose the operator's hands to hazards, including cuts and abrasions and heat. Wear suitable gloves to protect hands.		P
	- Operators and maintenance personnel shall be physically able to handle the bulk, weight and power of the tool.		P
	- Hold the tool correctly; be ready to counteract normal or sudden movements and have both hands available.		P
	- Maintain a balanced body position and secure footing.		P

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Clause	Requirement - Test	Result - Remark	Verdict
	- Release the start-and-stop device in the case of an interruption of the energy supply.		P
	- Use only lubricants recommended by the manufacturer.		P
	- Personal protective safety glasses shall be used; suitable gloves and protective clothing are recommended.		P
	- For overhead work, wear a safety helmet.		P
	- The stopping time, if longer than 5s, shall be started, and it shall be recommended that the grinder be placed in a stable position.		P
	- when cutting off, the workpiece shall be supported such that the slot is kept at constant or increasing width during the complete operation.		P
	- if the abrasive product becomes jammed in a cut slot, shut off the grinder and ease the wheel free. Check that the wheel is still correctly secured and not damaged before continuing the operation.		P
	- Grinding wheels and cutting-off wheels shall not be used for side grinding. (Exception: grinding wheels designed for side grinding.) Grinder shall not be used over the maximum peripheral speed of an abrasive product.		P
	- The operator shall pay attention that no bystanders are in the vicinity.		P
	- Personal protective equipment, such as suitable gloves, an apron, and a helmet, shall be used.		P
	- Grinding sparks can ignite clothing and cause sever burns. Ensure sparks do not land on clothing. Wear fire-retardant clothing and have a bucket of water nearby.		P
6.2.2.8	**Repetitive motions hazards**		
	- When using a grinder to perform work-related activities, the operator can experience discomfort in the hands, arms, shoulders, neck, or other parts of the body.		P
	- While using a grinder, the operator should adopt a comfortable posture whilst maintaining secure footing and avoiding awkward or off-balanced postures. The operator should change posture during extended tasks, this can help avoid discomfort and fatigue		P
	- If the operator experiences symptoms such as persistent or recurring discomfort, pain, throbbing, aching, tingling, numbness, burning sensations or stiffness, these warning signs should not be ignored. The operator should tell the employer and consult a qualified health professional.		P
6.2.2.9	**Accessory hazards**		
	- Disconnect the grinder from the energy supply before fitting or changing the inserted tool or accessory.		P

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Clause	Requirement - Test	Result - Remark	Verdict
	- Use only sizes and types of accessories and consumables that are recommended by the grinder manufacturer; do not use other types or sizes of accessories or consumable.		P
	- Ensure that the dimensions of the abrasive product are compatible with the grinder and that the abrasive product fits the spindle.		P
	- Ensure that the threaded type and size of the abrasive product exactly match the thread type and size of the spindle.		P
	- Inspect the abrasive product before use. Do not use abrasive products which can (possibly) have been dropped or which are chipped, cracked or otherwise defective.		P
	-Ensure that the abrasive product is correctly mounted and tightened before use and run the grinder at no-load speed for at least 1min in a safe position; stop immediately if considerable vibration or other defects are detected and determine the cause of these defects.		P
	- Prevent the spindle end from touching the bottom of the hole of cups, cones or plugs with threaded holes, intended to be mounted on machine spindles, by checking their dimensions and other relevant data.		P
	- Where abrasive products are supplied or used with reducing adaptors or bushings, the user shall ensure that the adaptor or bushing does not contact the face of the flange and that the clamping force provides sufficient rotational driving action to prevent the abrasive product from slipping.		P
	- In cases where flanges are supplied for several types or sizes of abrasive, always fit the correct flange(s) for the abrasive being used.		P
	- Avoid direct contact with the inserted tool during and after use as it can be hot or sharp.		P
	- Store and handle the abrasive product with care in accordance with manufacturer's instructions.		P
6.2.2.10	**Workplace hazards**		
	- Slips, trips and falls are major causes of workplace injury. Be aware of slippery surfaces caused by the use of the tool and also of trip hazards caused by the air line or hydraulic hose		P
	- Proceed with care in unfamiliar surroundings. There can be hidden hazards, such as electricity or other utility lines.		P
	- The grinder is not intended for use in potentially explosive atmospheres and is not insulated against contact with electric power.		P
	- Ensure that there are no electrical cables, gas pipes, etc., which can cause a hazard if damaged by use of the tool		P
6.2.2.11	**Dust and fume hazards**		

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Clause	Requirement - Test	Result - Remark	Verdict
	- Dust and fumes generated when using grinders can cause ill health (for example, cancer, birth defects, asthma and/or dermatitis); risk assessment and implementation of appropriate controls for these hazards are essential.		P
	- Risk assessment should include dust created by the use of the tool and the potential for disturbing existing dust.		P
	- Operate and maintain the grinder as recommended in these instructions, to minimize dust and fume emissions.		P
	- Direct the exhaust so as to minimize disturbance of dust in a dust-filled environment		P
	- Where dust or fumes are created, the priority shall be to control them at the point of emission		P
	- All integral features or accessories for the collection, extraction or suppression of airborne dust or fumes should be correctly used and maintained in accordance with the manufacturer's instructions.		P
	- Select, maintain and replace the consumable/inserted tool as recommended in the instructions, to prevent an unnecessary increase in dust or fumes.		P
	- Use respiratory protection in accordance with employer's instructions and as required by occupational health and safety regulations.		P
	- Working in certain materials creates emission of dust and fumes, causing a potentially explosive environment.		P
6.2.2.12	**Noise hazards**		
	- Exposure to high noise levels can cause permanent, disabling hearing loss and other problems, such as tinnitus (ringing, buzzing, whistling or humming in the ears). Therefore, risk assessment and implementation of appropriate controls for these hazards are essential.		P
	- Appropriate controls to reduce the risk may include actions such as damping materials to prevent workpieces from “ringing”.		P
	- Use hearing protection in accordance with employer's instructions and as required by occupational health and safety regulations.		P
	- Operate and maintain the grinder as recommended in the instruction handbook, to prevent an unnecessary increase in noise.		P
	- If the grinder has a silencer, always ensure that it is in place and in good working order whenever the grinder is being operated.		N/A
	Select, maintain and replace the consumable/inserted tool as recommended in the instructions handbook to prevent an unnecessary increase in noise.		P
6.2.2.13	**Vibration hazards**		

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Clause	Requirement - Test	Result - Remark	Verdict
	The information for use shall draw attention to vibration hazards that have not been eliminated by design and construction and remain as residual vibration risks. It shall enable employers to identify the circumstances in which the operator is likely to be at risk from vibration exposure. If the vibration-emission value obtained using ISO 28927-1 for angle and vertical grinders, ISO 28927-4 for straight grinders or ISO 20643 does not adequately represent the vibration emission in the intended uses (and foreseeable misuses) of the machine, additional information and/or warnings shall be supplied to enable the risks arising from vibration to be assessed and managed.		P
	- Exposure to vibration can cause disabling damage to the nerves and blood supply of the hands and arms		P
	- Wear warm clothing when working in cold conditions and keep your hands warm and dry.		P
	- If you experience numbness, tingling, pain or whitening of the skin in your fingers or hands, stop using the grinder, tell your employer and consult a physician.		P
	- Operate and maintain the grinder as recommended in the instruction handbook, to prevent an unnecessary increase in vibration levels		P
	- Do not allow the inserted tool to chatter on the workpiece as this is likely to cause a substantial increase in vibration.		P
	- Select, maintain and replace the consumable/inserted tool as recommended in the instruction handbook, to prevent an unnecessary increase in vibration levels.		P
	- Support the mass of the tool in a stand, tensioner or balancer, if possible		P
	- Hold the tool with a light but safe grip, taking account of the required hand reaction forces, because the risk from vibration is generally greater when the grip force is higher.		P
	- Use blotters where they are provided with the bonded abrasive product.		P
6.2.3	**Additional safety instructions for pneumatic power tools**		
	- Air under pressure can cause severe injury.		P
	- Always shut off air supply, drain hose of air pressure and disconnect tool from air supply when not in use, before changing accessories or when making repairs;		P
	- Never direct air at yourself or anyone else.		P
	- Whipping hoses can cause severe injury. Always check for damaged or loose hoses and fittings		P
	- Whenever universal twist couplings (claw couplings) are used, lock pins shall be installed and whipcheck safety cables shall be used to safeguard against possible hose-to-tool connection failure.		P

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Clause	Requirement - Test	Result - Remark	Verdict
	- Do not exceed the maximum air pressure stated on the tool.		P
	- Never carry an air tool by the hose.		P
6.2.4	**Additional safety instructions for hydraulic power tools**		
	- Do not exceed the maximum relief-valve setting stated on the tool		N/A
	- Carry out a daily check for damaged or worn hoses or hydraulic connections and replace if necessary		N/A
	- Use only clean oil and filling equipment		N/A
	- Power units require a free flow of air for cooling purposes and should, therefore, be positioned in a well ventilated area free from hazardous fumes.		N/A
	- Ensure that couplings are clean and correctly engaged before operation		N/A
	- Do not inspect or clean the tool while the hydraulic power source is connected. Accidental engagement of the tool can cause serious injury		N/A
	- Do not install or remove the tool while the hydraulic power source is connected. Accidental engagement of the tool can cause serious injury		N/A
	- Be sure all hose connections are tight.		N/A
	- Wipe all couplers clean before connecting. Failure to do so can result in damage to the quick couplers and cause overheating.		N/A
	Instructions shall be given that only hydraulic fluid recommended by the manufacturer shall be used.		N/A
6.2.5	**Specific safety instructions**		
	Warnings shall be given about any specific or unusual hazards associated with the use of the grinder. Such warnings shall indicate the nature of the hazard, the risk of injury and the avoidance action to be taken.		P
6.3	**Operating instructions**		
	The instructions shall include, where appropriate		
	- instructions for setting up or fixing the grinder in a stable position as appropriate for grinders that can be mounted in a support		P
	- assembly instructions, including recommended guards, accessories and inserted tools		P
	- illustrated description of functions;		P
	- limitation on tool use due to environmental conditions		P
	- instructions for setting and testing		P
	- general instructions for use, including changing inserted tools and limits on the size and type of workpiece		P
6.4	**Data**		
6.4.1	**General**		

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Clause	Requirement - Test	Result - Remark	Verdict
	The instructions shall include the information on the data plate and the following		
	- mass of the grinder;		P
	- for hydraulic grinder:		N/A
	- specification of the coupling;		N/A
	- specification of hoses with regard to pressure and flow		N/A
	- maximum inlet temperature of the inlet fluid		N/A
6.4.2	**Noise**		
6.4.2.1	**Declaration of emission**		
	The instructions shall include a noise-emission declaration in accordance with ISO 15744.		P
6.4.2.2	**Additional information**		
	If the values for noise emissions obtained using the appropriate tests defined in 5.2 do not adequately represent the emissions during the intended uses of the machine, additional information and/or warnings shall be supplied to enable the risks arising to be assessed and managed.		N/A
	Information on noise emission should also be provided in the sales literature.		P
6.4.3	**Vibration**		
6.4.3.1	**Declaration of emission**		
	The instruction shall include the vibration-emission value and uncertainty as specified in 5.3 and the reference number of the test code, i.e. ISO 28927-1 for angle and vertical grinders, ISO 28927-4 for straight grinders or ISO 20643 for grinders intended to be used with wire brushes.		P
6.4.3.2	**Additional information**		
	If the values for vibration-emission obtained using the appropriate tests defined in 5.3 do not adequately represent the emissions during the intended uses of the machine, additional information and/or warnings shall be supplied to enable the risks arising to be assessed and managed.		N/A
	Information on vibration emission should also be provided in the sales literature.		P
6.5	**Maintenance instructions**		
	The maintenance instructions shall contain:		
	- instructions to keep the grinder safe by regular preventative maintenance,		P
	- information on when the regular preventative maintenance shall be carried out, for instance after a specified time of operation, a specified number of cycles/operations or a stated number of times per year,		P
	- instructions for disposal so as not to expose personnel and the environment to hazards,		P

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Clause	Requirement - Test	Result - Remark	Verdict
	- list of the service operations that the user should carry out,		P
	- instructions for lubrication, if required,		P
	- instructions to check the speed and make a simple check of the vibration level after each service,		P
	- instructions to check the speed regularly,		P
	- regular inspection of spindles, threads and clamping devices in respect of wear and tolerances for the location of abrasive products.		P
	- specifications of the spare parts to use when these affect the health and safety of operators.		P
	Maintenance instructions shall include the precautions to take to avoid exposure to hazardous substances deposited (due to work processes) on the tool.		P
Annex A	**List of significant hazards**		
Annex B	**Examples of grinders covered by this part of ISO 11148**		
Annex C	**Symbols for labels and signs**		
Annex D	**Examples of abrasive products for hand-held grinders**		