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Acceptance tests for oxygen cutting machines — Reproducible accuracy — Operational characteristics

*Contrôle de réception des machines d'oxycoupage — Précision de
reproduction — Caractéristiques de fonctionnement*



Reference number
ISO 8206:1991(E)

Foreword

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International Standard ISO 8206 was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*.

Annex A of this International Standard is for information only.

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Acceptance tests for oxygen cutting machines — Reproducible accuracy — Operational characteristics

1 Scope

This International Standard applies to stationary cross-carriage oxygen cutting machines for shape cutting and/or parallel trimming.

It also applies to machines for cutting by other thermal processes.

2 Purpose of acceptance tests

The purpose of acceptance tests is the final inspection of the completed oxygen cutting machine on the premises of the user. Acceptance tests are used solely to demonstrate the reproducible accuracy and operational characteristics of the oxygen cutting machine, eliminating influences caused by the process. This International Standard is intended to be a basis for technical provisions of delivery.

3 Preconditions for acceptance tests

3.1 Setting up the oxygen cutting machine

Oxygen cutting machines are machine tools. At the place of installation, therefore, the same requirements as regards sensitivity to external influences shall be established as in the case of other machine tools.

Installation of the oxygen cutting machine outdoors, laying out the machine foundations in the vicinity of vibrating plant, and effects from electric or electromagnetic fields are to be avoided. Displacement or subsidence of the machine foundations shall be excluded. Exceptions shall be stipulated in agreement with the manufacturer.

3.2 Time of acceptance tests

The machine parts shall be properly stored on the user's premises. The oxygen cutting machine shall be properly installed immediately on delivery and tested in accordance with clause 5.

4 Principles of acceptance tests

4.1 Operating instructions

The operating instructions for the oxygen cutting machine shall be complied with.

Before commencing the acceptance tests the controls, electronics, motors and gear mechanisms shall be operated at no-load to bring them to a temperature corresponding to working conditions and the manufacturer's instructions.

4.2 Measuring instruments

The tests are to be carried out with calibrated measuring instruments in accordance with the measuring instructions given in this International Standard.

The limit of error of the measuring instruments shall not be more than 20 % of the permissible variation. The errors in the measuring instruments and the tolerances for the measuring devices, e.g. set pins, steel wire and prism blocks are to be taken into account.

4.3 Measurements

The measuring instruments, measuring devices and oxygen cutting machine, with the exception of the parts referred to in 4.1, are to be brought to the same temperature — generally room temperature. They shall therefore, be protected against sunlight and external thermal influences.

Should there be any discrepancy, a control measurement is to be carried out after testing the measuring instruments and the measuring devices.

4.4 Test report

The test results are to be recorded in a report (see annex A).

Additional tests of the manufacturing or working accuracy can be agreed at the time of ordering.

5 Extent of acceptance tests

5.1 Testing of the running track

The accuracy of manufacture and installation of the running track is tested with the cross-carriage positioned on it in accordance with table 1.

5.2 Testing of the manufacturing accuracy of the oxygen cutting machine

The criteria for this are given in table 2.

5.3 Testing of the working accuracy of automatically controlled oxygen cutting machines

The working accuracy of automatically controlled oxygen cutting machines is tested in accordance with table 3.

5.4 Testing of the working accuracy of planing machines

The working accuracy of planing machines is tested in accordance with table 4.

5.5 Electrical equipment

The electrical operations are tested in accordance with the operating instructions. The relevant IEC publications shall be complied with.

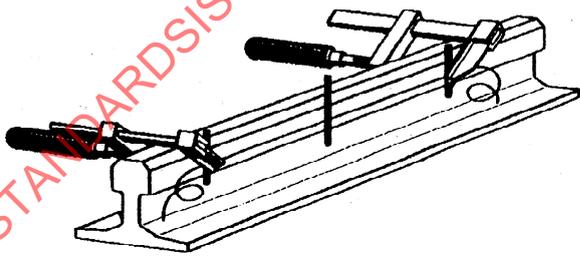
5.6 Gas engineering equipment

Pressure measurements are taken to test whether the pipes have a large enough cross-section to ensure that the gas supply equipment can operate efficiently.

The pressures of combustible gas and oxygen for heating and cutting required in accordance with the operating chart for the greatest thicknesses of workpieces shall be available at the torch inlet while all the torches are in operation which have been provided in accordance with the order for simultaneous oxygen cutting of such thicknesses of workpieces.

Testing is to be carried out for compliance with the safety requirements, observing the accident prevention regulations and other relevant regulations.

Table 1 — Testing of the running track

No.	Object of measurement	Figure	Measuring instrument	Measuring instructions	Permissible variation
5.1.1	Straightness of guide rail		Steel wire max. 0,5 mm Ø, end gauges (set pins), feeler gauge, levelling telescope	Move cross-carriage to rear end of running track. Carry the steel wire along the free part of the guide rail over the set pins and tension. Measure with set pins and feeler gauge at intervals of 1 m. Then move cross-carriage to the front end of the running track. Repeat measurement as before. Gauge length is at least twice the dead length of the machine	±0,2 mm to 10 m length

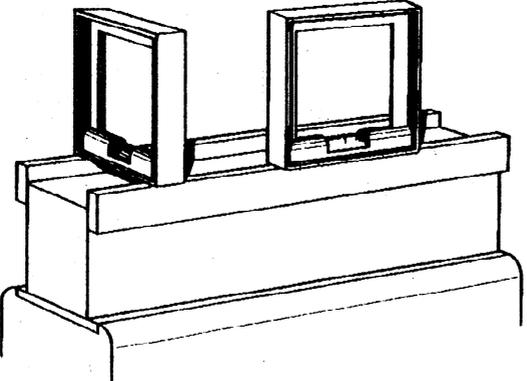
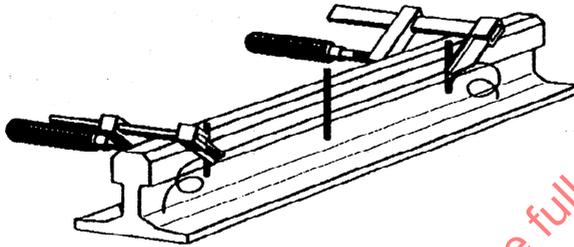
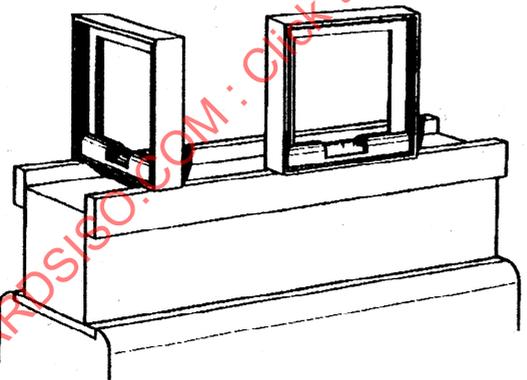
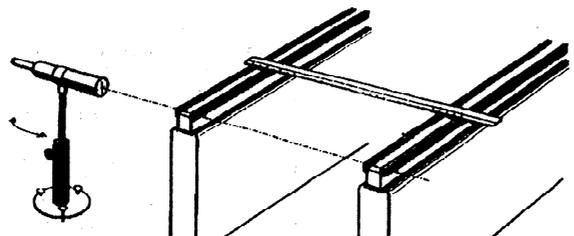
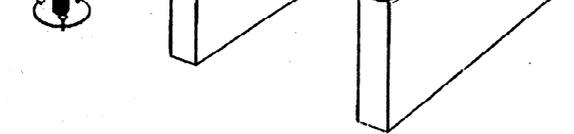
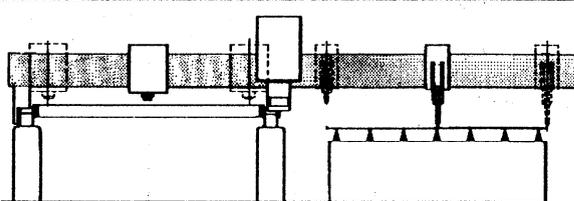
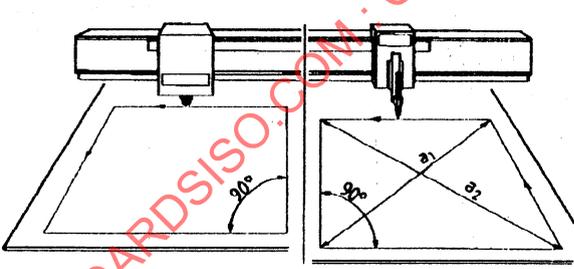
No.	Object of measurement	Figure	Measuring instrument	Measuring instructions	Permissible variation
5.1.2	Horizontal position of guide rail longitudinally and transversely		Spirit level with 0,1 mm/m scale interval, levelling instrument with coincidence bubble	Apply spirit level at intervals of 1 m along and across the rail surfaces. Attach prism block if necessary for prismatic rails	± 0,2 mm/m longitudinally but not more than ± 2 mm on running track lengths of up to 50 m, ± 0,1 mm/m transversely
5.1.3	Straightness of running rail		Steel wire max. 0,5 mm Ø, end gauges (set pins), feeler gauge, levelling telescope	Move cross-carriage to rear end of running track. Carry the steel wire along the free part of the running rail over the set pins and tension. Measure with set pins and feeler gauge at intervals of 1 m. Then move cross-carriage to the front end of the running track. Repeat measurement as before. Gauge length is at least twice the dead length of the machine	For rails machined laterally ± 0,5 mm up to a length of 20 m, for rails not machined laterally ± 3 mm up to a length of 20 m
5.1.4	Horizontal position of running rail longitudinally and transversely		Spirit level with 0,1 mm/m scale interval, levelling instrument with coincidence bubble	Apply spirit level at intervals of 1 m along and across the rail surfaces. Attach prism block if necessary for prismatic rails	± 0,2 mm/m longitudinally and transversely but not more than ± 2 mm over total length of running track
5.1.5	Horizontal position of guide rail and running rail in relation to each other		Hose level with 0,1 mm/m scale interval, levelling instrument, levelling telescope	Measure at the start, middle and end of the running track	± 0,5 mm to 10 m track width, ± 1 mm for track widths > 10 m
5.1.6	Parallelism of guide rail and running rail in relation to each other		Steel measuring tape	Measure at the start, middle and end of the running track. The distance between the guide rail and running rail — the track gauge shall be maintained according to the manufacturer's assembly plan	No limitation, but running wheel shall be fully supported over the total length

Table 2 — Testing of the manufacturing accuracy of the oxygen cutting machine

No.	Object of measurement	Figure	Measuring instrument	Measuring instructions	Required variation
5.2.1	Stroke of torch height adjustment		Steel measuring tape	Travel torch height slides to highest and lowest position. Compare with dimensions on manufacturer's assembly plan	At least 3 mm higher and lower than nominal dimension
5.2.2	Working width in the range of control device and cutting torch		Steel measuring tape	Move control device or cutting torch to inner and outer position. Measure distance of travel and compare with manufacturer's machine assembly plan	At least 10 mm wider than nominal dimension ¹⁾
5.2.3	Working length		Steel measuring tape	Move cross-carriage to forward and rear position. Measure distance of travel and compare with the manufacturer's machine assembly plan	At least 20 mm longer than nominal dimension ¹⁾

1) The minimum variations are required in order to be able to align the largest workpieces provided to the machine.

Table 3 — Testing of the working accuracy of automatically controlled oxygen cutting machines

No.	Object of measurement	Figure	Measuring instrument	Measuring instructions	Permissible variation
5.3.1	Right angle between longitudinal and transverse movement		Steel measuring tape. Measuring magnifier	Insert a scriber or a suitable recording instrument instead of a torch. Travel machine along the coordinates and trace a rectangle. Length of transverse side approximately equal to the working width, length of longitudinal side at least equal to the working width, and with large machines side length not more than 3 m. Measure length of diagonals a_1 and a_2	0,5 mm between diagonals
5.3.2	Cutting speed		Steel measuring tape. Stop-watch	Measure the speed over 75 % of the possible distance of travel in the transverse and longitudinal direction, after a flying start. For distances of travel up to 5 m, measure at intervals of 1 m at 300 mm/min, and 1/3, 1/2 and 2/3 of the maximum cutting speed in each case	± 5 % of the set speed with main voltage fluctuations of not more than ± 5 %

No.	Object of measurement	Figure	Measuring instrument	Measuring instructions	Permissible variation
5.3.3	Reproducible accuracy with automatic control on a scale of 1:1, with kerf compensation = 0 without numerical control		Steel measuring tape	<p>Insert a scriber or suitable recording instrument instead of a torch. Circumscribe a drawing of a square of 250 mm or 500 mm or 1000 mm side length with the automatic control in both directions and trace with the scriber. Determine the variations compared with the dimensions of the information medium, which should be regarded as zero dimensions. The tests are to be carried out at 300 mm/min and 1/2 and 1/1 of the maximum cutting speed. During this, contour radii at the corners shall be made in accordance with the operating instructions. Rotate square through approximately 30° and carry out tests in the same way. Carry out all tests on two diagonally opposed points of the working range</p>	± 0,4 mm, but ± 0,8 mm at corners
5.3.4	Reproducible accuracy with automatic control, photoelectrically from patterns on a reduced scale, with kerf compensation = 0		Glass scale with 0,1 mm or preferably 0,05 mm divisions for measuring the information medium, steel measuring tape and measuring magnifier for measuring the full-scale scribe	<p>Insert a scriber or suitable recording instrument instead of a torch. Circumscribe a drawing of a square corresponding to 250 mm or 500 mm or 1000 mm side length with the automatic control in both directions and trace with the scriber. Determine the variations compared with the dimensions of the input medium, which should be regarded as zero dimensions. For large machines, use a drawing of a rectangle corresponding to 3000 mm x 10000 mm. The tests are to be carried out at 300 mm/min and 1/2 and 1/1 of the maximum cutting speed. During this, contour radii at the corners shall be made in accordance with the operating instructions. Rotate square through approximately 30° and carry out tests in the same way. Carry out all tests on two diagonally opposed points of the working range. (For the figure for measuring procedure, see No. 5.3.3)</p>	± 1,5 mm

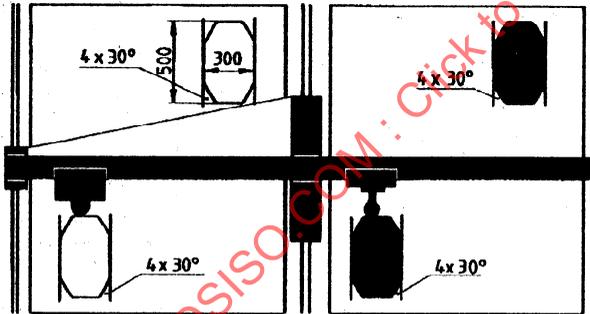
No.	Object of measurement	Figure	Measuring instrument	Measuring instructions	Permissible variation
5.3.5	Reproducible accuracy with numerical control with kerf compensation = 0		Steel measuring tape and measuring magnifier	<p>Insert a scriber or suitable recording instrument instead of a torch. Circumscribe a square of 250 mm or 500 mm or 1000 mm side length in both directions and trace with the scriber. Determine the variations compared with the dimensions of the information medium, which shall be regarded as zero dimensions. For large machines use a rectangle measuring 3000 mm x 10000 mm. The tests are to be carried out at 300 mm/min and 1/2 and 1/1 of the maximum cutting speed. During this, contour radii at the corners shall be made in accordance with the operating instructions. Rotate square through approximately 30° and carry out tests in the same way. Carry out all tests on two diagonally opposed points of the working range. (For the figure for measuring procedure, see No. 5.3.3)</p>	± 0,6 mm
5.3.6	Effects of vibration behaviour on the flame cut with 30° to longitudinal axis	<p style="text-align: center;">Dimensions in millimetres</p> 	Cut surface quality sample for a plate thickness of 15 mm	<p>Vibration behaviour is tested by its effects on the flame cut. Cutting torches and tips supplied by the manufacturer are to be used for this and the adjustment values adhered to. The test is carried out on a workpiece preferably 15 mm thick, of material Fe 360 with a bright metallic surface, and with realignments of 30°. It shall be carried out at two diagonally opposed points of the working range. The flame cuts are compared</p>	Drag line depth ≤ 80 μm

Table 4 — Testing of the working accuracy of planing machines

No.	Object of measurement	Figure	Measuring instrument	Measuring instructions	Permissible variation
5.4.1	Control accuracy of the machine		Steel measuring tape and measuring magnifier	With two torch mountings, insert a scriber or recording instrument in each instead of the torch. Travel longitudinal carriages in turn over total distance of travel at 1/3, 2/3 and 3/3 of maximum cutting speed and trace the distance of travel. Measure linearity and parallelism of the traces	$\pm 0,2$ mm for a 10 m length of measurement
5.4.2	Rectangularity between longitudinal and transverse directions		Pair of compasses of at least 3 m radius	Produce a right angle with the pair of compasses, replace the torch with a scriber or recording instrument, travel the machine transversely, trace the distance of travel and measure the right angle	± 1 mm over the working width up to 4 m

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Annex A
(informative)

**Test report on acceptance test of oxygen cutting machine in accordance with
ISO 8206**

Customer (name, address)

Manufacturer (name, address)

Type of machine

A.1 Testing of the running track

No.	Object of measurement	Measuring instruments	Permissible variation	Measured variation	Remarks
1.1	Straightness of guide rail	As per standard: yes/no or Nature: Indicating accuracy:	$\pm 0,2$ mm to 10 m length		
1.2	Horizontal position of guide rail longitudinally and transversely	As per standard: yes/no or Nature: Indicating accuracy:	$\pm 0,2$ mm/m longitudinally, but not more than ± 2 mm on running track lengths of up to 50 m, $\pm 0,1$ mm/m transversely		
1.3	Straightness of running rail	As per standard: yes/no or Nature: Indicating accuracy:	For rails machined laterally $\pm 0,5$ mm up to a length of 20 m, for rails not machined, laterally ± 3 mm up to a length of 20 m		
1.4	Horizontal position of running rail longitudinally and transversely	As per standard: yes/no or Nature: Indicating accuracy:	$\pm 0,2$ mm/m longitudinally and transversely, but not more than ± 2 mm over total length of the running track		

No.	Object of measurement	Measuring instruments	Permissible variation	Measured variation	Remarks
1.5	Horizontal position of guide and running rails in relation to each other	As per standard: yes/no or Nature: Indicating accuracy:	$\pm 0,5$ mm to 10 m track width, ± 1 mm for track widths or > 10 m		
1.6	Parallelism of guide and running rails in relation to each other	As per standard: yes/no or Nature: Indicating accuracy:	No limitation, but running wheel must be fully supported over the total length		

A.2 Testing of the manufacturing accuracy of the oxygen cutting machine

No.	Object of measurement	Measuring instrument	Required variation	Measured variation	Remarks
2.1	Stroke of torch height adjustment	As per standard: yes/no or Nature: Indicating accuracy:	At least 3 mm higher and lower than nominal dimension		
2.2	Working width in the range of control device and cutting torch	As per standard: yes/no or Nature: Indicating accuracy:	At least 10 mm wider than nominal dimension		
2.3	Working length	As per standard: yes/no or Nature: Indicating accuracy:	At least 20 mm longer than nominal dimension		

A.3 Testing of the working accuracy of automatically controlled oxygen cutting machines

No.	Object of measurement	Measuring instrument	Permissible variation	Measured variation	Remarks
3.1	Right angle between longitudinal and transverse movement	As per standard: yes/no or Nature: Indicating accuracy:	0,5 mm between diagonals		
3.2	Cutting speed	As per standard: yes/no or Nature: Indicating accuracy:	± 5 % of the set speed with main voltage fluctuations of not more than ± 5 %		
3.3	Reproducible accuracy with automatic control on a scale of 1:1, with kerf compensation = 0 without numerical control	As per standard: yes/no or Nature: Indicating accuracy:	$\pm 0,4$ mm, but $\pm 0,8$ mm at corners		
3.4	Reproducible accuracy with automatic control, photoelectrically from patterns on a reduced scale, with kerf compensation = 0	As per standard: yes/no or Nature: Indicating accuracy:	$\pm 1,5$ mm		
3.5	Reproducible accuracy with numerical control with kerf compensation = 0	As per standard: yes/no or Nature: Indicating accuracy:	$\pm 0,6$ mm		
3.6	Effects of vibration behaviour on the flame cut with 30° to longitudinal axis	As per standard: yes/no or Nature: Indicating accuracy:	Drag line depth ≤ 80 μm		