TC 44

INTERNATIONAL STANDARD 5172

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Manual blowpipes for welding and cutting

Chalumeaux manuels pour soudage et coupage

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FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 5172 was developed by Technical Committee ISO/TC 44, *Welding*, and was circulated to the member bodies in July 1976.

It has been approved by the member bodies of the following countries :

Austria	Israel	Romania
Belgium	Italy	South Africa, Rep. of
Bulgaria	Japan	Spain
Canada	Korea, Rep. of	Sweden
Czechoslovakia	Mexico	Switzerland
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France	New Zealand	U.S.A.
Germany	Norway	Yugoslavia
India	Portugal	

The member bodies of the following countries expressed disapproval of the document on technical grounds :

Poland
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Manual blowpipes for welding and cutting

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies the characteristics of manual blowpipes for welding and cutting of metals.

2 REFERENCES

ISO 554, *Standard atmospheres for conditioning and/or testing — Specifications.*

ISO 3253, *Hose connections for equipment for welding, cutting and related processes.*

ISO . . ., *Safety devices for welding gas supply hoses.*[1)]

3 TERMINOLOGY

Terminology concerning cutting and welding blowpipes is given in the annex.

4 DEFINITIONS

4.1 Common types of mixing systems

4.1.1 injector type mixer : Mixing system in which the fuel gas and the oxidizing gas are mixed by the action of the latter which, being discharged from the orifice of the injector, reduces the pressure, thus entraining the fuel gas. Accordingly, when the valve in the fuel gas channel is closed while the oxidizing gas is discharged, the pressure in this channel is below the atmospheric pressure. If during the same time the fuel gas hose connecting nipple is exposed to the atmosphere, air will be entrained (fuel gas valve open).

4.1.2 mixer without injector action : Mixing system in which the fuel gas and the oxidizing gas are mixed when the latter is discharged from the orifice and meets the fuel gas which is discharged at nearly identical pressure. When the valve in the fuel gas channel is closed while the oxidizing gas is discharged, the pressure in this channel is higher than the atmospheric pressure. If during the same time the fuel gas hose connecting nipple is exposed to the atmosphere, oxidizing gas will be discharged (fuel gas valve open).

4.2 Position of the mixing systems

The mixing systems according to 4.1.1 and 4.1.2 are usually in the shank; they may also be between the shank and nozzle or in the nozzle.

1) In preparation.

4.3 High-pressure and low-pressure blowpipes

4.3.1 high-pressure blowpipe : A blowpipe in which the pressure of both the fuel gas and the oxidizing gas measured immediately before the point of mixing is higher than the pressure of the gas mixture measured directly downstream between mixer and nozzle. (See figure 1.)

4.3.2 low-pressure blowpipe : A blowpipe in which one of the gas pressures measured immediately before the point of mixing is lower than the pressure of the gas mixture measured directly downstream between mixer and nozzle. (See figure 2.)

4.4 Blowpipes classified according to the possibility of varying the flow rate

4.4.1 blowpipe with a single flow rate : A blowpipe which due to design gives a single nominal gas flow rate which can only be varied within narrow limits.

4.4.2 blowpipe with multiple flow rates : A blowpipe giving a range of flow rates corresponding to a series of nozzles.

4.4.2.1 blowpipe with multiple gas flow rates adjusted by means of the injector : A blowpipe with multiple gas flow rates which are varied by means of a device for adjustment of the injector cross-section (blowpipe with variable injector).

4.4.2.2 blowpipe with multiple gas flow rates adjusted by the pressure : A blowpipe with multiple gas flow rates which are varied by adjusting the feed pressures (blowpipe with fixed mixer).

4.4.2.3 blowpipe with multiple gas flow rates adjusted by changing the injector : A blowpipe with multiple gas flow rates which are varied by changing the injector. The latter often forms a single component with the outlet nozzle (blowpipe with interchangeable nozzle).

4.4.2.4 blowpipe with multiple gas flow rates adjusted by means of gas control valves : A blowpipe with multiple gas flow rates which are varied by adjustment of the gas inlet control valves.

4.5 Backfire, flashback and backflow

4.5.1 backfire : The return of the flame into the blowpipe with a popping sound, the flame being either extinguished or re-ignited at the nozzle.

4.5.2 sustained backfire : The return of the flame into the blowpipe with continued burning within the neck or handle. This is accompanied by an initial popping sound followed by a hissing sound from the continued burning within the blowpipe.

4.5.3 flashback : The return of flame through the blowpipe into the hoses and even the regulators. It may also reach the acetylene cylinder, causing heating and decomposition of the contents.

4.5.4 backflow : Flowing back of the gas with the higher pressure into the gas hose with the lower pressure; this can be caused by the nozzle exit becoming blocked.

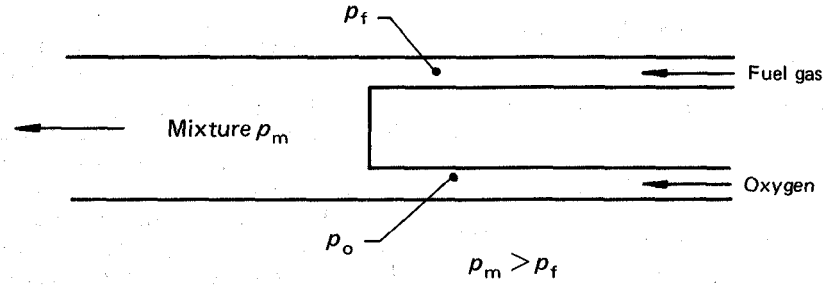


FIGURE 1 – **High-pressure blowpipe**

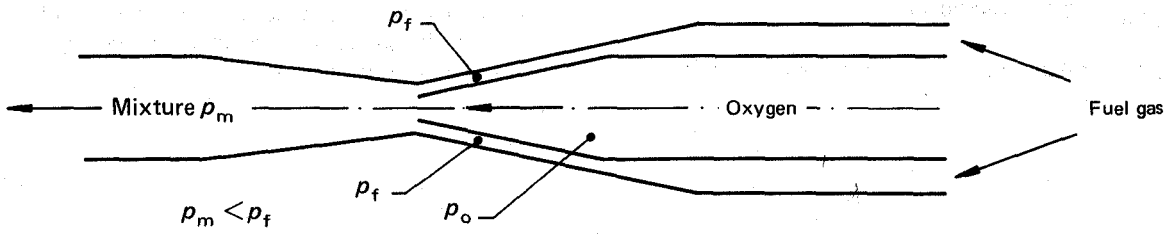


FIGURE 2 – **Low-pressure blowpipe**

5 HOSE CONNECTIONS

The nipples may be either permanently fitted to the shank or detachable. The external profile of the nipples is left to the choice of manufacturer. Where a threaded union connection is used, it shall conform to ISO 3253, and be selected from the range 1/8, 1/4, 3/8 and 1/2 in.

6 MATERIAL

The material used for blowpipes shall have adequate resistance to chemical and thermal attack by the gases used, and to the environmental conditions.

Components in contact with oxygen shall be free from oil, grease and other contaminants.

NOTE – In most countries, regulations exist to limit the maximum copper content of some components coming directly in contact with acetylene.

7 MARKING

The marking shall be legible and durable.

7.1 Marking of the shank

The blowpipe shank shall carry the name or registered trade mark of the manufacturer, and the reference number of this International Standard. The connection adjacent to the oxygen inlet of blowpipes with fixed hose connecting nipples shall be identified by the letter "O".

7.2 Marking of oxygen valves

The oxygen valves (body or knob) shall be identified by the letter "O" and/or the colour blue.

7.3 Marking of nozzles

All nozzles shall be marked with the name, registered trade mark or identifying mark of the manufacturer, with the symbol identifying the fuel gas, and with a code to permit easy reference to the manufacturer's operating data.

7.4 Marking of welding attachment

Where mismatching of interchangeable components (for example mixer and injector) could occur, an identifying code, the manufacturer's trade mark, and the symbol identifying the fuel gas shall be marked and shown in the operating data.

7.5 Marking of cutting attachment

The cutting attachment shall be marked with the name, the registered trade mark or the identifying mark of the manufacturer.

7.6 Marking of mixers

Mixers shall be marked to indicate the method of mixing, relative to 4.1, with symbols as follows :

to indicate mixing with suction;

to indicate mixing without suction.

Normally, interchangeable mixers and injectors shall be marked with the symbol identifying the fuel gas.

7.7 Order of marking

The marking shall be in the following order :

a) manufacturer's name, trade mark or identifying mark;

b) type of fuel gas;

c) code identity;

d) method of mixing (at the point of mixing, i.e. on the mixer, injector or nozzle).

8 SAFETY AND OPERATIONAL REQUIREMENTS

8.1 Safety requirements

8.1.1 *Gas tightness*

All gas passages, connections, valve seats and glands shall be gas tight both internally and to atmosphere at a pressure 1,5 times the maximum working pressure recommended by the manufacturer, but in no case less than 2,5 bar.[1)]

Some oxygen control valves are designed to form part of the gas mixing system. Designs of this type are not permitted to discharge more than 1 l/h into the mixing chamber when in the closed position.

This test shall be repeated after completion of subsequent tests (see 9.1.1).

8.1.2 *Strength requirements*

The blowpipes shall be robust and suitable for the purpose intended. They shall be able to resist maltreatment due to incorrect operation and handling, for example backfire and shock. (No specific test procedure is applicable.)

8.1.3 *Valve design*

Valve elements shall remain captive when valves are fully opened.

1) 1 bar = 10^5 Pa

8.1.4 *Resistance to sustained backfire*

8.1.4.1 RESISTANCE TO SUSTAINED BACKFIRE OF WELDING ATTACHMENTS AT HIGH TEMPERATURES

The welding blowpipe shall not sustain a backfire in the mixer and/or injector without a warning period of 2 s from the beginning of successive backfires (i.e. machine-gunning) (test conditions 9.1.2.1).

8.1.4.2 RESISTANCE TO SUSTAINED BACKFIRE WITH PARTIALLY CLOSED ORIFICE

The blowpipe and nozzle shall be resistant to sustained backfire when the orifice is partially closed (test conditions 9.1.2.3).

8.1.4.3 RESISTANCE TO SUSTAINED BACKFIRE AT REDUCED FLOW

Sustained backfire shall not occur under the conditions described in 8.2.3.

8.1.5 *Protection against backflow*

It is possible to create conditions of backflow in any kind of blowpipe.

In some countries, regulations exist that require the installation of anti-backflow valves in the system.

If an anti-backflow valve is incorporated in the blowpipe, it shall conform to ISO . . .

8.2 Operational requirements

8.2.1 *Flow rate*

It shall be possible to obtain the stated nominal nozzle flow of oxygen and fuel gas when the gases are supplied to the blowpipe as specified by the manufacturer.

8.2.2 *Adjustment of flame*

It shall be possible to adjust the flame continuously from reducing to oxidizing around the stated nominal flow.

8.2.3 *Turn-down ratio*

It shall be possible to reduce by a minimum of 25 % a neutral flame set at the nominal flow.

8.2.4 *Stability in wind*

It shall be possible to maintain the flame in a wind of approximately 10 m/s perpendicular to the axis of the emergent gas stream at the orifice.

9 TEST CONDITIONS

The accuracy of the measuring and test equipment used shall be considered in the evaluation of the test results.

9.1 Safety test conditions

9.1.1 *Leak test*

The tests shall be made using oil-free air or nitrogen with the blowpipe immersed in water.

The test period for each part being tested shall not be less than 2 min.

9.1.2 *Sustained backfire test*

The tests shall be carried out for each combination of nozzle/mixer/shank from the manufacturers' range.

9.1.2.1 OVERHEATING TEST – WELDING BLOWPIPES

The nozzle and blowpipe being tested shall be adjusted to the nominal flow stated by manufacturer and neutral flame conditions.

To generate a backfire, external heating shall be applied to the mixing tube and/or the nozzle either by reflected heat from the flame or by a secondary heat source. This external heating shall be applied for a minimum period of 2 s after the first backfire.

If no sustained backfire occurs the blowpipe/nozzle is acceptable. If sustained backfire occurs without backfire, or within 2 s of the first backfire, the blowpipe/nozzle is rejected. An initially rejected blowpipe/nozzle shall pass the test twice before being regarded as acceptable (cooling and cleaning between tests is permitted).

9.1.2.2 OVERHEATING TEST – CUTTING BLOWPIPES

[In preparation.]

9.1.2.3 SUSTAINED BACKFIRE TEST WITH PARTIALLY CLOSED ORIFICE – WELDING NOZZLES

The test assembly is shown in figures 3 and 4.

Setting up conditions

– Test radius : $R \approx 100\ (1 + 0{,}4 \log Q)$ mm

where Q is the nominal flow of fuel gas in litres per hour under the conditions defined in ISO 554.

– Vertical load between test segment and nozzle : $F \approx 5$ N.

– Rotational frequency of the copper segment : $n \approx 10\ \text{min}^{-1}$.

– Orifice parallel and in contact with the test segment.

Flow setting conditions

The test shall be carried out at two flow conditions :

a) at nominal flow (8.2.1);

b) at turned-down flow (8.2.3).

Flame setting conditions

The flame shall be neutral.

Procedure

Ignite the flame, stabilize for 30 s (adjustment to maintain a neutral flame is permissible), and start rotation (no adjustment to maintain a neutral flame is required during rotations).

Acceptance requirements

The nozzle/blowpipe is acceptable if, after five complete revolutions, no sustained backfire occurs.

Should a sustained backfire occur, stop the test, and cool and clean the blowpipe and nozzle. For acceptance, the test shall be repeated twice without sustained backfire, with cooling after each test of five rotations.

9.1.2.4 SUSTAINED BACKFIRE TEST – CUTTING BLOWPIPES

[In preparation.]

9.2 Operational tests

No special test conditions are required.

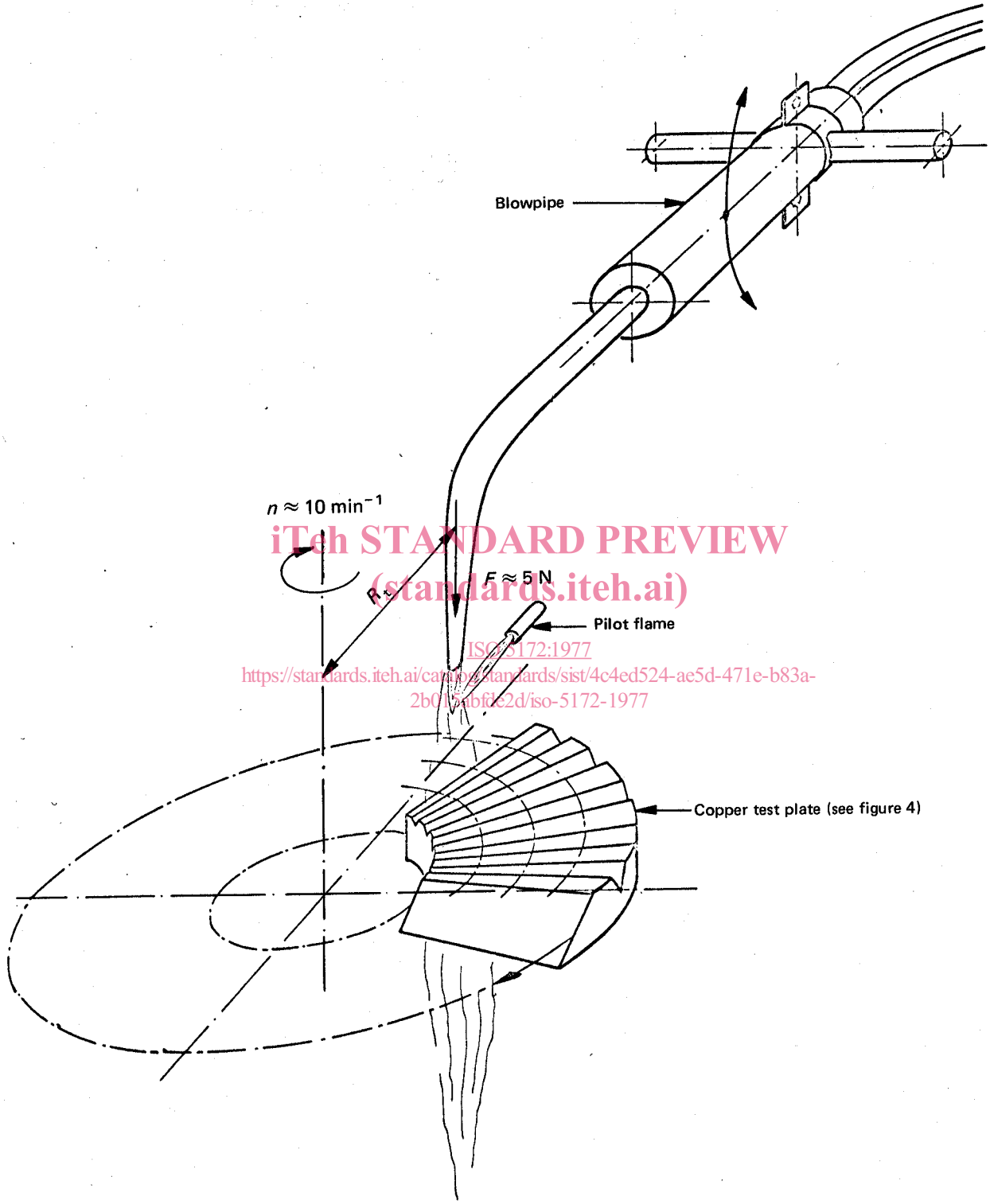
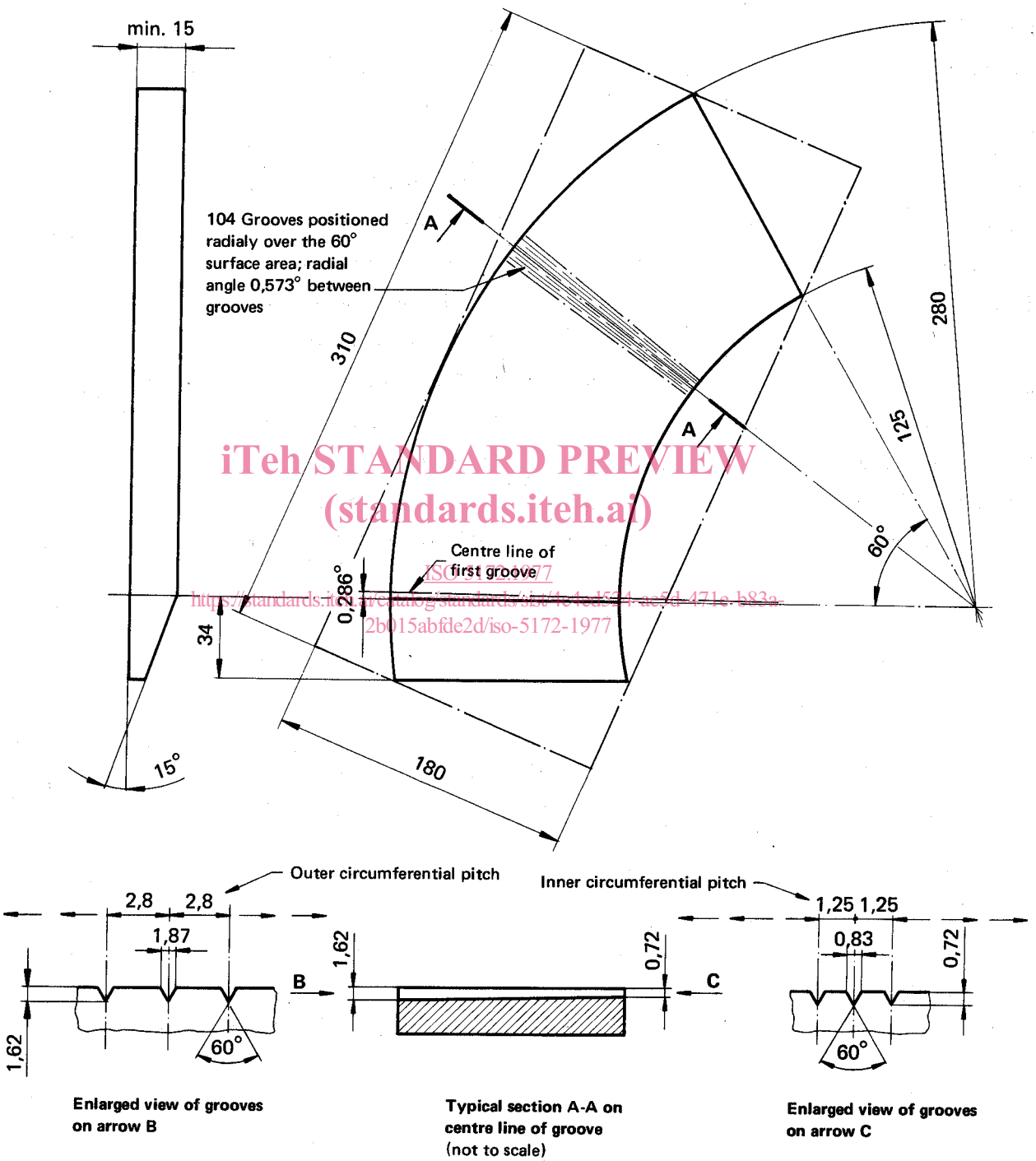


FIGURE 3 — **Assembly for testing blowpipes for resistance to sustained backfire**

Dimensions in millimetres



Enlarged view of grooves on arrow B

Typical section A-A on centre line of groove (not to scale)

Enlarged view of grooves on arrow C

FIGURE 4 — **Drawing for machine-grooved copper test segment**