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**Gas welding equipment — Small kits for
gas brazing and welding**

*Matériel pour le soudage au gaz — Petits ensembles pour le brasage et le
soudage au gaz*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established 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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 14112 was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 8, *Equipment for gas welding, cutting and allied processes*.

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Gas welding equipment — Small kits for gas brazing and welding

1 Scope

This International Standard specifies safety requirements for the construction of small kits for brazing, soldering and welding for non-professional use.

This International Standard is applicable to appliances whose welding equipment is completely set up in the factory and which use a liquefied gas or gas mixture as combustible gas, and compressed oxygen, air or an air/oxygen mixture for combustion.

It is applicable to appliances which use gases contained in refillable containers having a maximum water capacity of 5 litres, or in disposable containers with maximum water capacity of 1 litre.

It is not applicable to the following:

- appliances using acetylene or hydrogen as combustible gas;
- air-aspirated appliances;
- appliances working with an oxygen generator;
- appliances working by electrolysis.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 2503:1983, and Add. 1:1984, *Pressure regulators for gas cylinders used in welding, cutting and allied processes.*

ISO 3821:1992, *Welding — Rubber hoses for welding, cutting and allied processes.*

ISO 5171:1995, *Pressure gauges used in welding, cutting and allied processes.*

ISO 5172:1995, *Manual blowpipes for welding, cutting and heating — Specifications and tests.*

ISO 5175:1987, *Equipment used in gas welding, cutting and allied processes — Safety devices for fuel gases and oxygen or compressed air — General specifications, requirements and tests.*

ISO 9090:1989, *Gas tightness of equipment for gas welding and allied processes.*

ISO 9539:1988, *Materials for equipment used in gas welding, cutting and allied processes.*

ISO 10297:—¹⁾, *Gas cylinder valves — Specifications and testing.*

ISO 11118:—¹⁾, *Non-refillable metallic gas cylinders in sizes up to 5 litres — Specification and test methods.*

ISO 12170:—¹⁾, *Gas welding equipment — Thermoplastic hoses for welding and allied processes.*

EN 417:1992, *Non-refillable metallic gas cartridges for liquefied petroleum gases, with or without a valve, for use with portable appliances — Construction, inspection, testing and marking.*

EN 521:—¹⁾, *Dedicated liquefied petroleum gas appliances — Portable appliances operating at vapour pressure from liquefied petroleum gas containers.*

1) To be published.

EN 837-1:—¹⁾, *Pressure gauges — Part 1: Bourdan tube pressure gauges — Dimensions, metrology, requirements and testing.*

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 appliance: Small kits for brazing and welding, that generally include:

- the welding equipment;
- the gas containers;
- the carrying construction;
- the instructions;
- the eye-protecting equipment;
- the accessories.

3.2 welding equipment: Set of devices (connecting devices, gas controls, regulators, safety devices, hoses, blowpipes, etc.) assembled in the factory.

NOTE 1 According to the design of the welding equipment, some devices may be unnecessary.

3.3 non-refillable container: Container designed to be disposed of when empty, for example:

- pierceable cartridge;
- cartridge with a valve;
- non-refillable cylinder.

3.4 connecting device: A part of the welding equipment designed to provide the connection to the gas container.

NOTE 2 It may be separate or integral with another device of the welding equipment.

3.5 shut-off device: Device which controls the flow of gas to the welding equipment; it may be fitted to the container (cylinder valve or tap) or to the welding equipment.

3.6 gas cylinder valve: A part, integral with a container, provided with a threaded outlet and a hand-wheel which opens and closes the gas flow.

3.7 pressure regulator: A part which allow reduction of the pressure of the gas flowing out of the container; it may be adjustable or pre-adjusted, integral with another device, or separate.

3.8 safety device: Device which, when correctly used and placed, prevents damage resulting from misuse or malfunction of the blowpipe or associated equipment.

It may be:

- a non-return valve, which prevents the passage of the gas in the direction opposite to normal flow; or
- a flame arrestor which quenches a flame front (flashback).

The two functions may be associated in a single device.

3.9 carrying construction: Structure which allows containers, welding equipment and accessories to be carried and which secures the gas containers in a safe position.

3.10 adjustable blowpipe: Blowpipe fitted with a valve on each gas line so as to control and adjust the flame.

NOTE 3 A blowpipe without a valve is said to be "non-adjustable".

4 Design

4.1 General

All parts of the appliance shall be free from sharp corners and edges which could give rise to injury during normal assembling, use and maintenance.

Parts and devices of the welding equipment which are integral to its safe operation shall be fitted securely so as to avoid loosening in normal use. Compliance shall be checked during testing.

Welding equipment, including the connecting device, shall be tight when tested according to 7.2, both before and after the endurance test described in 7.3.

The connection of different parts of the appliance by the user shall be easy and safe. Respective positions of the parts shall be obvious. Necessary tools and instructions for safe assembly shall be supplied with the appliance.

1) To be published.

4.2 Materials

Materials shall comply with requirements specified in ISO 9539.

4.3 Gas containers

4.3.1 Non-refillable gas containers

Pierceable cartridges and cartridges with valves shall comply with the requirements of EN 417. Cartridges for compressed oxygen should comply with the relevant future International Standard.

Non-refillable cylinders should comply with ISO 11118 or national standards or regulations.

4.3.2 Refillable containers

Refillable containers should comply with the requirements of appropriate future International Standards or national standards or regulations.

4.4 Connecting device

The connecting device shall be designed to fit the container specified by the manufacturer. It shall not be possible to interchange the fuel gas and oxygen containers.

The devices for cartridges for fuel gas shall comply with the relevant requirements of EN 521.

4.5 Shut-off device

It shall be possible to shut off the gas supply quickly at each gas container without disconnecting the gas container.

The device may be a separate part (tap) or integral with another part (e.g. a regulator).

If the shut-off device is not an integral part of the container, it shall be clearly marked with the gas it controls.

If the device operates by turning, the closing direction shall be clockwise and marked in a durable and visible fashion. If the device has a fixed OFF position, it shall also be marked.

It shall not be possible to remove unintentionally that part of the device which opens and closes the gas flow.

The body of the device shall show no permanent deformation when tested according to 7.4.1.

When the shut-off device is a cylinder valve (or tap), it shall comply with the requirements of ISO 10297.

4.6 Pressure regulator

4.6.1 General

The gas circuit shall be provided with a device for reducing the pressure when the maximum service pressure of the container (pressure at 50 °C) exceeds the maximum working pressure of the hose or blowpipe.

The device shall be so designed that it cannot be set to give a pressure exceeding the maximum working pressure of the hose or the blowpipe.

4.6.2 Gas containers with a cylinder valve

For gas containers with a cylinder valve, adjustable pressure regulators shall comply with ISO 2503.

Preset pressure regulators may be used, provided that the standard discharge does not exceed 2,5 m³/h. They shall comply with the safety requirements given in ISO 2503 concerning materials, resistance to internal ignition, relief valve and mechanical resistance.

Physical characteristics (pressures and flows) are left to the manufacturer's discretion provided the values of the irregularity coefficient, *i*, and the coefficient of pressure increase upon closure, *R*, comply with the requirements of ISO 2503.

Pressure gauges shall comply with ISO 5171. For pressure gauges with non-standardized dimensions (size 40 mm), the requirements of ISO 5171 shall apply except for those dealing with dimensions.

4.6.3 Other containers

For other gas containers, the pressure regulators shall comply with the following requirements.

- a) The body of the device shall show neither deformation nor damage liable to impair safety when tested according to 7.4.2 a).
- b) When tested according to 7.4.2 b), it shall be verified that no pieces are ejected in the case of rupture in the device (e.g. diaphragm). If gas is discharged to the atmosphere, it shall flow out in a direction safe for the user.
- c) For compressed gases, the downstream pressure shall be prevented from exceeding 30 bar in the event of a regulator failure, either by design or by provision of a pressure-relief device.
- d) If there is an oxygen regulator with a service pressure not less than 20 bar, it shall be resistant to ignition and show no internal damage when submitted to the ignition test given in 7.5.

- e) The pressure regulator shall be durably marked with the gas it is designed for.
- f) A pressure gauge is not a requirement; if fitted, it shall comply with requirements for gauges for preset pressure regulators (see 4.6.2).

4.7 Safety devices

The appliance shall be protected against backflow and flashback.

A flame arrestor may be submitted only to a static mixture test (see 7.6.2 of ISO 5175:1987).

Safety devices which are not integral with other parts of the appliance shall comply with ISO 5175.

Devices which are integral with part of the appliance shall comply with 6.2.2 and 6.2.3 of ISO 5175:1987, as appropriate. In addition, pressure resistance and tightness shall be checked during testing of that part which includes the safety device.

4.8 Hoses and hose-coupling nipples

Hoses shall comply with ISO 3821 or with ISO 12170.

Individual lengths of hose shall not exceed 3 m.

Welding equipment shall be supplied with hoses in a fully assembled condition. The tensile strength of the connections between hoses and hose-coupling nipples shall be in accordance with 7.6.

After the test for strength of hose connections given in 7.6, the welding equipment shall remain gastight during subsequent testing for gas-tightness according to 7.2.

4.9 Blowpipes

The appliance may be equipped with either an adjustable or a non-adjustable blowpipe.

Blowpipes of all types shall comply with the following safety requirements in accordance with ISO 5172:

- mechanical strength;
- valve design, if any;
- resistance to sustained backfire (by overheating and occlusion).

Testing for backfire by occlusion is not required for nozzles having a rated flow of less than 15 l/h of combustible gas, measured under the normal working conditions specified by the manufacturer.

If an appliance has a non-adjustable blowpipe, it shall be possible to obtain an adequate neutral flame.

2) Liquid petroleum gas.

Assembly and dismantling of blowpipe attachments shall be easily carried out with the small kit tools provided.

Each valve of an adjustable blowpipe shall be clearly marked with the gas it controls.

4.10 Carriage and stability

The appliance shall be provided with a carrying structure of a design suitable for the storage, transportation and use of the gas containers and equipment.

Liquefied gas containers shall be held in the carrying structure in such a manner that liquid cannot be drawn off.

The carrying structure shall not permit accumulation of gas from accidental leakage.

Constituent materials (except for those concerning wheels, if necessary) shall be flame resistant when tested according to 7.8.

When tested according to 7.7, the appliance shall not tip over.

4.11 Eye-protecting equipment

Eye-protecting equipment shall be supplied which is suitable for the intended applications of the kit.

5 Marking

5.1 Gas controls

The gas shall be identified and clearly marked on the gas controls by either

- a letter:
 - O for oxygen;
 - D for compressed air;
 - P for LPG²⁾;
 - F for other liquefied combustible gases; or
- a colour:
 - Blue for oxygen and air/oxygen mixtures containing more than 20 % added oxygen;
 - Black for air;
 - Orange for combustible gases.

5.2 Appliances

The following information shall be clearly visibly and durably marked:

- identification of the manufacturer and/or supplier;
- identification of equipment type or model.

The following instructions in the national language(s) of the country(ies) where the appliance is sold shall be clearly and permanently marked at a suitable place on the appliance:

- a recommendation to read carefully the complete instructions for use and connection of the containers;
- reference to the type of containers to be exclusively used;
- instructions to connect or change the containers in a flame- or ignition-free atmosphere, far removed from other persons;
- a warning not to use grease or oil on parts in contact with oxygen;
- a warning that goggles are to be worn when the appliance is operating;
- instructions on how to stop the appliance safely.

5.3 Durability

All markings shall be durable; compliance shall be checked by rubbing the marking by hand for 15 s with a piece of cloth soaked with water and again for 15 s with a piece of cloth soaked with petroleum spirit.

Labels, if used, shall be adhesive over the whole attachment surface; ordinary paper shall not be used for permanent labelling.

6 Instructions for use and maintenance

The appliance shall be accompanied by instructions in the national language(s) of the country(ies) where it is sold.

The instructions shall include the following points.

- a) Read carefully the instructions before using the appliance. Keep this booklet and read it when necessary.
- b) Assembly and adjustment made in the factory shall not be modified. It may be dangerous to try to modify the adjustment or the construction of the appliance, to dismantle some parts or to use components other than those recommended.
- c) References to and specifications for the containers to be used:
 - recommendation to use only the specified containers; it may be dangerous to use containers other than those recommended;
 - never connect a container before reading the instructions printed on it;
 - refillable containers shall only be refilled by the supplier; refilling by another method may lead to serious accidents.
- d) Precautions to be taken before connecting the container:
 - verify that seals, if any, at the connection are well placed and not damaged;
 - check the hoses for damage;
 - do not use an appliance which shows any damage;
 - close the taps of the appliance before connection.
- e) Connect the containers in a well-ventilated place, free from flame, or ignition sources and far from other persons. Do not smoke when changing containers.
- f) How to connect the containers:
 - tools to be used;
 - verification.
- g) How to change the containers:
 - for pierceable cartridges: never change the cartridge before being sure that it is completely empty.
- h) Do not use grease or oil on parts in contact with oxygen.
- i) How to use the appliance:
 - do not put an ignited blowpipe down;
 - be careful not to heat the containers or burn the hoses;
 - method of changing accessories, if any.
- j) Working conditions:
 - do not work in an enclosed space; maintain good ventilation;

- work only in a clean place, far from combustible or greased materials;
 - wear the eye-protecting equipment supplied;
 - wear non-greased clothes;
 - avoid breathing welding/soldering fumes.
- k) Performances and recommendations for working:
- gas consumption (normal setting) for each accessory;
 - duration of the containers.
- l) How to shut down the appliance:
- depressurize the hoses;
 - allow the blowpipe to cool before stowing away.
- m) Storage and transport conditions:
- disconnect the containers if the appliance is not to be used for a prolonged period, or in the case of transportation by vehicle;
 - store and transport the containers in an upright position;
 - keep away from children.
- n) Maintenance:
- use only specified spare parts;
 - never use an appliance with a damaged part.
- o) Address of aftersales service.
- p) What to do in case of fire:
- first shut off the oxygen cylinder.
- q) What to do in case of leakage.

7 Tests

7.1 General

NOTE 4 The described procedure is a type test for evaluation of the satisfactory performance and safety of the appliance.

The pressure gauges used for the measurement shall be at least of standard class 1 of EN 837-1.

7.2 Gas-tightness test

A gas-tightness test shall be carried out on the complete assembled welding kit, including the gas container connection, for each possible configuration of the kit.

The test method shall be in accordance with ISO 9090.

Leakage rates for individual components shall satisfy the requirements of ISO 9090.

Total leakage shall not exceed 30 cm³/h.

NOTE 5 To ensure the gas container connection is included in the test, the test gas is normally supplied through a cylinder fitting simulating the gas container. For pierceable cartridges, the test gas supply should be plugged into an empty cartridge with its holder.

7.3 Endurance test

The number of cycles to be performed shall be as follows.

- a) Connecting device: 100 connection/disconnection cycles. Connect the device according to the manufacturer's instructions using the tools provided, if any, with the specified torque.
- b) Shut-off device and pressure regulator with shut-off function:
- 1 000 cycles for an appliance with an adjustable blowpipe; or
 - 2 000 cycles for an appliance with a non-adjustable blowpipe.
- A cycle consists of an opening and closing operation at a frequency of $(6 \pm 2) \text{ min}^{-1}$. Carry out the test under an air pressure of 0,5 bar.
- Devices such as needle valves shall be closed with a torque of 0,15 N·m minimum.
- c) Valves of adjustable blowpipe: 2 000 cycles as defined in b), with a closing torque of 0,15 N·m minimum and frequency and air pressure as given in b).

7.4 Test for resistance to pressure

The mechanical resistance shall be checked for each device by means of a hydraulic pressure applied for at least 5 min under the following conditions.

7.4.1 Shut-off devices: apply a pressure equal to twice the test pressure for cartridges and to the test pressure for the other containers, through the inlet

with the outlet closed, the device being in the open position. When the shut-off function is fulfilled by a pressure regulator, carry out the test under the conditions given in 7.4.2.

7.4.2 Pressure regulator: the strength of the body and the protection of the low-pressure circuit shall be checked as follows.

- a) Strength of the body: high-pressure and low-pressure chambers shall be separately tested.

Parts which connect both chambers (e.g. regulator valve) and the diaphragm, if any, shall be blanked or replaced by rigid blanking plugs if necessary.

Pressurize the high-pressure chamber through the inlet to at least 30 bar or to the test pressure of the container to which it is connected.

Pressurize the low-pressure chamber through the outlet to 30 bar.

- b) Safety tests: these shall be carried out with compressed air. The operator shall be protected against possible ejection of parts. Maintain the regulator valve fully open and either fit the outlet with a pressure gauge (for compressed gases) or plug it (for liquefied gases).

Apply an increasing pressure through the inlet, up to the maximum service pressure of the container normally connected to the pressure regulator if no venting takes place.

Compliance with the requirements given in 4.6.3 shall be checked.

7.5 Ignition test

For oxygen regulators, the test shall be performed in accordance with 10.5.3 of ISO 2503:1983/Add. 1:1984, but the test pressure shall be increased to 1,2 times the maximum filling pressure at 15 °C of the container the pressure regulator is connected to.

7.6 Test for strength of hose connections

The welding equipment shall be fixed at one end and the other end submitted to a tensile load of 300 N.

Perform the test simultaneously for both lines.

7.7 Stability test

The full appliance shall not tip over when placed on a plane at an angle of 10° from the horizontal.

Carry out the test with the appliance placed in the most unfavourable position with a full gas container. Repeat it with an empty container.

7.8 Inflammability test

Using the blowpipe with its largest nozzle, open and adjust it according to the manufacturer's instructions, in order to obtain a normal flame. Apply the tip of the feather of the flame for a period of 10 s perpendicular to the surface of the test material (see 4.10) and close to its centre.

After removing the flame, the material shall self-extinguish within 10 s.