PD CEN/TR 13259:2013

BSI Standards Publication

Gas welding equipment — Industrial manual and machine blowpipes for flame heating, flame brazing and allied processes

bsi.

...making excellence a habit.™

National foreword

This Published Document is the UK implementation of CEN/TR 13259:2013. It supersedes PD 6633:1998 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee WEE/18, Gas welding and cutting appliances.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Published by BSI Standards Limited 2013

ISBN 978 0 580 81659 8

ICS 25.160.30

Compliance with a British Standard cannot confer immunity from legal obligations.

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 30 November 2013.

Amendments issued since publication

Date	Text affected

TECHNICAL REPORT

RAPPORT TECHNIQUE

TECHNISCHER BERICHT

CEN/TR 13259

October 2013

ICS 25.160.30

Supersedes CR 13259:1998

English Version

Gas welding equipment - Industrial manual and machine blowpipes for flame heating, flame brazing and allied processes

Matériel de soudage aux gaz - Chalumeaux manuels et automatiques à usage industriel, pour le chauffage à la flamme, le brasage à la flamme et les techniques connexes

Gasschweißgeräte - Handgeführte Sonderbrenner und Maschinenbrenner für industrielle Prozesse zum Flammwärmen, Flammlöten und für verwandte Prozesse

This Technical Report was approved by CEN on 29 July 2013. It has been drawn up by the Technical Committee CEN/TC 121.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. CEN/TR 13259:2013: E

Contents

Page

Foreword

This document (CEN/TR 13259:2013) has been prepared by Technical Committee CEN/TC 121 “Welding and allied processes”, the secretariat of which is held by DIN.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes CR 13259:1998.

Introduction

Requests for official interpretations of any aspect of this Technical Report should be directed to the Secretariat of CEN/TC 121/SC 7 via the National Standards Body.

1 Scope

This Technical Report refers to manual blowpipes and stationary machine blowpipes with free burning flames for heat treatment of work pieces. These blowpipes are, due to their type of construction, designed for special applications and do not fall under the scope of EN ISO 5172 and EN ISO 9012.

This Technical Report contains technical regulations, specifications and tests.

Blowpipes are intended for gaseous fuels in connection with oxygen, compressed air or aspirated air.

Flow rates are not expressly limited and depend on the thermal process to be performed.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN ISO 5172:2006, *Gas welding equipment — Blowpipes for gas welding, heating and cutting — Specifications and tests (ISO 5172:2006)*

EN 29090, *Gas tightness of equipment for gas welding and allied processes (ISO 9090)*

EN ISO 9539, *Gas welding equipment — Materials for equipment used in gas welding, cutting and allied processes (ISO 9539)*

ISO 15296, *Gas welding equipment — Vocabulary — Terms used for gas welding equipment*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 15296 and the following apply.

3.1
manual blowpipe
blowpipe, manually guided by the operator

3.2
machine blowpipe
blowpipe which for operation is fixed to a mechanical device and guided by it

3.2.1
semi-automatic machine blowpipe
blowpipe which is mechanically guided

Note 1 to entry: Operation manually performed.

3.2.2
automatic machine blowpipe
blowpipe operated independent of persons and controlled and monitored by control and regulation devices

3.3
blowpipe head

Note 1 to entry: The type of blowpipe head depends on its application.
Note 2 to entry: Table 1 gives examples for different blowpipe head constructions.

Table 1 — Types of blowpipes – application

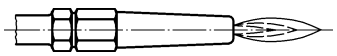
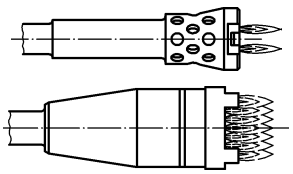
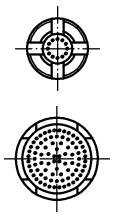
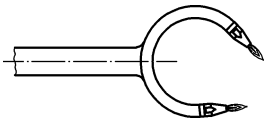
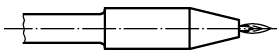
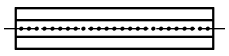
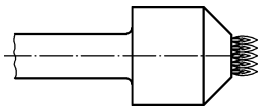
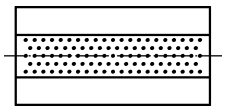
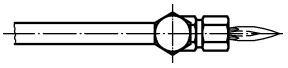
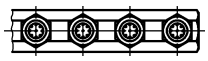
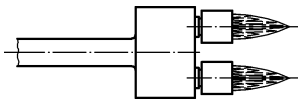
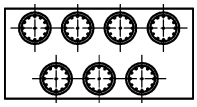
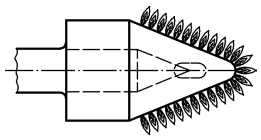
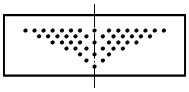
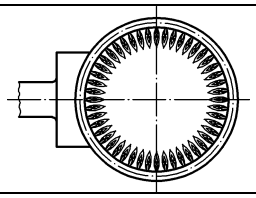
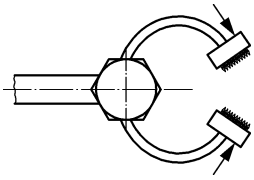
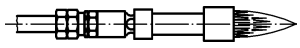
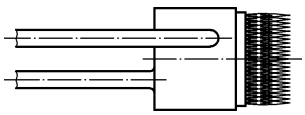
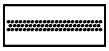
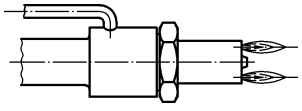
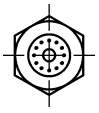
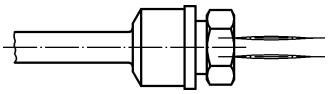
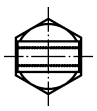
	Blowpipe head	Flame shape	use by H = hand M = machine	application	combination
single flame blowpipe (with and without stabilisation flame)			H/M	— preheating — flame-straightening — flame brazing and soldering — flame-hardening — hot forming — fusion welding — general gas flame processes	— fuel gas — oxygen — compressed air
multi-flame blowpipe			H H/M		
twin head blowpipe			H/M	— preheating — hot forming — flame brazing	— fuel gas — oxygen — compressed air
single row blowpipe			H/M	— flame-annealing — flame-hardening	— fuel gas — oxygen

Table 1 *(continued)*

	Blowpipe head	Flame shape	use by H = hand M = machine	application	combination
multi row blowpipe			M	— hot forming — fusion welding — flame brazing and soldering	— fuel gas — oxygen — compressed air
single row nozzle blowpipe			M	— pre-heating — flame brazing and soldering	— fuel gas — oxygen — compressed air
multi row nozzle blowpipe			M	— pre-heating — flame brazing and soldering	— fuel gas — oxygen — compressed air — aspirated air
profile blowpipe			M	— flame-heating — flame-hardening — special applications	— fuel gas — oxygen — compressed air
ring blowpipe			H/M	— pre-heating — flame-heating — hot forming — flame-hardening	— fuel gas — oxygen — compressed air
flame-hardening blowpipe			M	— flame-hardening	— fuel gas — oxygen
air-aspirated blowpipe			H/M	— flame brazing and soldering — ignition flame	— fuel gas — aspirated air
diffusion blowpipe			M	— flame-heating — flame-polishing	— fuel gas — oxygen
nozzle mixing blowpipe			H/M	— flame-heating — hot forming	— fuel gas — oxygen
microjet blowpipe			M	— flame brazing and soldering	— fuel gas — oxygen — compressed air

3.3.1
single flame blowpipe
flame shape of the blowpipe which consists of one flame

Note 1 to entry: For slowly burning fuel gases, the single flame can be supported by concentrically arranged stabilising flames.

3.3.2
multi-flame blowpipe
flame shape from the blowpipe head which consists of one or more concentric flame circles

3.3.3
twin head blowpipe
blowpipe which is supplied by one mixing device

Note 1 to entry: Several blowpipe nozzles enclose the work piece.

3.3.4
single row blowpipe
flame shape from the blowpipe head is composed of one row of flames

Note 1 to entry: Flame openings are in-line with the blowpipe head.

3.3.5
multi row blowpipe
flame shape from the blowpipe head which is composed of several flame rows, the number and position of which depend on the specific intended use

3.3.6
single row nozzle blowpipe
flame shape from the blowpipe head which is composed of several single nozzles applying linear heat to the work piece

3.3.7
multi row nozzle blowpipe
flame shape from the blowpipe head which consists of several single nozzles which form the flame shape

3.3.8
profile blowpipe
flame shape blowpipe with a blowpipe geometry and shape depending on the intended use

3.3.9
ring blowpipe
flame shape from the blowpipe which circularly encloses or covers the work piece

3.3.10
flame-hardening blowpipe
flame shape from the blowpipe with integrated quenching shower which is adapted to the work piece

3.3.11
air-aspirated blowpipe
blowpipe in which the flame is produced according to the "Bunsen burner principle"

Note 1 to entry: Regulation of the burner capacity is made by closing or opening the air supply and adjusting the fuel gas pressure.

3.3.12
diffusion blowpipe
blowpipe in which oxygen and fuel gas are separately passed through the blowpipe head

Note 1 to entry: Mixing takes place outside the blowpipe head and forms, as necessary, the flame shape.

3.3.13
nozzle mixing blowpipe
blowpipe in which oxygen and fuel gas are mixed inside the heating nozzle according to the injector principle

Note 1 to entry: See Figure 2. Each gas orifice outlet is supplied by an injector.

3.3.14
microjet blowpipe
blowpipe in which the flame shape is made of small very close flame bores

Note 1 to entry: According to the type of application, one or several parallel bore rows are used.

3.4
ignition device
separate energy source inside or at the blowpipe ensuring the safe ignition of fuel gas mixtures escaping from the orifice outlets

Note 1 to entry: See Figure 1.

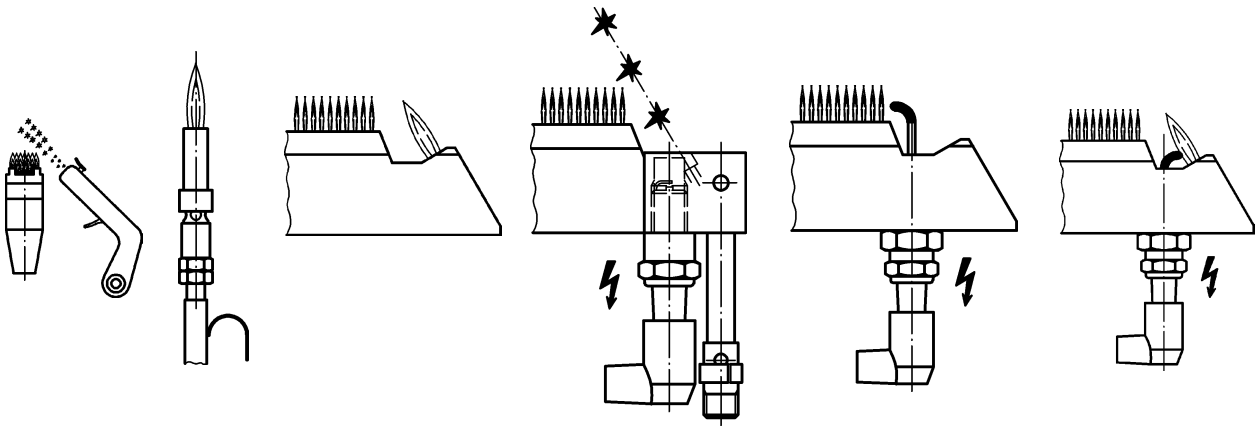


Figure 1 — Ignition devices

3.5
stabilising flames
continuously burning flames to stabilise the main flame during service

4 Mixing systems

4.1 General

Device where fuel gas is mixed with oxygen or air.

4.2 Injector blowpipe

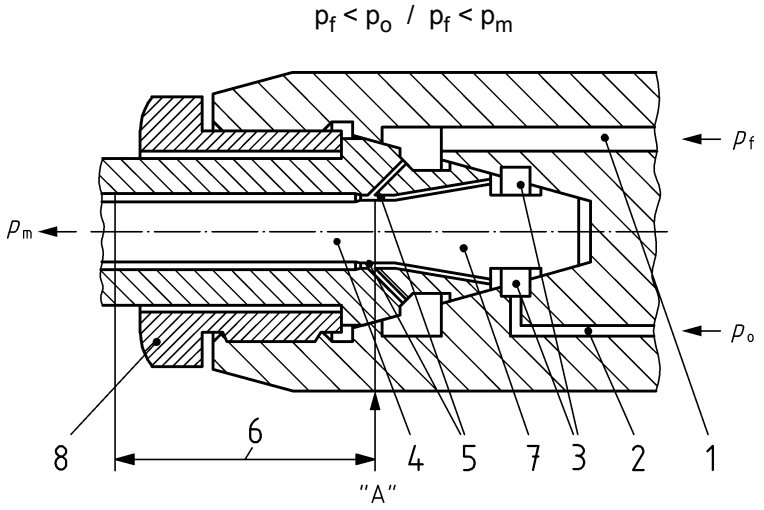
See EN ISO 5172:2006, 3.1.1.

4.3 Equal pressure blowpipe

See EN ISO 5172:2006, 3.1.3.

4.4 Blowpipe with gas mixing nozzle

Blowpipe where oxygen and fuel gas are individually mixed according to the injector principle. This occurs in the nozzle in front of the gas orifice outlet bores (nozzle mixing). See Figure 2.



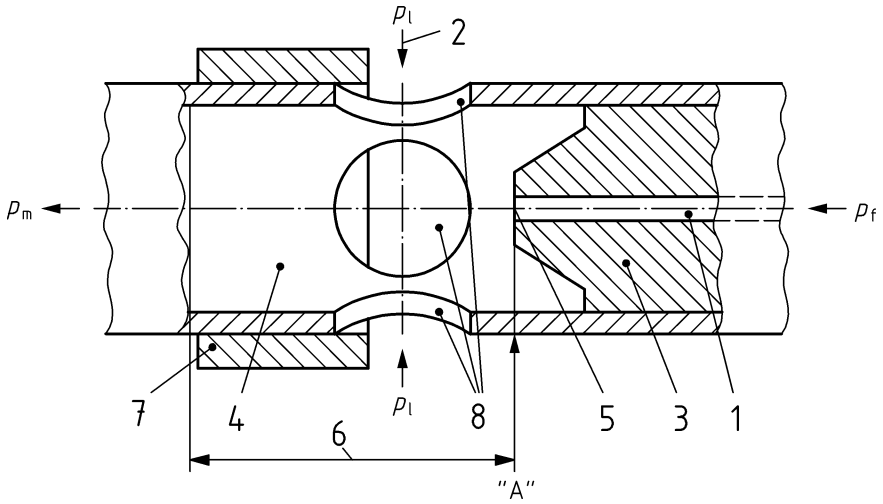
Key

1	fuel gas	p_f	pressure of fuel gas
2	oxygen/compressed air	p_o	pressure of oxygen/compressed air
3	injector	p_m	pressure of mixture
4	mixing chamber		
5	mixing point "A"		
6	mixing distance		
7	heating nozzle		
8	pressure screw		

Figure 2 — Nozzle mixing

4.5 Blowpipe for aspirated air

Blowpipe where the fuel gas, which flows from the gas nozzle into the mixing point, aspirates sufficient air from the surrounding atmosphere in order to be burnt as a technically usable flame (Figure 3). Regulation of the fuel gas-air mixture is made by a movable cover which can be displaced across the air inlet openings.



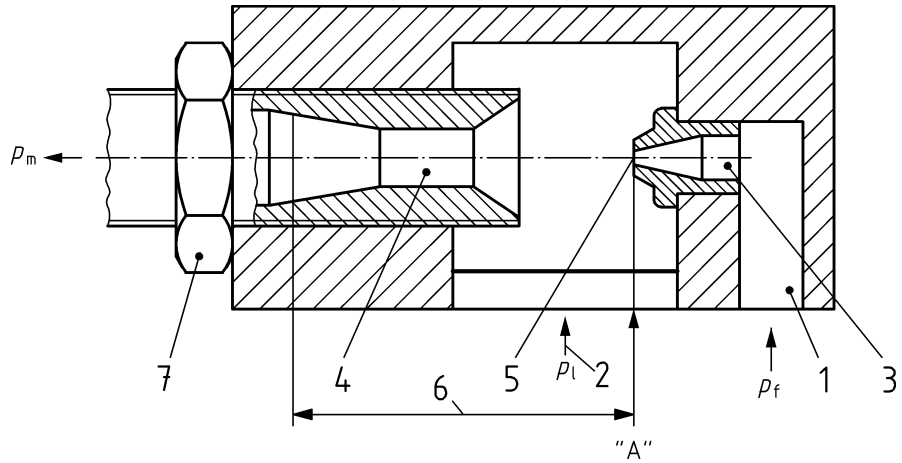
Key

1	fuel gas	p_f	fuel gas pressure
2	air	p_l	air
3	injector	p_m	pressure of mixture
4	mixing chamber		
5	mixing point "A"		
6	mixing distance		
7	air slider		
8	air inlet openings		

Figure 3 — Mixer for fuel gas-aspirated air with air slider

Fuel gas is guided to the injector. The mixing area can be regulated by a screw adjustment at the mixing nozzle so that the air inlet opening to the fuel gas can be varied (Figure 4).

$$p_f > p_l$$



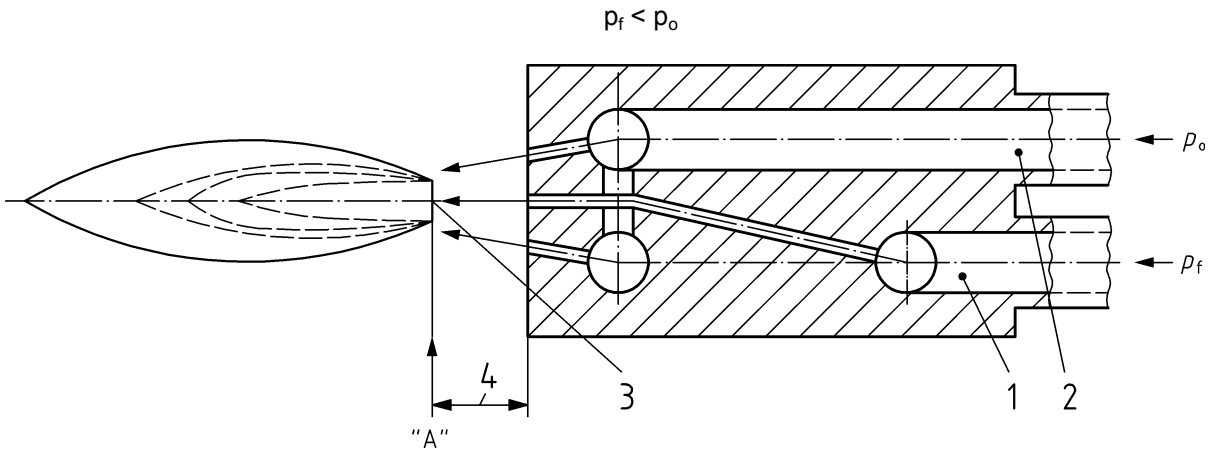
Key

1	fuel gas	p_f	pressure of fuel gas
2	air	p_l	air
3	pressure injector	p_m	pressure of mixture
4	mixing chamber		
5	mixing point "A"		
6	mixing distance		
7	counter nut		

Figure 4 — Mixer for fuel gas-aspirated air with screw adjustment

4.6 Blowpipe with external mixing

In the blowpipe, fuel gas and oxygen are separately guided to the gas orifices. Mixing is made outside the gas orifice bores (Figure 5)



Key

1	fuel gas	p_f	pressure of fuel gas
2	oxygen	p_o	pressure of oxygen
3	mixing point "A"		
4	mixing distance		

Figure 5 — Blowpipe with external mixing

5 Examples for the design of blowpipes

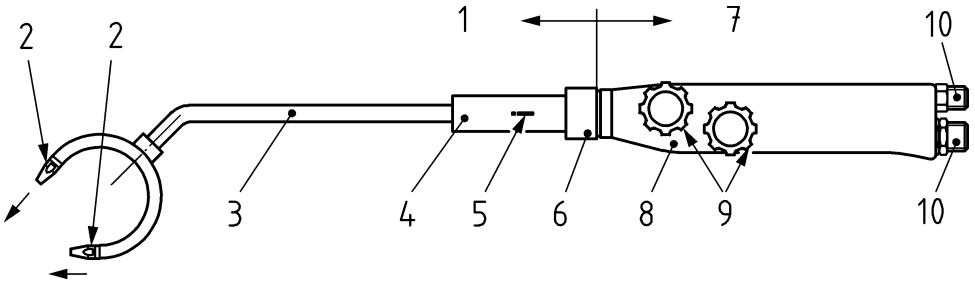
5.1 General

Blowpipe construction/design and flow rates of oxygen/compressed air/fuel gas are not subject to any limitations.

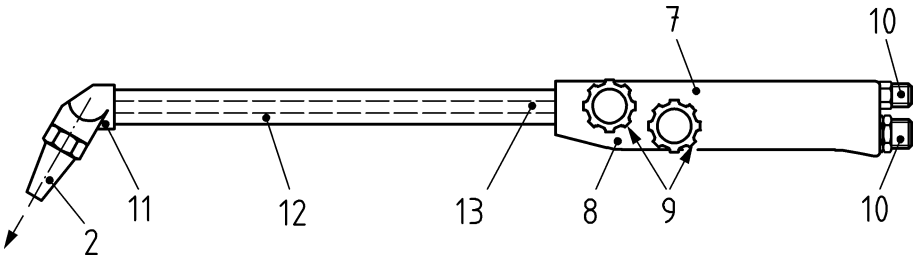
5.2 Manually guided blowpipes

Manually guided blowpipes are designed for manual operation and for a specific application.

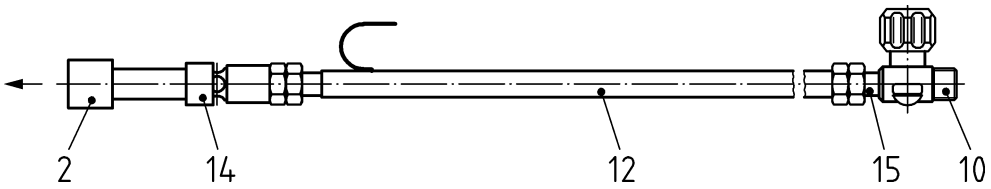
In general, they consist of a shank with gas-regulating valves and of a heating attachment with blowpipe nozzle. (Examples are given in Figure 6).



a) injector blowpipe with suction effect



b) blowpipe with gas mixing nozzle



c) blowpipe for aspirated air

Key

1 heating attachment
2 blowpipe nozzles
3 mixture tube
4 mixing device (mixing chamber and injector)
5 marking "suction effect"
6 connecting nut
7 shank
8 body
9 adjustment valves
10 hose connections
11 blowpipe head
12 fuel gas tube
13 oxygen tube
14 air inlet (air slider)
15 fuel gas valve

Figure 6 — Examples for the design of manual blowpipes

5.3 Machine blowpipes – semi-automatic

Machine blowpipes, operated semi-automatically, are fixed and guided in/by devices.

During operation the blowpipe is monitored by the operators.

Essential elements are:

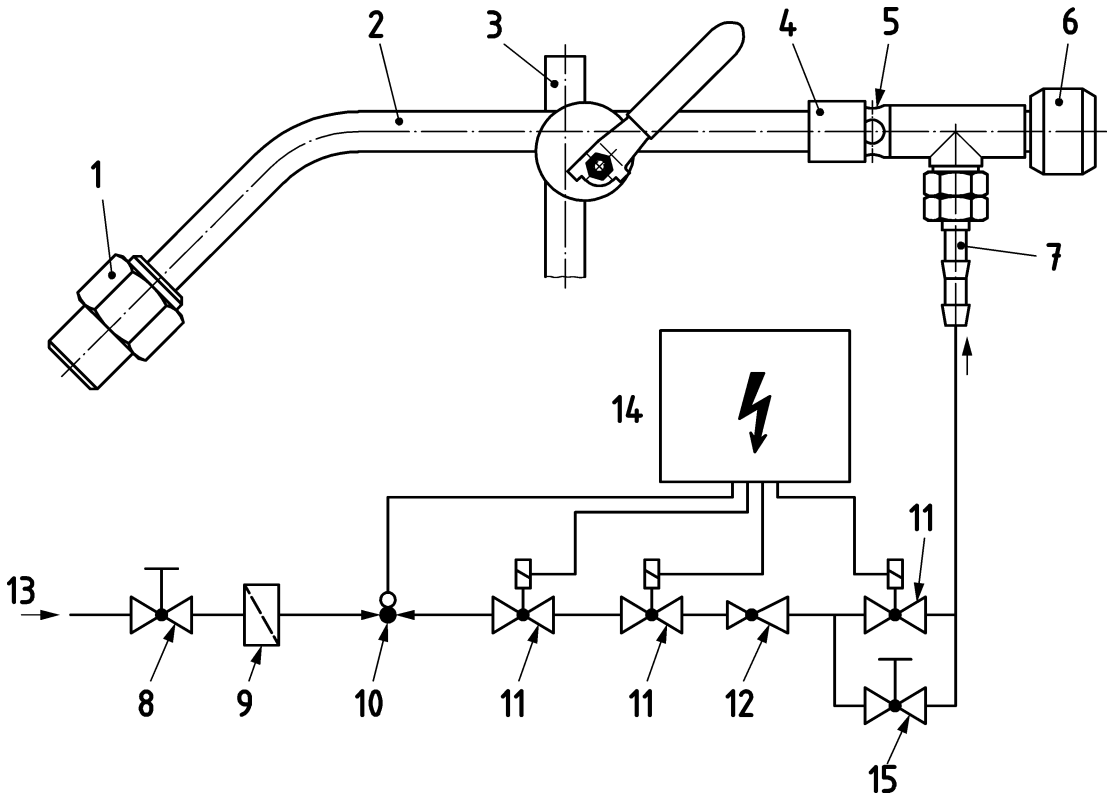
— blowpipe device

— gas distribution system

— connection devices

— ignition aids

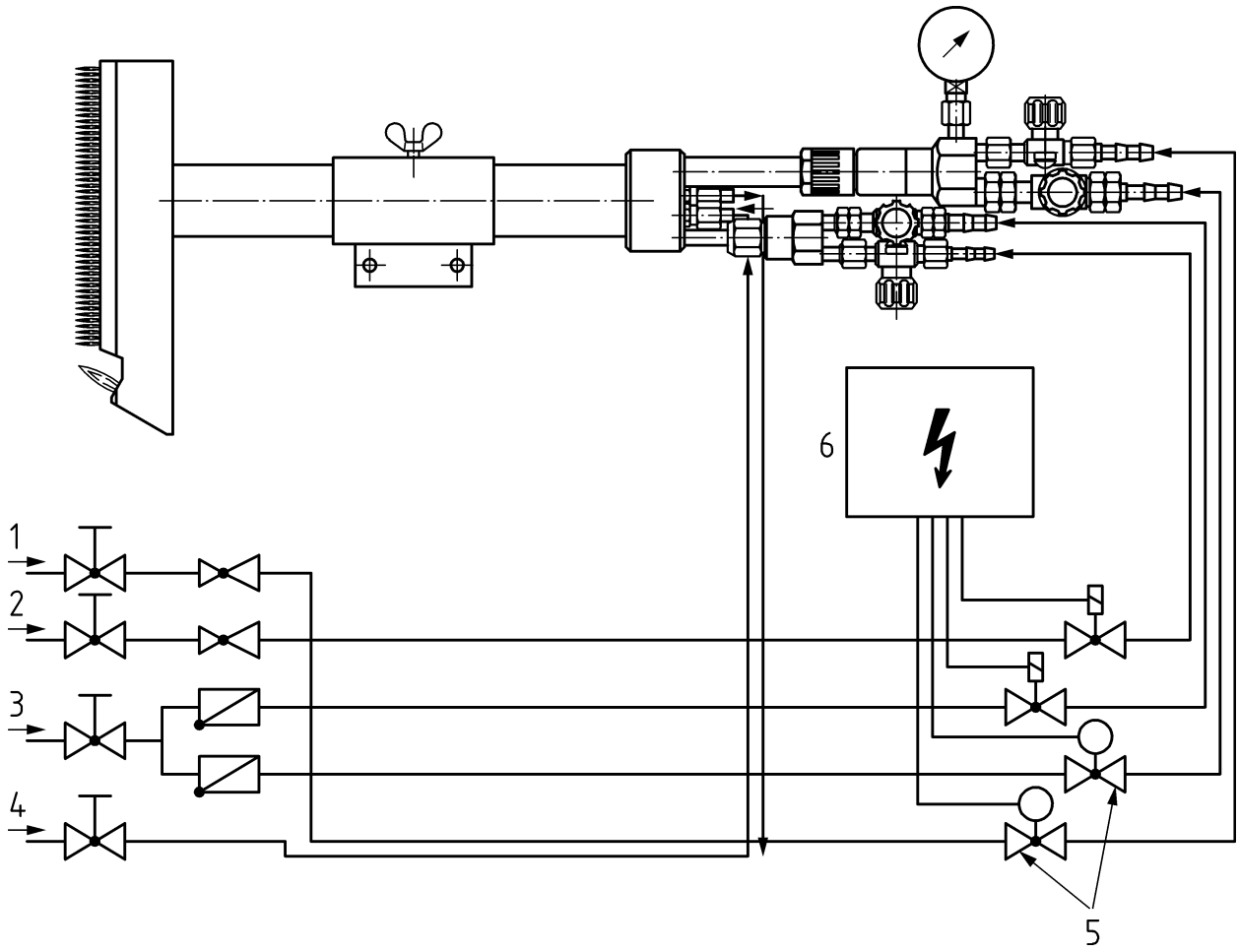
Examples for semi-automatic machine blowpipes are given in Figure 7 and Figure 8.



Key

1 heating nozzle
2 mixing tube
3 blowpipe support
4 air slider
5 air inlet opening
6 fuel gas valve
7 fuel gas connection
8 shut-off valve
9 filter
10 pressure switch
11 magnetic valve
12 pressure regulator
13 fuel gas
14 voltage
15 bypass valve

Figure 7 — Machine blowpipe - semi-automatic - with gas distribution system



Key
1 oxygen/compressed air
2 compressed air
3 fuel gas
4 cooling water
5 air
6 voltage

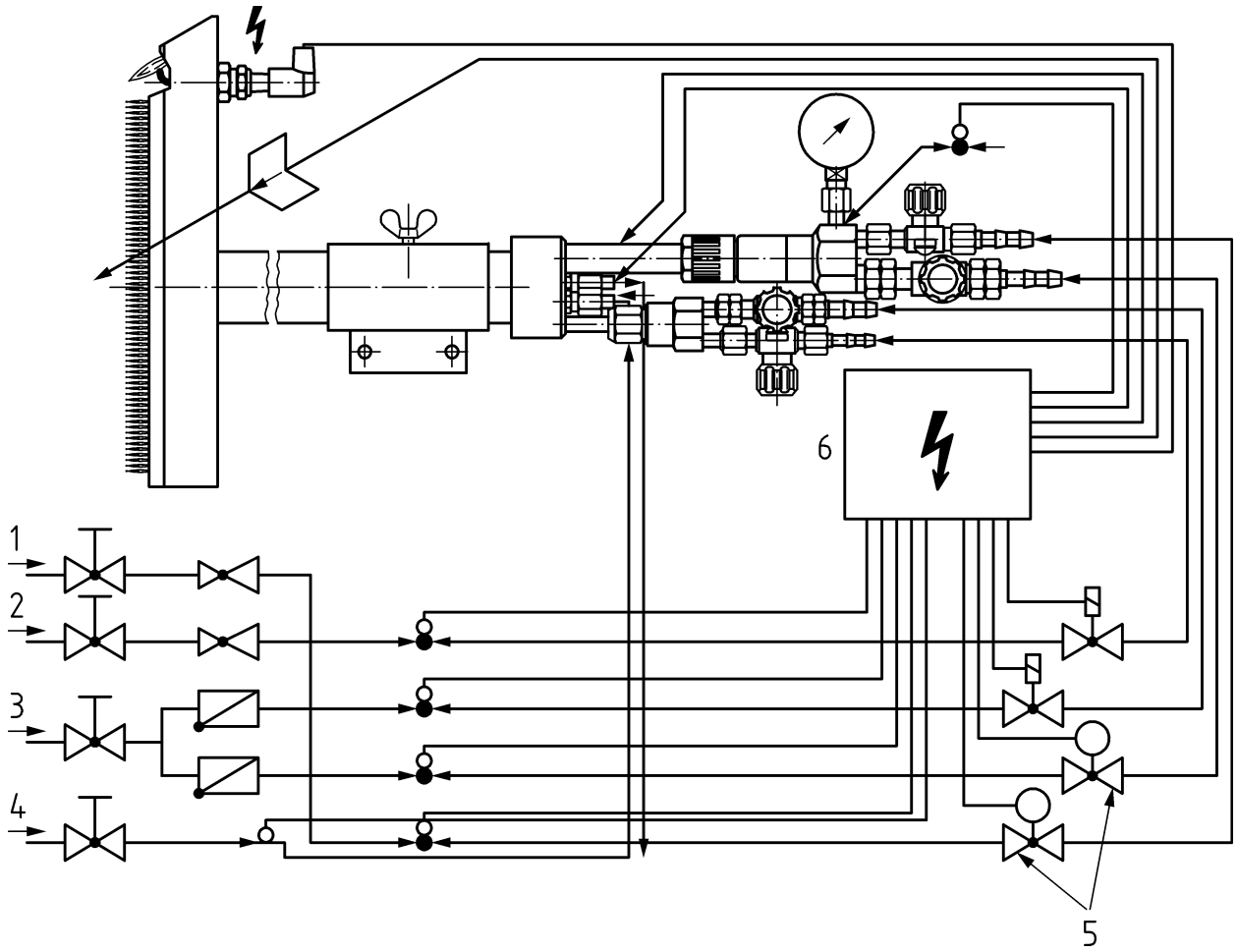
Figure 8 — Machine blowpipe - semi-automatic - with gas distribution system

5.4 Machine blowpipe - automatic

Automatic machine blowpipe function is operated and monitored by safety and control devices.

Control and monitoring functions are made by sensors which act on the control devices.

An example of an automatically working machine blowpipe is given in Figure 9.



Key
1 oxygen/compressed air
2 compressed air
3 fuel gas
4 cooling water
5 air
6 voltage

Figure 9 — Machine blowpipe - automatic - with gas distribution system

6 Hose connections

Hose connections are specified in EN ISO 5172.

7 Materials

Material requirements are specified in EN ISO 9539.

8 Description of operation and operational incidents

8.1 Description of mixtures and flames

8.1.1 Flame blow off at the flame

Flame blow off at the flame off the blowpipe head. This may lead to an extinction of the flame.

8.1.2 Neutral flame (only for acetylene)

The acetylene flame is set under normal conditions at a volume mixing ratio of approximately 1 portion of acetylene and 1,1 portion of oxygen or 7 portions of compressed air. Strictly limited primary flame cones occur.

8.1.3 Process-related flame (for all fuel gases)

The flame is operated at a process-related mixing ratio.

8.1.4 Neutral mixture

The acetylene/oxygen mixture or acetylene/compressed air mixture required to obtain a neutral flame (see Annex B).

8.1.5 Process-related mixture

The mixture containing fuel gas/oxygen, fuel gas/compressed air or fuel gas/aspirated air necessary to obtain a process-related flame..

8.2 Description of operational incidents

The requirements for backfire, sustained backfire, flashback and gas backflow are specified in EN ISO 5172:2006, Clause 3.

9 Marking

The requirements for marking are specified in EN ISO 5172:2006, Clause 6.

10 Requirements

10.1 General

All blowpipe components shall be capable of withstanding mechanical, chemical and thermal stress to which they are exposed under normal operating conditions.

For each blowpipe unit, a gas distribution system can be used which is appropriate for the process, if necessary with control.

For manually-guided blowpipes, simple gas distribution systems with corresponding safety devices are often sufficient.

The higher the mechanisation level, the more complex are the gas distribution systems.

Requirements beyond this Technical Report can specifically be agreed between the manufacturer from the blowpipe and the user.

All gas distribution and ignition systems mentioned and demonstrated are only examples and do not fall under the scope of this Technical Report.

In order to ensure the system meets all requirements it is strongly recommended that blowpipe systems are designed in conjunction with the blowpipe manufacturer, the system manufacturer and the user.

10.2 Safety and operating requirements

10.2.1 Gas tightness

The gas tightness test should be carried out according to 11.2.

10.2.2 Valves

Testing of valves should be carried out according to 11.4.

10.2.3 Adjustment of flame

It is possible to adjust the flame continuously from flows stated by the manufacturer to a reducing state (only for acetylene) obtained by increasing the fuel flow by 25 % and to an oxidising state obtained by increasing the oxygen flow or compressed air flow by 25 %.

10.2.4 Flow rate

Gas flow rates and gas pressures are specified by the manufacturer in the operating instructions. It should be verified that the gas flow rates and pressures are achieved.

10.2.5 Protection against gas backflow

For blowpipes, passover of one gas into the gas line of another is considered being avoided under operating conditions when this gas passover does not occur.

This does not apply to air-aspirated and diffusion blowpipes.

If a non-return valve is incorporated in the blowpipe, it should conform to ISO 5175.

10.2.6 Extinguishing behaviour and protection against flashback

A flame which has been adjusted to a reduced flow of 25 % below the specified nominal flow rates, without backfire or flashback.

This is the minimum requirement for safety against flashback.

10.2.7 Stability in wind

It is possible for a flame to be maintained when wind blows directly across the emergent gas at the orifice. This applies to fuel gas/ compressed air/ air-aspirated flames. Test conditions are according to EN ISO 5172:2006, 7.1.

10.2.8 Thermal stability

Thermal stability is ensured when the heating attachment of the blowpipe head does not heat in excess during its intended use.

11 Tests

11.1 General

The accuracy of measurements and the test devices can be specified in the test report. All tests are type tests and not production tests. For single-piece productions, type tests are considered as production test.

11.2 Leak test

This test should be carried out in accordance with EN 29090. Leakage rates are given in EN 29090.

11.3 Test for stability in wind for fuel gas/compressed air and air-aspirated flames

The Test for the stability of blowpipes in wind can be tested by using the apparatus shown in EN ISO 5172:2006, 8.4

11.4 Valve test

The valve test is described in EN ISO 5172:2006, 8.5.

11.5 Gas backflow test

11.5.1 General

The gas backflow test is described in EN ISO 5172:2006, 8.6.

The resistance to backflow of gas is tested separately for both oxygen/compressed air and for the fuel gas lines. The tests are carried out with oil-free compressed air or with nitrogen for all nozzle sizes and heating attachments
.
Appropriate pressure measuring devices should be used.

11.5 does not apply to fuel gas/air-aspirated blowpipes and diffusion blowpipes.

A practical and approved backflow test of oxygen/compressed air into the fuel gas line and of fuel gas into the oxygen/compressed air line is the "quick suction effect test".
The "quick suction effect test" shall be carried out as follows:

Procedure:

— Connection of the blowpipe to compressed air or nitrogen to the corresponding connecting piece (for testing the gas backflow of oxygen/compressed air into the fuel gas line, the connection is made at the connecting piece for oxygen/compressed air, in the reversed case at the fuel gas connecting piece);

— adjustment of the gas pressures at operating conditions (see instruction manual);

— connection, opening of all valves.

Evaluation:
A clearly noticeable suction effect can be recognised at the connecting piece of the gas line under test.
If no suction effect is visible/noticeable or if a backflow of compressed air/oxygen into the fuel gas line or of fuel gas into the oxygen/compressed air line occurs, the blowpipe should in no case be put into service.

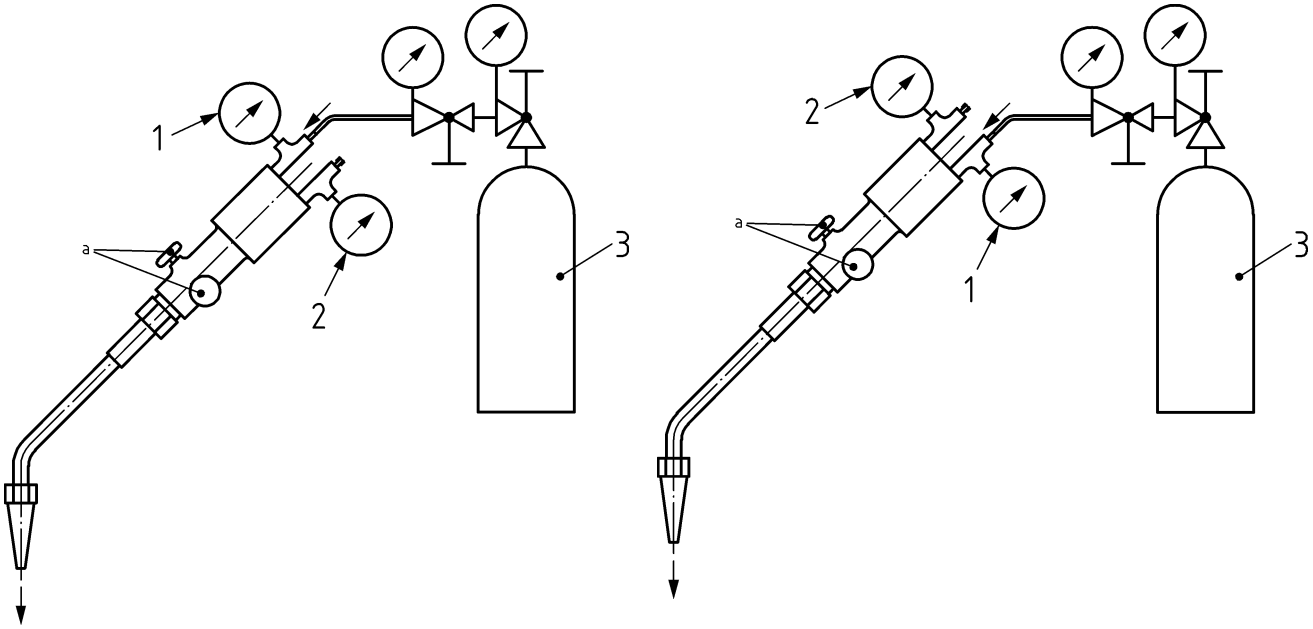
This applies to injector blowpipes.

For blowpipes which are due to their special design show no suction effect or when back pressure of gas is identified, appropriate safety devices for the backflow of gas can be used.

The manufacturer of blowpipes has the option to carry out the test according to 11.5.1.

11.5.2 Testing the gas backflow of oxygen/compressed air into the fuel gas line

The test assembly is shown in Figure 10.



a) Test: backflow of oxygen/compressed air into the fuel gas line

b) Test: backflow of fuel gas into the oxygen/compressed air line

Key:
[a] valve fully opened
1 overpressure gauge at the connecting piece of the blowpipe
2 negative pressure gauge (appropriate measuring instruments) (e.g. U-tube or thumb test) at the blowpipe hose connection

Figure 10 — Assembly for testing the backflow into another gas line within the blowpipe

11.5.3 Testing of flashback

The blowpipe manufacturer should ensure that the blowpipe is safe against flashback when used as intended. Depending on the various blowpipe head shapes and heating attachments and on the purposes, he should apply suitable test methods.

It is the blowpipe manufacturer's choice which test methods can be used. No backfire or flashback should occur during the intended use. The minimum requirements according to 10.2.6 shall be met.

Due to the large number of blowpipe heads and heating attachments, it is not possible to use a uniform test method.

The test method according to EN ISO 5172:2006, 8.3.3.3 (Figure 7) is an approved test method for checking the various blowpipe head shapes. Parameters should be adapted correspondingly to the blowpipe head and heating attachment to obtain the desired overheating effect.

12 Instruction manual

The manufacturer, trader or distributor should supply an instruction manual for each blowpipe. This should contain at a minimum:

- information on the intended use;
- permissible gas type;
- connection values (gas connection data and electricity);
- explanation of all markings;
- mixing system;
- safety advices;
- required or recommended safety devices and control systems;
- behaviour in case of malfunctioning of the blowpipe and fault rectification;
- steps to be performed prior to putting into service including leak test;
- operation during putting into and out of service;
- operation, maintenance and repair;
- required gas distribution systems.
- information on protective measures
  - UV and IR radiation
  - noise protection
  - hazardous substances
  - personal protective equipment

The instruction manual for blowpipes may be integrated in the general instructions manual for machines and equipment and may deviate from the above listing.

Annex A
(informative)

Terminology for heating blowpipes and examples of design

Table A.1 — List of designations

No.	English	French	German
1	Welding nozzle	Buse de soudage	Schweißdüse
2	Mixing tube	Tube de mélange	Mischrohr
3	Mixing chamber	Chambre de mélange	Mischkammer
4	Injector	Injecteur	Druckdüse
5	Nozzle nut	Écrou de fixation de la buse de coupe	Düsenschraube
6	Oxygen valve	Robinet d'oxygène	Sauerstoffventil
7	Fuel gas valve	Robinet de gaz combustible	Brenngasventil
8	Shank or body	Manche de chalumeau	Griffstück
9	Hose connection integral or detachable	Douille porte-tuyau intégrée ou démontable	Unlösbarer oder lösbarer Schlauchanschluss
10	Heating attachment	Lance de chauffage	Wärmeinsatz
11	Seal	Joint	Dichtung
12	Needle	Aiguille	Nadel
13	Mixer	Dispositif mélangeur	Mischer
14	Fuel gas line	Conduit d'amenée du gaz combustible	Brenngaszuführung
15	Oxygen line	Conduit d'amenée de l'oxygène	Sauerstoffzuführung
16	Compressed air line	Conduit d'amenée de l'air comprimé	Druckluftzuführung
17	Mixed gas channel or passage	Conduit d'amenée du mélange	Gasgemischzuführung
18	Nozzle outer	Buse externe	Heizdüse
19	Lance attachment coupling nut	Écrou de fixation de la lance	Überwurfmutter
20	Blowpipe head	Pièce avant du chalumeau	Brennerkopf
21	Heating nozzle	Buse de chauffage	Wärmdüse
22	Hose coupling nipple with union nut	Douille porte-tuyau avec écrou de fixation	Schlauchtülle mit Überwurf-mutter
23	Single valve	Robinet	Einzelventil
24	Threaded union	Mamelon fileté	Gewindestutzen

Annex B
(informative)

Approximated mixing ratios for process-related flame settings (adjustments)

Table B.1 — Approximated mixing ratios

Approximated mixing ratios for normal flames	**Chemical formulas**	**Fuel gas/ oxygen**	**Fuel gas/ compressed air**
Acetylene	C_2H_2	1:1,3	1:7
Propane (LPG)	C_3H_8	1:3,75	1:18
Butane	C_4H_{10}	1:4,5	1:21,4
Natural gas, Methane	CH_4	1:1,6	1:7,6
Hydrogen	H_2	1:0,36	1:1,8
Ethylene	C_2H_4	1:2,6	1:12,4
MPS (methyl acetylene-propadiene mixtures)	C_3H_4/C_3H_4	1:3,5	1:16,5
Other fuel gas mixtures		According to the manufacturer's instructions	
Most oxygen/acetylene blowpipes are operated with a neutral flame, the setting of which requires a ratio of 1:1,1.			

Bibliography

[1] ISO 3, *Preferred numbers — Series of preferred numbers*

[2] EN ISO 3821, *Gas welding equipment — Rubber hoses for welding, cutting and allied processes (ISO 3821)*

[3] ISO/TR 28821, *Gas welding equipment — Hose connections for equipment for welding, cutting and allied processes — Listing of connections which are either standardised or in common use*

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

[5] EN ISO 9012, *Gas welding equipment — Air-aspirated hand blowpipes — Specifications and tests (ISO 9012)*

[6] ISO 554, *Standard atmospheres for conditioning and/or testing — Specifications*

[7] ISO/DIS 10225, *Gas welding equipment — Marking for equipment used for gas welding, cutting and allied processes*

[8] DIN 32509, *Hand-operated shut-off valves for welding, cutting and allied processes — Type of construction, safety requirements, tests*

[9] prEN 746-9, *Industrial thermo-processing equipment — Part 9: Safety requirements for machines and equipment with open firing blowpipes and their gas distribution systems (in preparation)*

This page deliberately left blank

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

Useful Contacts:

Customer Services
Tel: +44 845 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 845 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

bsi.

...making excellence a habit.™