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Working Instruction

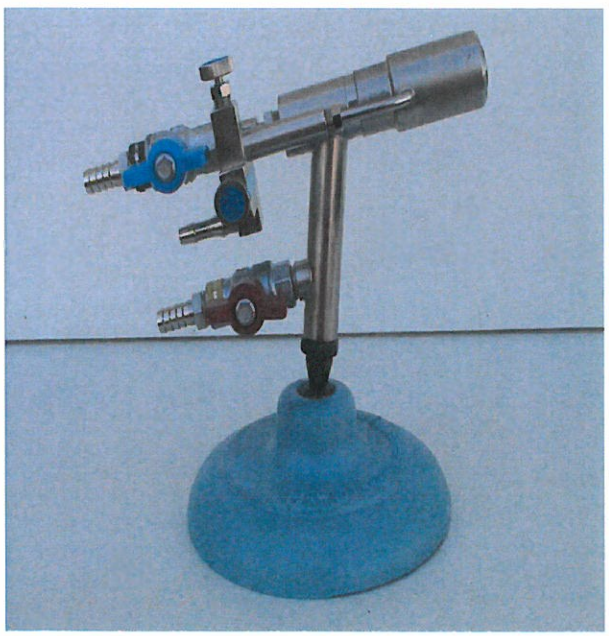
Bench burner „ model Thuringia“

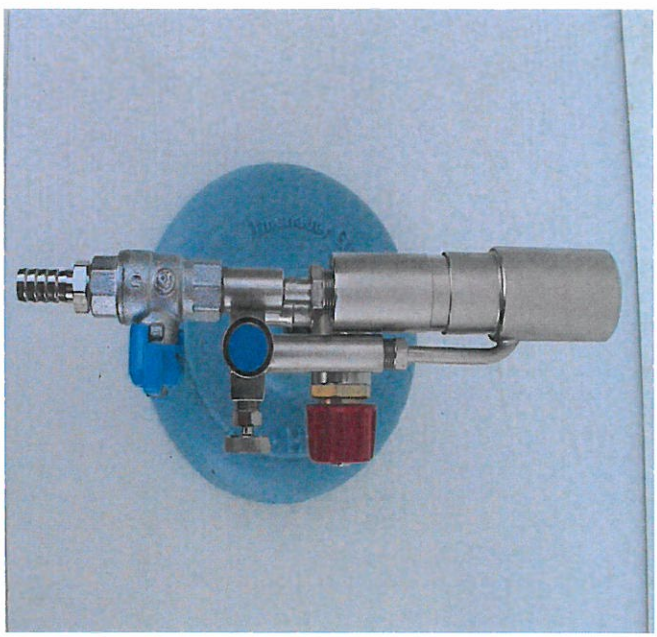
operated with natural gas / air / oxygen

Basic kit
and
Complete kit

operated with propane gas / air / oxygen

Basic kit
and
Complete kit





Contents

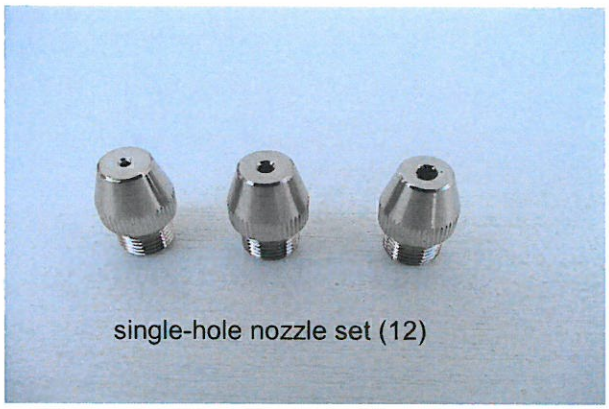
1.0 Bench burner's equipment

Existing standard burners (*see p. 4*) can be completed with:

- natural gas design, small or large
- propane gas design, small or large

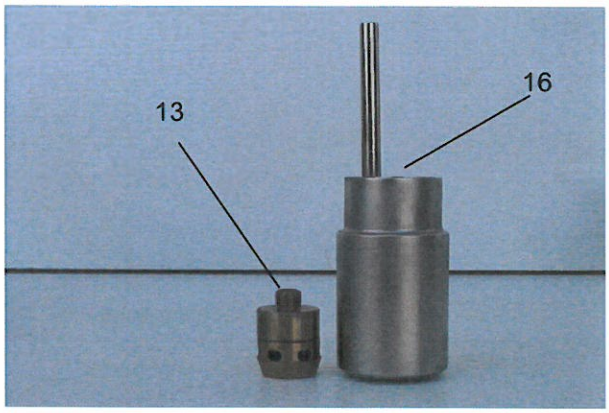
On demand, the standard burner can be equipped with the following constructional units:

- single-hole nozzle
  with drilling diameter
  0.3 – 3.0 mm

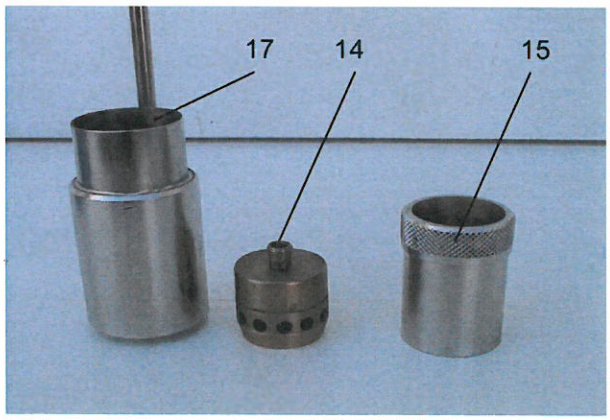


single-hole nozzle set (12)

- small, low-noise nozzle
  (7-hole)



- large, low-noise nozzle
  (19-hole)

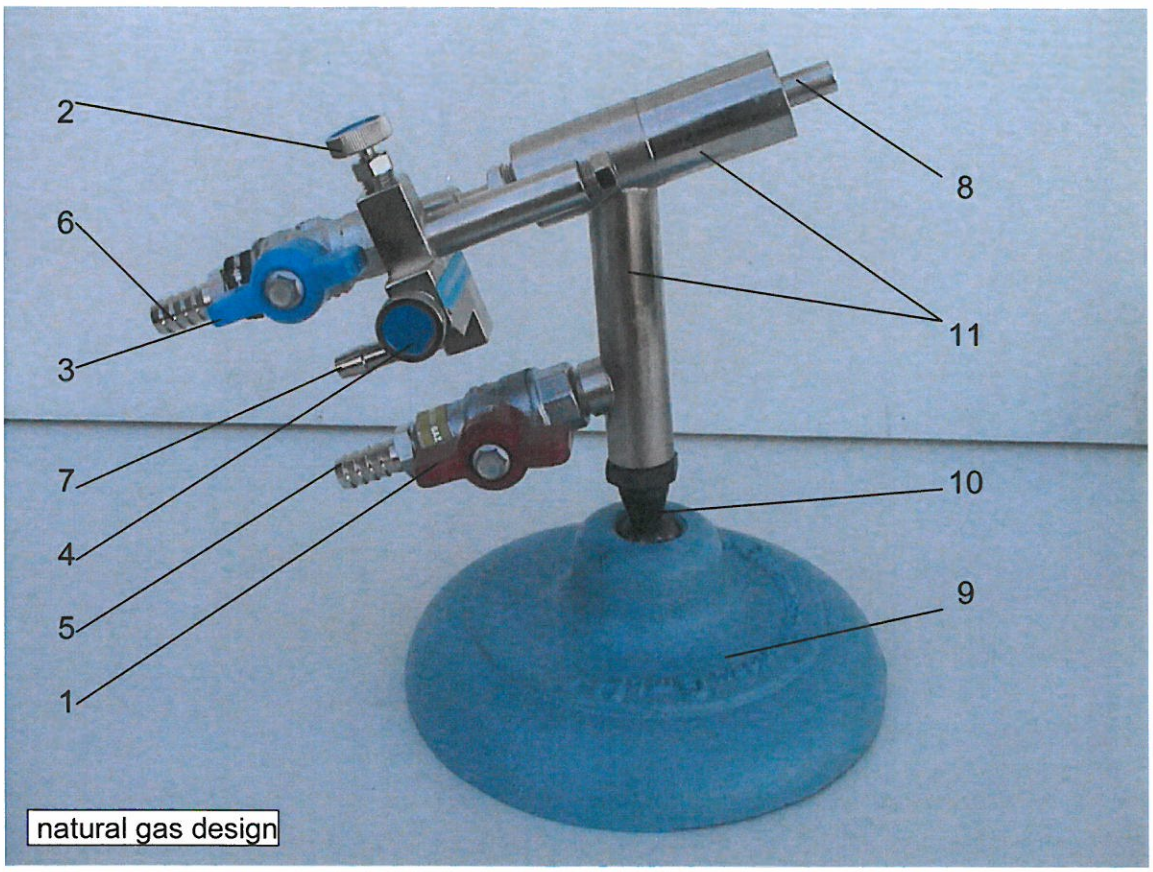


Application of stabilizer sockets:

For single-hole nozzles: stabilizer sockets with 10 mm diameter (especially suitable for small pear-shaped flames) or 14.5 mm, resp.

For 7-hole nozzles: stabilizer socket with 14.5 mm diameter, only;
for 19-hole nozzles: stabilizer socket with 22.0 mm diameter plus fitting piece.

The stabilizer socket has to bee flush with the multi-hole nozzle.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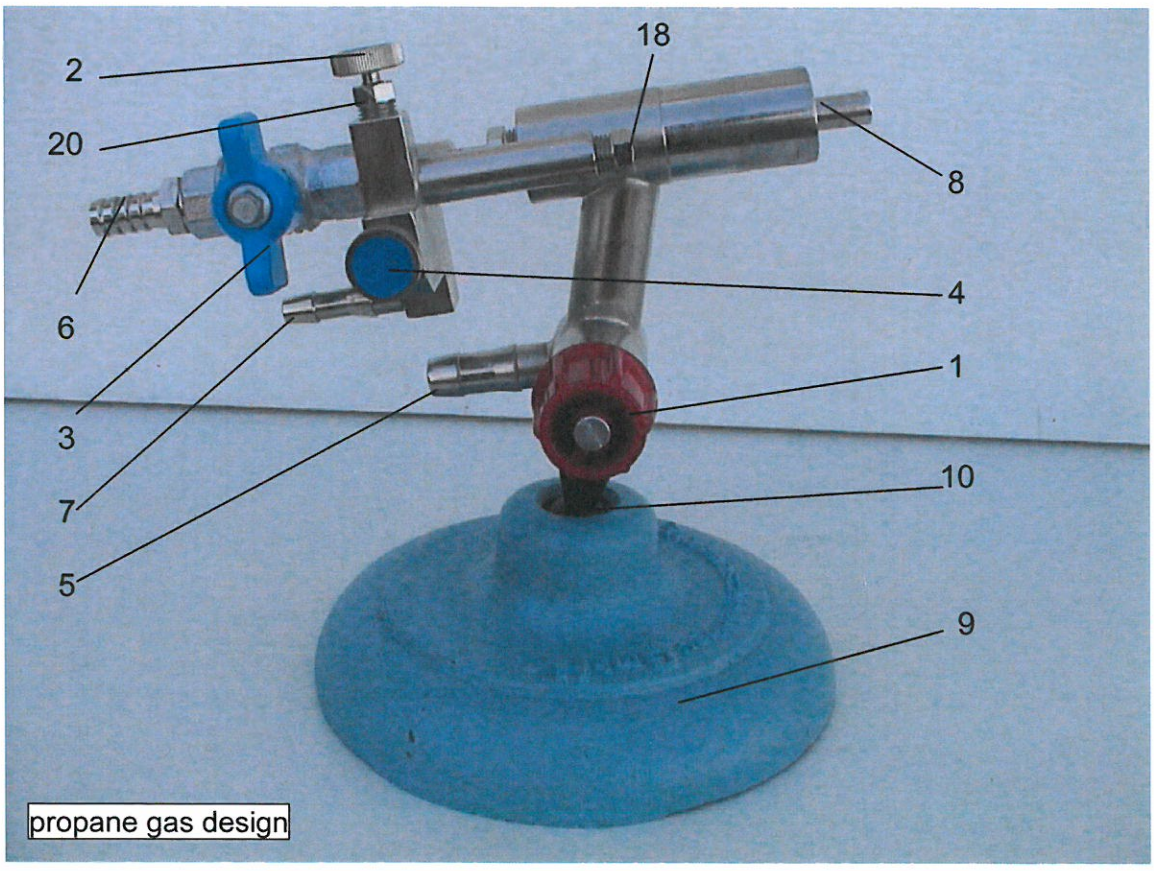
natural gas design


18
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propane gas design

Positioning plan in numerical order for burner parts /operating elements

(1) ball valve for gas (natural gas design) or gas valve (propane gas design)

(2) valve for oxygen stabilization

(3) ball valve for air

(4) valve for oxygen

(5) hose coupling for gas (natural gas design) and (propane gas) resp.

(6) hose coupling for air

(7) hose coupling for oxygen

(8) screwed connection for nozzle holder

(9) burner stand, small

(10) ball holding bar

(11) tube rack

(12) single-hole nozzle

(13) multi-hole nozzle, 7-flames

(14) multi-hole nozzle, 19-flames

(15) fitting piece for stabilizer socket, diameter 22.0mm

(16) stabilizer socket, diameter 14.5mm

(17) stabilizer socket, diameter 22.0 mm

(18) screwed stuffing box stabilizer tube

(19) screwed stuffing box oxidant tube/nozzle holder

(20) screwed stuffing box oxygen valve

These numerical positions are being used on all illustrations.

2.0 Technical Data

Dimensions / Mass

depth:	230 mm
diameter stand:	140 mm
height:	200 mm
biggest stabilizer (diameter):	35 mm
mass:	ca. 3.5 kg

burner connections

hose couplings	natural gas design	propane gas design
gas	10 mm / DN 7.5	9 mm / DN 7
air	10 mm / DN 7.5	10 mm / DN 7.5
oxygen	6 mm / DN 3	6 mm / DN 3

Working pressure: *see section 4.1* in data sheet for connecting.

Consumption figures

These figures are just for information. They mainly depend on:

- size of production part, performance of work, e.g. attaching to
- kind of glass

and can essentially differ at:

working flames

natural gas:	0.8 m^3/h	liquid gas:	0.8 kg/h
oxygen:	0.8 m^3/h	oxygen:	3.0 m^3/h
air for combustion:	7.0 m^3/h	air for combustion:	7.0 m^3/h

pear-shaped flames

natural gas:	0.3 m^3/h	liquid gas:	0.3 kg/h
oxygen:	0.3 m^3/h	oxygen:	0.4 m^3/h
air for combustion:	2.0 m^3/h	air for combustion:	3.0 m^3/h

3.0 Putting into operation and handling

3.1 General information on using

The bench burner " model Thuringia" (natural gas/air/oxygen and propane/air/oxygen resp.) is an all-purpose burner and can be fitted both with single-hole nozzles and a small sliding socket with a diameter of 10 mm or 14.5 mm and with low-noise nozzles— multi-hole nozzles –7-flame – or 19- flame. The 7-flame low-noise nozzle head is combined with a sliding socket of 14.5 mm diameter and the 19-flame with a sliding socket of 22.0 mm diameter. The sliding socket of 22.0 diameter can be used with a fitting piece only.

Working scope:
Further processing of glasses

- fabrication of laboratory equipment
- glassware finishing, mainly from glass tubes
- shaping ornamental glasses

All operations can be done with light-melting up to difficult-melting glasses. Through single-hole and multi-hole nozzles and different sliding sockets with stabilizer in connection with the adjustment range by means of settings for gas, air and oxygen, the working flame is allowed to fit on nearly all operations.

In connection with single-hole nozzles, a low-noise working is not possible if combustible air supply has to be high.
Multi-hole nozzles allow working at a lower noise when using higher oxygen supply but cannot be used for all working steps. Working with this kind of bench burners requires certain skills from the glass blower, especially that designed for propane gas use. By feeding the flame with the appropriate amounts of liquid gas, combustible air, and oxygen the necessary intensity/temperature is adjusted. If the oxygen outflow at the multi-hole nozzle of the stabilizer socket is too low, a lifting of flame can happen when using air as an oxidant. Therefore, just the necessary oxygen amount is to adjust.

3.2 Describing the burner

3.2.1 Working mode

The bench burner is a separate gas design; that means the combustible gas (natural gas or liquid gas) is introduced to the port mouth via the piping system with the nozzle holder concentrically leading around the oxidant mixture.
Not before leaving the opening of sliding socket the combustible gas can intermix with oxidant.
Back flash on reasons of too low flow rates or too high oxygen supply cannot happen.
This solution of problem allows a large working range of flame adjustment. The sliding sockets allow a huge variety of flame type adjustment. Peaked flames can be realized with single-hole nozzles and broader working flames with multi-hole nozzles.
By mixing oxygen with combustible air in the tubing system of the nozzle holder the port mouth is fed with homogeneously mixed oxidant but this solution requires securing the discharge point against creeping or sudden oxygen back flow into the low pressure air pipe.

3.2.2 Construction

The bench burner is made of a tube rack and can be moved on all sides at an angel of ca. 15 degrees to the normal side on a burner stand via a ball-and socket-joint.
The tube rack (11) consists of the pipe system for the nozzle holder (8) with its setting ball valve for combustible air (3) and the two setting valves for oxygen one for stabilization (2) and another one for operating (4) as well as hose couplings for combustible air (6) and oxygen (7).
The single-hole nozzles (12) or multi-hole nozzles for 7 flames (13) or 19 flames (14) respectively, can be screwed by means of a fine thread into the nozzle holder.
This screwing-in has to be hand-tight up to the limit stop otherwise in case of an oxidant escape burning can happen in the gas stream and leads to a destruction of the nozzle holder.
Burner's design is presented as a positioning plan in *section 1.0*. With respect to gas adjustment, bench burners have the identical oxidants systems but different connections.
At the side, the natural gas burner's rack has a connecting nipple bearing a ball valve with a hose coupling for gas (1) (5).
The propane gas burner's rack is designed with an integrated setting valve (1); here, the valve housing carries the hose coupling for gas (5).

3.3 Connecting with media
3.3.1 Combustible gas

The bench burner designed for natural gas is in any case supplied from a stationary connecting line in the working room. This connecting line has to be installed by an authorized expert and must be fitted with a final armature. It is recommended to install a thermal released closing device in combination with a sleeve valve for gas. A nominal width of DN 15 (R_p ½") in connection with a hose coupling 10[1)] for tube connection to the burner is sufficient.
A bench burner designed for propane gas can be supplied from a small cylinder of up to 11 kg (placed in the working room) via an industrial controlling unit of 1.5 kg/h with an adjustable working pressure of > 50mbar up to 0.5 bar at a gas discharge up to 0.4 kg/h (max. 0.5 kg/h).
An authorized person employed with the liquid gas supplier should do this installation.
At large liquid gas discharge or several liquid gas burners of a glass-blowing workshop in operation, a stationary installation with the respective controlling units is recommended. The discharge point should be fitted with a thermal closing device similar to natural gas.

<u>Hints in respect to propane gas usage</u>

When installing a stationary connecting line in the working room, guidelines TRF 96 and VBG 21 " Usage of liquid gas" are to comply with. These guidelines give the right instructions for installing the line with the appropriate armatures, tubes and ventilation.
Normally, the liquid gas distribution network operator hands out a short version on transportation of liquid gas.

[1)] e.g. a hose coupling 10 as to DIN 12898 with R_p ½ connection (AG) or a screw-in hose coupling (order no. 239.108 supplied by Seifert, in 08315 Bernsbach, Germany)

3.3.2 Oxygen

When using just a single bench burner in a working room, oxygen can be supplied from a single cylinder of between 20 l and 50 l with a filling pressure of 200 bar. This cylinder has to be fitted with a single-stage pressure-reducing valve and secured against tip over. The operating pressure has to be adjusted at a value of 1.5 bar (*see section 2.0*).
If several burners are planned for setting in operation, a pipe work with discharge points (safety devices *see section 4*) from a central oxygen unit (cylinder bank, pallet of bundle, pressure vaporizer) or several cylinders should be drawn into consideration.

3.3.3 Combustible air

Normally, combustible air is supplied from a compressor or a storage tank. It is advisable to install a water and oil separation and keep the same maintained. Depending on pipeline's cross-section the pressure reduction can be mounted either at the exit of the separator or at the discharge points. Hints presented *under section 4.0* should be attended.

3.3.4 Hints to be considered by the user

- Before starting with work all screwed joints and tube connections are to submit a visual inspection and if necessary to carry out a leak proofing
- a weekly visual inspection of tubes and burner's stuffing boxes at
    - the connecting tube of sliding socket / connecting with oxygen (18) **?**
    - the burner stand for the air tube / nozzle holder (8)
    - the valve spindles for oxygen (20)

Loosen stuffing box screws are to be tightened and to check for leak-tightness.

- Connections of supplying units should be weekly inspected and constructor's instructions are to observe.
- It is to ensure that oxygen connections and valves are free from oil and grease, *see section 4.0*.

4.0 Safety hints

4.1 Data sheet for connecting

Bench burners are designed for operating with
- combustible gas: natural gas or liquid gas
- oxidants: oxygen
and compressed air / combustion air

Bench burners are connected via tube lines onto the stationary discharge points.

Operating pressures:

- combustible gas: natural gas: L or H as to DVGW – working sheet G 260
or
liquid gas: mixture C as to DIN 51622 (usual)
But other mixtures as to DIN 51622 can be applied provided that evaporation at respective actual existing outside temperatures can be secured.

Burners designed for natural gas are for operating with natural gas with a connecting pressure of max. 50 mbar only. Deviating connecting pressures need a consultation with the constructor.

Burners designed for propane gas are for operating with liquid gas at a pressure range from 50 mbar to 500 mbar (0.5 bar). Deviating connecting pressures need a consultation with the constructor.

- compressed air / combustion air max. 300 mbar (0.3 bar)
- oxygen 1.5 bar

If higher connecting pressures are present at the discharge points, a reduction valve is necessary to adjust to the working pressures above mentioned.

Connecting tubes:

On principle: The necessary tube length depends on the technological design. From stationary discharge connections, the necessary tube length should be as short as possible.
Fixed installations are not allowed of being replaced by tubes.

Tube for combustible gas:
- natural gas: tubes for all combustible gases 9 x 3.5 mm DIN 8541-120
colour code: red / orange, half-page each of

- liquid gas: tube for liquid gas (class 6) 9 x 3.5 mm DIN 4815

Tube for Oxygen:
size: 6.3 x 3.5 mm DIN EN 559 / DIN 8541
colour code: blue

Tube for combustible air:

size: 9 x 3.5 mm tube for compressed air
colour code: black

Tube connections:

for natural gas burners

natural gas:	hose coupling, external diameter (10 mm)
combustible air:	hose coupling, external diameter (10 mm)
oxygen:	hose coupling 6 mm as to DIN EN 560/ DIN 8542

for propane gas burners

propane gas:	hose coupling, external diameter (9 mm)
combustible air:	hose coupling, external diameter (10 mm)
oxygen:	hose coupling 6 mm as to DIN EN 560/ DIN 8542

Hints:
End of tubes are to protect with hose clamps against unintended slip off both at the burner and at the discharge points.

Safety devices:

Both types of burners don't require safety devices at the burner connection because these are external mixing burner types (*see section 3.2*). However, each medium pipe leading to the burner has to be equipped with a suitable non-return valve as to DIN EN 730.

Hint:

This statement is only valid for natural and propane gas burners described in this working instruction because they have a similar oxidation system.

Recommendation

- Recipient vessel LG VI / FS G ¾ RH for air discharge from low pressure network resp.
  Recipient vessel LG VII G ¾ RH for air discharge from low pressure network
- Recipient vessel F VI G 3/8 RH for compressed air networks up to 16 bar operating pressure in connection with a suitable reduction valve
- Recipient vessel F VI G ¼ RH for oxygen

Hints:

A recipient vessel installed in a compressed air network cannot be used in an oxygen connection. Therefore, G 3/8 and G ¼ in the above mentioned recommendation.

Having connected all tubes and burners they have to be put under operating pressure and all joints are to check against leakage with a suitable spray. Adjusting valves / ball valves have to be closed.

4.2 Hints in respect to industrial safety during working with gas burners

The operating crew has to be instructed and must be aware of risks appearing during handling with gas burners.
Burner's user has to make working instruction accessible to the operating crew and has to introduce the operator in equipment's handling.
Burner's location and operational site has to be selected so that during operation neither persons nor items are damaged through flames, off gases or hot burner parts. Burner's user is obliged to provide the operator with the appropriate protective equipments, e.g. safety goggles as to DIN 58211 TI 7 against radiation of sodium and heat, protective gloves against burns through glasses heated up, and protective shoes.

A sufficient workplace exhausting has to be in existence in order to carry off the gas formed during burning of mixtures of natural gas/oxygen and propane/oxygen, respectively, and that are partly dangerous to health.

Should a deviating flame face signalises a sudden operational interruption work on this burner has to be stopped immediately. The media supply is to stop as follows:
- oxygen
- combustible gas
- air

Please contact fabricator's service department and on safety reasons refrain from doing self-repairs.

These burners are hand controlled that means manually lit up, and adjusted. Therefore, the escaping gas or mixture of gas/air/oxygen is to light up immediately at the die orifice. During standstill times the operator has to make sure that an escaping of combustible gas or mixture of gas/air/oxygen is excluded.

4.3 Burner's ignition and extinguishing / turn off

4.3.1 Burner's putting into operation

If all connecting tubes are properly installed and the main gate valve to the discharge point is open, the burner can be put into operation as follow:

1. Open slightly the gas valve (1) at the burner and ignite the escaping gas.
2. Open slightly the valve for oxygen stabilization (2) and stabilize the flame with O_2.
3. Open slightly the ball valve for air (3); flame is getting smooth and regular.
4. By admixing oxygen through valve (4) flame's intensity/temperature can be increased.

The necessary size and shape of flame can be adjusted through the valves (1), (3), and (4) whereas - depending on the situation - stabilization with oxygen has to be increased, too. The size of flame depends on material's size and the kind of glass as well as on the particular procedure.

4.3.2 Burner's turn off

- Close the O_2 valve (4)
- Close the ball valve for air (3)
- Close the valve for oxygen stabilization (2)
- Close the ball valve for natural gas (1)
- Close the gas valve for propane gas (1), respectively.

Hint:
Please observe the right order to avoid detonating gas (oxyhydrogen gas).

4.3.3 Adjusting the ignition flame

When not working with the burner, glass blowers are used to have a small diffusion flame. This is possible by not completely locking the gas / ball valve. But it has to be ensured that the glass blower has the flame in his visual angle. When he is leaving the workshop the valves have to be closed.

5.0 Behaviour at failures

- Unusual flame noise,
- deviating flame coloration or shape of flame

indicates a failure at the burner.

The burner has to be closed in the following order (*see section 4.3.2*, too)

- close the oxygen valve
- close the air valve
- close the gas ball valve.

After cooling down the sliding socket it is taken off and checked whether the air/oxygen nozzle (single-hole or multi-hole nozzle) is in the correct position. Sometimes, by screwing tight (hand-tight, without an instrument) the failure can be repaired.

Control the tight position of the stuffing boxes.

In case the damage is identified the burner should be sent for repair to the manufacturer.

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6.0 Servicing and Maintenance

Bench burners are normally of low-maintenance but the following inspections are necessary:

- Check the screw-in thread [mainly the large multi-hole (19-hole) nozzles]; don't screw-in with greater application of force at damages at the beginning of the thread. A consequential damage could be a damaged thread on the nozzle holder.

- Check the screwed stuffing box
  - at the oxidant tube/nozzle holder (19)
  - at the stabilizer tube (18)
  - at both oxygen valves (2); (4)

Sliding sockets with their connecting tubes, connecting threads of the nozzles and the fitting piece for the large sliding socket with a ∅ of 22 mm (15) should be put in a casing to avoid a bending of connecting tubes and socket's ends. Burned residues at the multi-hole nozzles or at the sliding socket's nozzle ring should be removed with a brass-wire brush.