1 GENERAL SAFETY INSTRUCTIONS

General information

These are general repair instructions for gas appliances.

Suggestions and tips are welcome!

Information specific to the appliance can still be found in the special repair instructions selected for the particular appliance.

Safety instructions

Danger!

Repairs may be carried out by a qualified gas engineer only!

The user may be put at risk and injured by improper repairs!

After working on gas-conducting connections, conduct a leak test

Exercise special care when working on and testing gas appliances!

Observe national regulations for the connection and installation of the appliances!

Gas appliances which have relevant malfunctions (e.g. leaks) must not be operated

Gas appliances may be repaired only with original parts which have been tested for this application.

Gas appliances require in the gas connection a shut-off device which must be situated near the appliance and be easily accessible.

If the appliance has not been installed safely, this must be pointed out to the user and corrected (acknowledgement of information), If there are safety concerns, the appliance must be disconnected.

To prevent electric shocks, always comply with the following instructions:

If the appliance is faulty, the housing or frame may be live!

Do not touch components in the appliance. Even the modules can be live!

Before commencing repairs, ALWAYS disconnect the appliance from the power supply!

If tests have to be conducted while the appliance is live, ALWAYS use a residual-current-operated circuit-breaker!

The protective conductor connection must not exceed the standardised values! This is essential for personal safety and appliance function!

When repairs are complete, perform a test in accordance with VDE 0701 or the appropriate national regulations.

When repairs are complete, perform a function test!

Caution!

Always comply with the following information to prevent damage to the appliance or components:

NEVER attempt repairs by randomly replacing components!

ALWAYS proceed systematically and follow the troubleshooting instructions!

2 LEAKAGE TEST

Always conduct a gas leakage test if:

- **A gas-conducting connection was loosened**
  Examples: Gas tap changed, appliance connection loosened, safety valve replaced on gas taps with thermal release
- **Gas odour established or complained about**
- **The appliance is generally in a poor condition** (damage in transit, fairly old appliance)
- **There is a customer requirement**

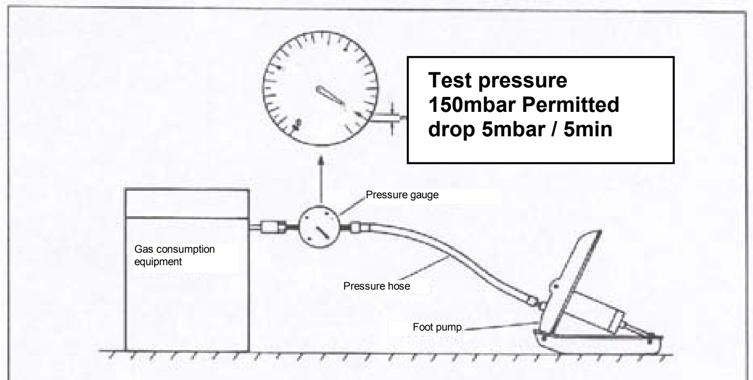
In principle, customer service has 2 methods of conducting a leakage test:

- Leakage test with pressure gauge
- Leakage test with foam

Remark: Leakage tests are also done with electronic leak detectors (gas snoopers). This have some advantages in specific cases but are not best appropriate for testing and searching for leaks in our appliances. Some misinterpretation is possible. See chapter leakages and gas smell

2.1 Leakage test with air pressure + pressure gauge

Leakage test by "pressure testing" with pump and pressure gauge



Connection of the leakage tester

Principle: the appliance is pressurised not with gas but with air (test pressure) via a pump. The applied pressure is indicated via a pressure gauge.

If there is a leak, there will be a more or less pronounced drop in the test pressure.

Advantage:
The test can be conducted in accordance with DIN EN 30 at a test pressure of 150 mbar: At this higher pressure even small leaks can be reliably identified. If no excessive pressure drop is established on the pressurised part of the line, this section is definitely leak-proof.

The disadvantage is that the appliance must be disconnected from the gas connection and the tester connected. This may require a suitable adapter

A recommended leakage tester can be purchased under material number 340034. It can be connected directly to a ½ inch pipe. (with foam rubber sealing plug). More details overleaf.

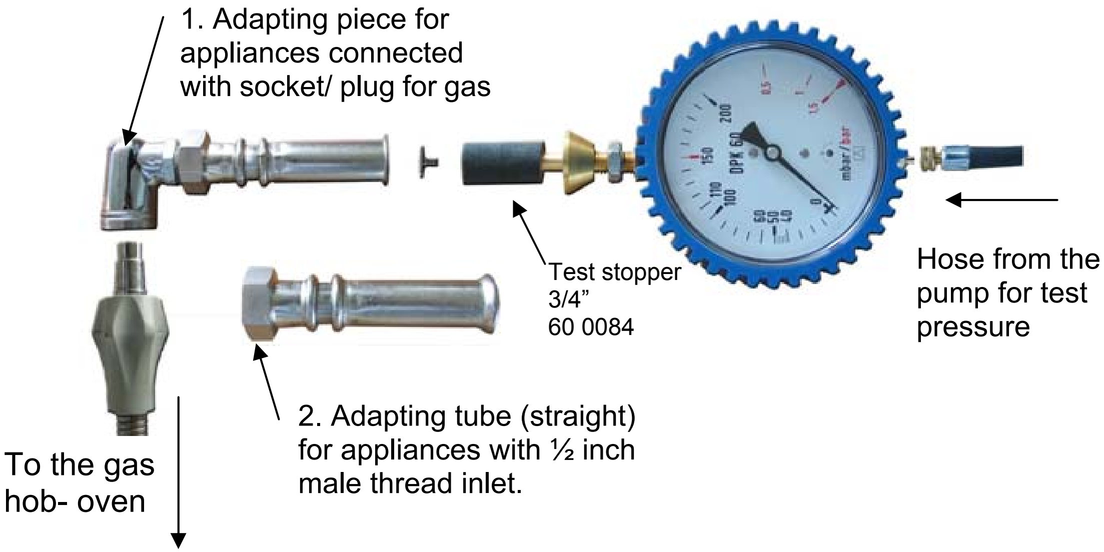
Connecting the leakage tester:

To connect the leakage tester to a gas appliance, there are currently 2 prefabricated adapters:

1. Socket adapters for connection to appliance which feature gas socket (short ¾ inch pipe section on safety gas socket, see picture). Only useable when the socket plug system is used on appliance connection, i.e. wide spread in Germany)
2. straight pipe section with ½ inch screw connection on the appliance side and with an inlet for tester (for gas appliances with curved gas connection or elbow or inner diameter of the connection piece <½ inch)

For other gas connection types which are of a specific national design adapters must be purpose-made.

Alternatively the test pressure can also be applied via an adapter piece via the nozzle (for the test the appliance shut-off device must then be closed and the gas tap in the appliance opened)



For part numbers see: Part numbers

Test sequence: see next page

Special connection to LPG hoses:

With this adapter one can disconnect the appliance hose from the pressure regulator and connect the gauge/ pump device to the hose (1/4 inch leftturning thread or also 3/8 leftturning thread possible.)

Advantage:
Appliance connecting area can remain untouched (instead of this the disconnection / connection has to be done on better assessable gas bottle area)

Appliance connection and hose is checked within the tightness test.

2.1.1 Main test sequence

all actuators (gas taps, etc.) in “off” position

- **Apply 150 mbar test pressure** (caution, do not “overpump”!)
- **Await 5 min test time**
- **Permitted pressure drop max 5 mbar**

If a pressure drop greater than 5 mbar can be established, it is essential to localise the leak (with foam) and eliminate it!

This test is conducted according to the appliance test in accordance with standard DIN EN 30, but it contains only a part of the EN30 tightness test.

Further tests on Gas taps with safety device
There can be done easily 2 further tests, which check also 2 tightening components of this system:
a) tightness of tapered plug   Press only without turning*
This opens the safety valve and gives test pressure to the tapered plug in each case (not depended whether safety valve is before or behind tapered plug, see safety valve)
b) Tightness test of safety valve – turn only without pressing
This opens the gas way to the burner with exception of the safety valve, if this does not has its full tightening function, there appears a pressure drop

2.1.2 Background information on leakage rates / testing methods:

According to DIN EN 30 Section: 7.3.1.1.1 the gas appliances are tested with air and at a pressure of 150 mbar. (1 x with closed setting devices, 1 x with open setting devices + closed main nozzles).

Permitted leakage rate by standard EN 30 = 0.1 dm³/h =100 cm³/h (the “lost” volume is indicated).

Permitted leakage rate BSH internal = 0.01 dm³/h =40 cm³/h .

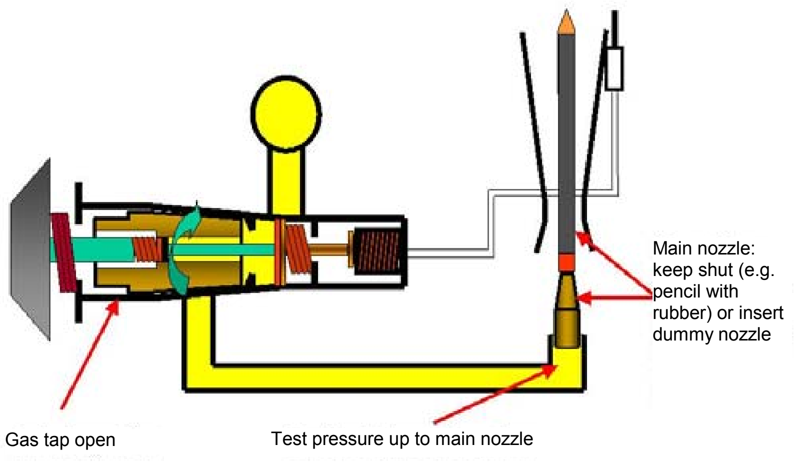
Customer service measurement (5 mbar pressure loss / 5 min) corresponds to approx. 9 cm³/h–30 cm³/h, depending on volume of the lines in and to the appliance. (if the tested line has the large volume, means about 1 m manifold + 1,5m connection hose, a 5 mbar drop in pressure signifies a the higher leakage rate of 30cm³/h).

Only for background information:
In the installation area of some countries the test is conducted differently, i.e. in Germany at a test pressure of 150 mbar and only up to the appliance shut-off device; there must be no measurable drop in pressure, display accuracy at least 0.1mbar.
If with this criteria the appliance is included to the test (shut off device opened) the appliance will be declared as “not tight”, nevertheless it fulfils the demands of EN30 satisfying.
There can also be executed a pre- test of the installation with up to 1,5bar. If with this test method the appliance shut of device is not closed, appliance (gas taps) will be damaged because of to high pressure.

2.1.3 More extensive testing

For the testing of components which are under pressure only when a burner is on, e.g. pipe connection between gas tap and burner.

If the leak tightness of the appliance is to be tested after the actuator ("tap plug" or safety valve in the gas tap), a more extensive test can be conducted. This may require a device for closing the nozzle or a dummy nozzle.



If the actuator is open while the nozzle is closed (keep shut with finger or pin, use a soldered main nozzle), a small drop in pressure is indicated on the pressure gauge (2–5 mbar, test pressure distributed on larger pipe section). However, the indicator on the pressure gauge must stop again.

No specific test pressure and no default test time has been defined for this more extensive test. The connection is regarded as leakproof if there is no apparent drop in the pressure gauge pointer.

This test must be used if:

- gas odour is detected when a burner is on
- pipe connections in this area are loose or the connection technology is problematic

For further information see: Gas tap with thermal release

2.2 Leakage test with foam

(Testing with leak detector spray, leak detector agent)

Use only leak detecting agents which are permitted for this use.
A leak detecting agent which is applied with a paint brush is available as spare part 340055.
(Water with washing-up liquid is not permitted! Risk of the sealing material swelling and then inability to find the leak).

Bubble formation on pipework or connections under gas pressure indicates the leak.

Advantage: low expenditure if only a specific location has to be tested

Disadvantages:

a) If a whole area has to be checked (e.g. diffuse gas odour), a reliable conclusion is very unlikely

b) As normal gas connection pressure is generally used, it is difficult to detect fairly low leakage rates, especially with natural and town gas (only 20 or 8 mbar gas pressure)

c) A 100 % definitive assertion ("our appliance is leakproof") cannot be given or verified.

Even if troubleshooting with a pressure gauge (leakage tester), foam or a leak detecting agent must also be used to localise the fault.

Leakage detection (bubble building) works better with the higher pressure provided by the pressure gauge (150mbar versus 20mbar), especially if the leak is small (low leakage rate)

3 FUEL GASES / GAS TYPES / CONVERSION

The utilised gases and descriptions differ to some extent in countries. However, throughout Europe the different gases can be divided into **3 gas families**.

Below is an overview of the conditions in the most important European countries:

Gas family	Gas	Standard connection pressure (nominal values)	Subgroups (Europ. region Gxx, Wobbe index* Ws_{ref})
1	Town gas	8 mbar (in DK and SE)	a (G110, 6.9 kWh/m³) b (G120, 7.68 kWh/m³) c (G130, 11.1 kWh/m³) e (G150, 10.3 kWh/m³)
2	Natural gas	20 mbar (NL: 25 mbar)	**H** (**G20**, 14.1 kWh/m³), **L** (**G25**, 11.5 kWh/m³), (in most European countries:) **E** (**G20**, 14,1-11.5 kWh/m³) (in DE, FR, BE) **LL** (**G25**, 11.4 kWh/m³) (in DE, see also Natural gas in Germany)
3	Liquid petroleum gas - LPG	30 mbar or 28 / 37 mbar 50 mbar (DE, AT, CH)	Butane / propane (G30/G31) Propane / butane mixture (G30/31)

Information about Wobbe index* Ws_{ref}: see right column

Specification at reference temp. 15 °C
The specifications are nominal values. Deviations are permitted (different for the various countries,
The Wobbe index is the measurement of the amount of heat energy which is supplied to a burner by the particular gas.

The Wobbe index takes into consideration the energy content and the "viscosity" of a gas.

Ws = Hs / vd (Wobbe index = calorific value / root of the rel. density)

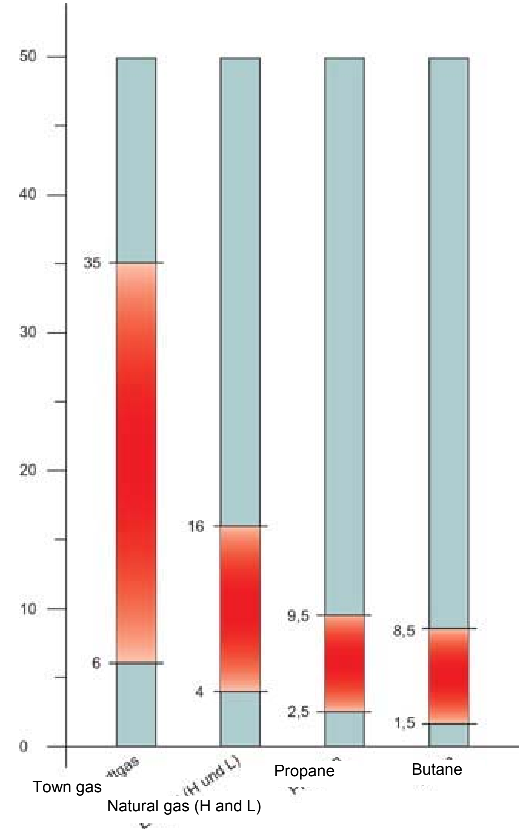
3.1 Flammability limits of the gases

Coupled with the different energy content of the various gas families are also the different flammability limits, i.e. Gas-air mxiture ratios at which the gas is flammable.

This is both important for the function of a burner and – especially – for the explosion risk which represents a gas distributed in the room due to a fault.

Liquid gas is to be assessed more critically as:

- the flammability limits are the lowest
- on account of its higher volumetric weight, this gas collects and becomes concentrated in depressions (i.e. cellars, appliance cavities).
- Smell of gas is not good distributed in a room because of weight (see point above)
- Highest gas pressure (more leakage gas on a certain leak area)



3.2 Authorisation for countries and gases in Europe

Whether an appliance may be operated in a particular country and with the gas available on site is indicated on a rating plate with direct countries of destination and gas categories (Cat). This sticker is obligatory with the introduction of the CE mark (01.01.95) in Europe and is situated:

on hobs: usually on the hob base

on cookers: on the side panel or on the rear panel.

3.2.1 Suitability for gases / classification into categories:

Appliances are classificated because of its suitability to different gases . This classification is called “categories” (CAT)

Operation with gases from	x gas family (of three) possible
Cat I:	1 gas family
Cat II:	2 gas families
Cat III:	3 gas families

In addition, the individual gas families and subgroups (see left) are indicated.

Example: (fictitious)

CE prod. part no. 0085AU0052

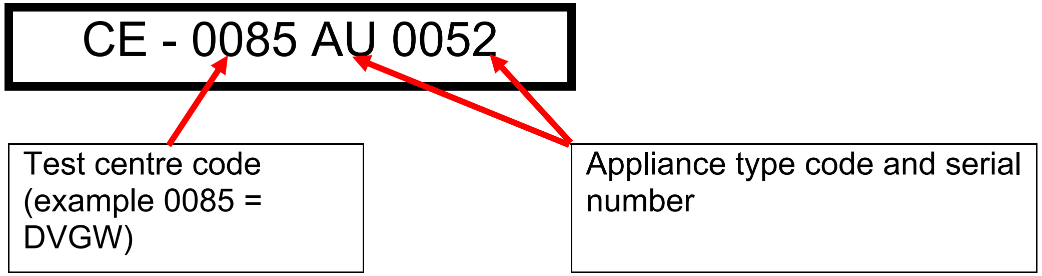
IT	II_{2H3+}	20 mbar 28–30/37 mbar
FR	II_{2E3+}	20 mbar 28–30/37 mbar
NL	$II_{2L3B/P}$	25 mbar 30 mbar
DE	$II_{2E,LL3B/P}$	20 mbar 50 mbar

3.2.2 CE number / approbation

With the authorisation / approbation of appliances, the test centres issue a so-called CE product part number. This practice has been mandatory since 1.1.1996 when the European gas appliance directive came into force

Different European certification centres, so-called “Notified Bodies”, are entitled to check and issue the product part no.)

This number (also known as “CE test number”) is situated on a special gas rating plate (see also categories on the previous page) and has the following configuration (example):



Occasionally this number is requested by the installation company or gas supplier before the appliances are available (these centres can determine the gas specifications of the appliances via the product part no. and thereby plan installations and networks).

Regarding these requests:

Some appliances have the CE product part no. indicated in the particular repair instructions.

3.2.3 Natural gas – specific features in Germany

Attention; this is only valid for (complicated) situation in Germany
In Germany natural gas is divided into subgroups in 2 different ways:

a) Division into subgroups based on the gas supplier (GVU)

b) Division into subgroups based on the appliance (gas consumer / appliance manufacturer)

In both cases, however, the most important criterion for division into subgroups is the **Wobbe index Ws** (previous designation Wo).
Here indicated values for W_{sn} (gas under standard conditions = 0 °C) in **kWh/m^3**

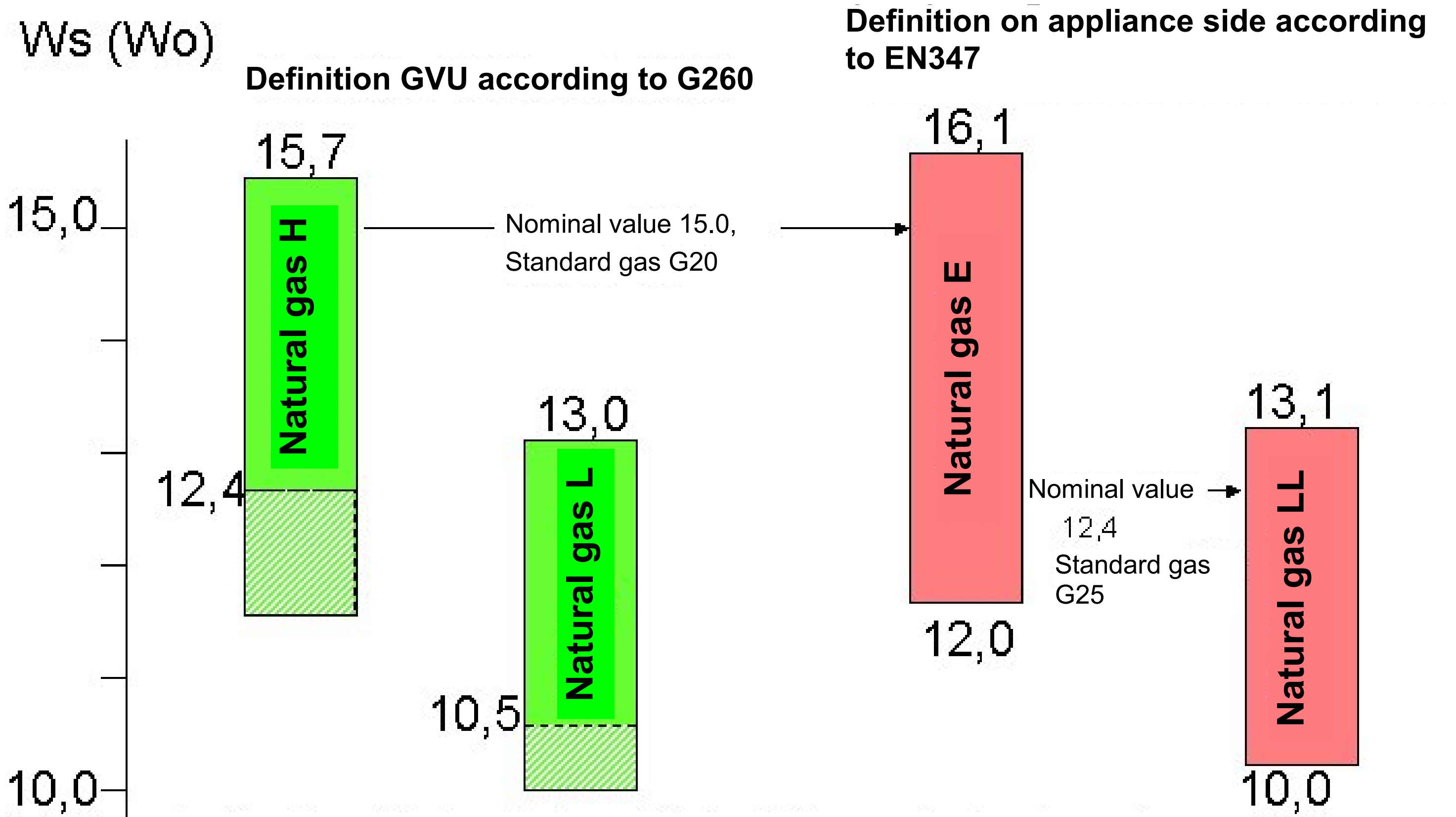
Background:
The Wobbe index is the measurement of the amount of heat energy which is supplied to a burner by the particular gas.
The Wobbe index takes into consideration not only the energy content but also the flow properties ("viscosity") of a gas.

Ws = Hs / √d
(Wobbe index = calorific value / root of the rel. density)

Occasionally Ws_{ref} is also indicated (gas at reference temperature = 15 °C)
a conversion Ws_n = Ws_{ref}: +5.5%

Conversion from MJ/m^3:
value in MJ/m^3) divide by 3.6 = value in kWh/m³

Appliances which have been set to natural gas E/H (standard factory setting) can be operated in most areas without nozzle conversion.
If Wobbe index < 12.0 kwh/m³ natural gas LL nozzles must be used
If Wobbe index < 13.1 kwh/m³ natural gas LL nozzles may be used



Appliances which have been set to natural gas E can be operated with all gases of group H and with most gases of group L

A special nozzle set LL (G25) is required only if gas has Ws < 12.0 kWh/m³

3.3 Connection pressure, potential faults

3.3.1.1

The term “connection pressure” is defined as the flow pressure of the gas (pressure above atmospheric ambient pressure) on the appliance connection, i.e. pressure when burners are operating.

Due to the characteristics of the pressure regulators in the installation and flow friction in the gas lines, this flow pressure is often significantly lower than the static pressure when the appliance is in an idle state.

The connection pressure is specified by pressure regulators and is kept constant within a tolerance, largely irrespective of the gas flow rate. However, this functions only for a gas flow rate for which the pressure regulator is designed.

Each gas type has a nominal connection pressure and permitted deviations, within which the gas appliance must function properly.
If these deviations are exceeded, malfunctions may occur.

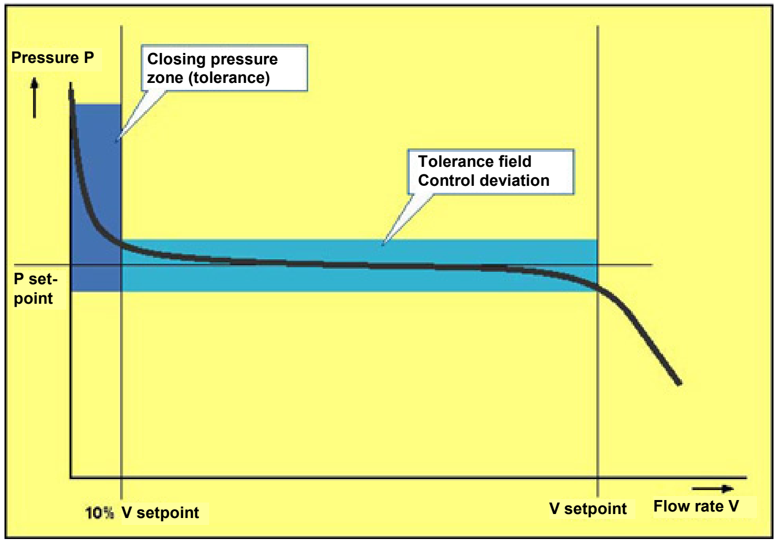
Type of gas	Nominal pressure	Fluctuation range
Natural gas G20 G25 (in parts of DE)	20 mbar	17–25 mbar
Natural gas G25 (NL, parts of BE)	25 mbar	20–30 mbar
Liquid gas G30 Butane	28-30 mbar	20–35 mbar
Liquid gas G31 Propane	37 mbar	25–45 mbar
Liquid gas G30/31 Propane/butane mixture	50 mbar	42.5–57.5 mbar

Pressure regulator function (example)

The pressure regulators in the low-pressure range convert a higher input pressure to a controlled lower output pressure.

The required accuracy is attained only within a flow rate range for which the regulator is designed.

Particularly in the case of liquid gas appliances it is quite possible that a high gas withdrawal will result in a sudden dip in the connection pressure (standard pressure regulators designed for 1 or 1.5 kg/h corresponds to approx. 15–20 kW, may be exceeded with some gas consumers)



3.3.2 Malfunctions caused by connection pressure fault:

Pressure too high:

- Flame lifts off or breaks away
- Flame ignites poorly or not at all
- Flame does not heat thermocouple correctly

Pressure far too high: (wrong pressure regulator, complete failure of the pressure reducing function due to sticking membrane).

- Gas tap leaking because of damage to seals in the gas tap (tap spindle, safety valve, see Gas tap). However, this requires a pressure considerably greater than 200 mbar. This is not at all unusual especially in the case of failing liquid gas regulators. Occasionally the pressure reducing valve fails only temporarily, i.e. only the leak remains, however the failure can no longer be recognised by the flame aspect

Pressure too low:

- Burner power inadequate (boil-start capacity)
- Flame goes out at low setting
- Burner switches off at low setting via thermal release)

Too low pressure may also occur only temporarily if, e.g. a large consumer is connected (externally: heater, gas boiler or internally: many burners in the appliance on full capacity) which causes a load on the pressure regulator or an increased pressure drop on the supply line

3.3.2.1 Testing the connection pressure:

An exact measurement of the connection pressure (flow pressure) is expensive and requires special measuring instruments.

A measurement of the pressure is required only infrequently. (A clear sign of a problem with the connection pressure is a similar malfunction at all burner locations)

In **exceptional cases** a simple test can be conducted on different types.

3.3.2.2 Natural gas: assessment of flow rate on the gas meter

Check the gas consumption on the gas meter for several minutes while the burner is operating. (warm burner)

This table provides information on the pressure provided a correct nozzle is used.

Nominal pressure 20 mbar	Flow rate in litres/min per kW burner power (based on Hs_{ref})		Also possible deviation caused by nozzle tolerance in litres/min
	17 mbar	24 mbar	
G20, thin (d=0.555) warm	1.46	1.73	+0,14 -0.12
G20, thin (d= 0.555) cold	1.43	1.69	+0.14 -0.12
G20, thick (d= 0.684) warm	1.31	1.56	+0.13 -0.11
G20, thick (d= 0.684) cold	1.23	1.51	+0.13 -0.10

* Warm = gas temperature approx. 15 °C, Cold = gas temperature approx. 0 °C

relativ density d = absolut density divided by density of air = 1,29kg/m³ (Which is on 0°C, 1013mbar)

3.3.2.3 Measuring the pressure with a pressure gauge:

At least one burner must be operating. Pressure can be conveyed to the pressure gauge by means of a hose (e.g. . 05 4011), e.g. by connecting a hose to a main nozzle. However, this “measured burner” must be opened simultaneously on the gas tap (there are also instrument glands with nipple outlets which can be installed in the gas connection).

Alternative: adapting piece with measuring nipple, which can be introduced in gas supply connection, (= ½ inch intermediate tube - female-male) Ident-Nr.:34 1052

Pressure gauges which can be used:

- Liquid gas 50 mbar: assessment with leak tester pressure gauge. Measurement range is meaningful from approx. 50 mbar only)
- Natural gas: U-tube pressure gauge. 34 0036
  Measurement range does not exceed 25 mbar, beware of static pressure (“load burners” switched off, higher pressure empties U-tube)
- Simple electronic pressure gauge, e.g. Testo 505-p1 0560.5051 (possible for all gas types), Ident. Nr. 34 1097 (for all kinds of gas useable)

(high-quality electronic pressure gauges are very expensive)

3.4 Gas type conversion

Gas type conversion is required to adjust an appliance to a gas type used on site. This conversion usually requires

- replacement of the main nozzles and
- replacement or setting of the small flame nozzles (bypass nozzles) and
- setting of the primary air

A nozzle set specific to the appliance and gas type is almost always required.

3.4.1 Selecting the correct nozzle set

The spare-parts lists indicate the nozzle sets which are applicable to the appliance, with additional information (abbreviations) on the associated gas type.

Only the abbreviation (e.g. G20, G30) of the gases is being used more and more (see also Gas families)

To ensure the correct selection, it is important to identify the designation and connection pressure of the gas used on site

3.4.1.1 Examples of common designations and gases:

Natural gas E / H (G20), 20 mbar
Gas type widely used in Europe, the appliances are usually delivered set to this gas type.

Natural gas LL (G25) 20 mbar
only in a few areas of Germany (see Natural gas in DE)

Natural gas L (G25) 25 mbar
is used only in netherlands (and parts of Belgium and France)

Lower calorific value is mostly compensate by higher pressure, but nevertheless mostly specific nozzles are used
(in Belgium, France however this gas is used with the standart G20, 20mbar nozzle, approbation II $2_{E+,}$ means pressure pair 20/ 25mbar)

Liquid gas (G30/G31) 50 mbar
Liquid gas = propane / butane mixture (bottled gas) which is used at this connection pressure only in DE, AT, and CH

Liquid gas (G30/G31) 30 mbar (also LPG or butane) or 28/37 mbar
Liquid gas (propane G31 or butane G30, bottled gas), is used in many countries in Europe at this connection pressure or at these connection pressures (butane at 28–30 mbar, propane at 37 mbar)

Town gas (G110 or G120), 8 mbar
is used only in a few regions in Europe (Denmark, Sweden, small areas in IT ES and PT)
Widely used in Hongkong, Singapore, China

3.4.2 Allocating the correct nozzles during installation

The nozzles themselves are usually identified by a number stamped on them. This number corresponds in almost all cases to the bore diameter (1/100 mm). Usually, **but not always**, the following allocation is applicable

- ⇨ larger numbers (diameter) for larger burners or gases with lower calorific value.
- ⇨ smaller numbers (diameter) for smaller burners or gases with higher calorific value.

A nozzle numbering – burner size /capacity allocation table can be found in the appliance installation instructions and usually on an instruction leaflet enclosed with the nozzle set as well as in the special repair instructions, if available.

The allocation table must always be used. It is then possible to establish any incorrectly delivered or incorrectly packed nozzles.

In many cases the small flame nozzles or bypass nozzles do not have to be replaced, but only set. (see Small flame setting).

Following the conversion, always conduct a performance test!

The newly set gas type must be documented on a sticker included with the nozzle set and stuck on the appliance!

3.4.3 Charging for the gas type change

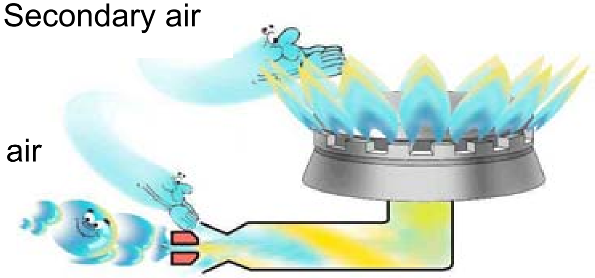
If a new appliance is not preset for the required gas type, the required conversion can usually be charged in most countries via a special account (free of charge to customers, usually via a special regulation in goodwill accounts, LA41).

Such a gas type conversion must not be charged to the warranty! A charge to the warranty is permitted only if nozzles are damaged or nozzle features deviate from the required factory setting (and this wrong nozzles were built in by factory)

4 COMPONENTS, FUNCTIONS AND FAULTS

4.1 Hot plate burner and burning behaviour

4.1.1 Hot plate burner (burner with partial premixing of air)



Clean, dry, undamaged and correctly assembled burner parts are essential for a stable, even flame and clean non-polluting combustion. Furthermore, the burning behaviour and flame aspect of the burners is defined mainly by:

- the type of fuel gas (energy content, combustion properties, flow properties)
- the gas flow and the pressure on the main nozzle
- the primary air supply after the main nozzle
- the supply of secondary air

The most important criterion for a good flame is a complete combustion of the gas and only very low traces of pollutants (CO, NO_x ,soot) may occur. If this is achieved, the burner exhaust air contains only natural CO_2 and humidity.

However, there is always required:
adequate combustion air (burner must not be overloaded)
good premixing of gas and air.

4.1.1.1. Background information about combustion

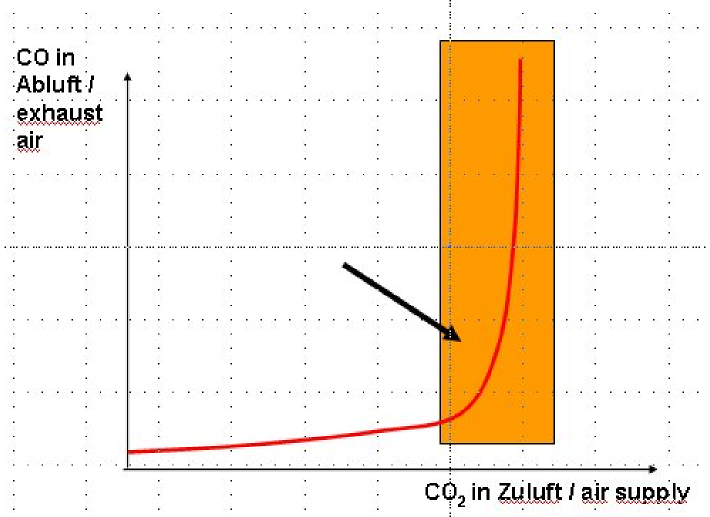
Example: Combustion reaction of burning natural gas

methane + oxygen -> carbon dioxide + humidity (water steam)
CH_4 + $2O_2$ -> CO_2 + $2H_2O$
(products of this reaction are not poisonous and integral parts of air)
Similar reaction with propane and butane (C_3H_8 and C_4H_{10})
To reach this reaction there is always required adequate amount of combustion air (means also: burner must not be overloaded) and a good premixing of air and gas. .
If there occurs a lack of oxygen there will appear following problems:

- Bad flame aspect, means soft, washy or yellowish flame, without clear visible („sharp“) flame cores
- Unsufficiant performance of burner
- Appearance of soot, pots get darkened by soot
- **Increased percentage of carbonic monoxide CO (poisonous!) in exhaust gas**

Danger of inadequate combustion .
Especially for percentage of carbon monoxide (CO) there is allowed only a ambitious low level (see overleaf).
Carbonic monoxide CO is a gas without taste, smell or colour. Therefore there are no alarm indicators. In air there will be no areas with increased concentration (CO will be distributed quite homogenous in air) because its density is similar to air density - 0,9 : 1). Mostly because of thermic CO concentration will reach highest values in regions above burners where air is breathed in by user.
CO causes toxic reactions already at a low percentage contamination because these molecules take the position of **O_2** in the blood much better than **O_2.**. CO contamination will be experienced with watery eyes, headache, fatigue, loss of consciousness and finally death..
Signs of toxication depends on CO- concentration and time of exposure and can be suffered well below 0,1% CO within the breathing air

CO Concentration in burner exhaust air rises, if there is a higher percentage of CO_2 in the air supply of the burner (instead of oxygen O_2)
This rise of CO occurs dramatically above a given limit of CO_2 in supply air, i.e because of “used” air in the air supply of an appliance or burner (bad ventilation in room or room to small or used air of an oven burner comes to the primary air of the hot plate burner).



4.1.1.2. CO limits for burners

CO percentage in exhaust air can only be measured in a difficult process (collecting all the exhaust products of an burner or of an appliance by a specific device, analysing also needs specific device and procedure).
The measured values are representing than the relation of CO to the whole exhaust air, but not to concentration in whole room or area on the near of the hob (there the exhaust air is mixed with other air and so the CO percentage which can be breathed is even lower).
The standard EN 30 defines a maximum CO percentage in exhaust air of every burner (working alone) below 0,01% and for the whole appliance (all burners working together) below 0,02%. There are defined the size of pots used for this measurement (very big, kind of worst case) and other using conditions.
In correct use the burners used in BSH appliances are well below the limits

4.1.1.3. Burners creating CO

There exist some specific situations where burners can create remarkable concentrations of CO, for example::

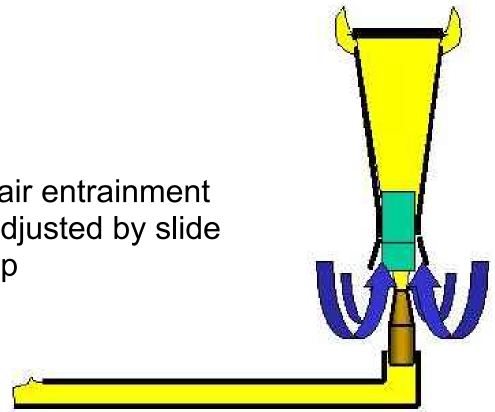
- ► Overload of burner (to big injectors, i.e. using NG injectors on LPG use)
- ► Blocked air supply or air exhaust channels (mostly on oven burners)
- ► Small room with poor ventilation and a high burner performance
- ► To less primary air

Beneath a change in flame aspect (to big and yellow or blue but bad defined, unsteady and always “searching” for some fresh air) a wrong working and CO producing burner can be indicated by sooty pots and a tendency that user experience watery eyes or headache when using the burners. On cooktop the highest CO concentration can be found above the hob (in height where users breath in the air) because it is in near of the source and warm combustion product (exhaust air) will likely rise into that area.

The situation listed above on first position is found in many occasions when an appliance is used with LPG but without changing the injector nozzles to LPG (bigger diameter of NG nozzles lead to a high flow of LPG and energy, means a severe overload of the burner).

In any case do not manipulate the burners by using other injectors than the ones which are actually designed for the burner and the kind of gas Use original nozzles only from nozzle sets and use them according the tables!. (The injectors used in our appliances are designed specific to ensure a correct energy flow and optimum air supply in order to fulfill the requirement for a low CO concentration).

4.1.1.4 Burner with adjustable primary air



The primary air gap is altered by changing a setting device (clamp, slide) and adjusting the primary air supply to the conditions (primarily to the gas type).

There are also solutions, such as adjusting a screw in the mixing pipe, which can achieve the same effect.

Large primary air gap:
=> sharp, bluish flame, has a tendency to lift off, hisses, small flame may backfire

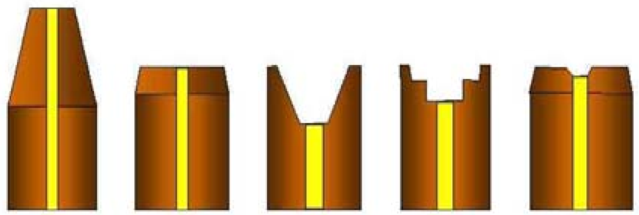
Small primary air gap:
=> soft flame, tendency to yellow tips, blazing flame or soot formation

The optimum setting is determined by an optical assessment of the flame and noise (no measuring equipment available) according to the following sequence:

- Switch on burner and heat up (approx. 5 min)
- Operate burner at high setting
- Reduce primary air (soft flame), then increase slowly
- Flame lifts off or hisses loudly => reduce primary air slightly

4.1.1.5 Burner without primary air adjustment

On many modern burners the primary air cannot be adjusted. Even these burners operate with a primary air supply adjusted to the burner and gas type. Apart from the design of the burner this primary air supply is specified by the size and shape of the utilised nozzles (in particular the shape of the bore outlet affects the entrained primary air flow)



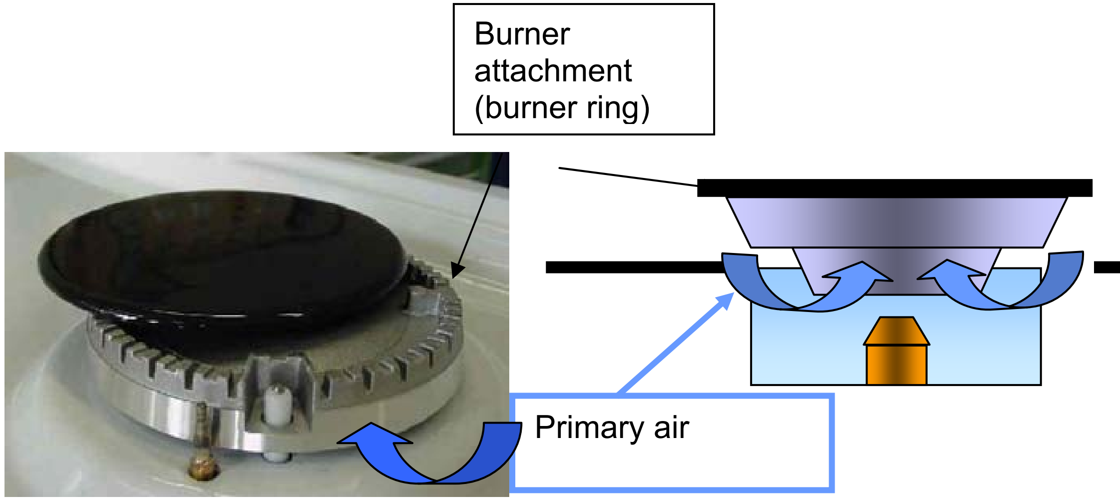
Dirt or damage (e.g. burrs, roughness) on the nozzle tip may obstruct the air entrainment, causing poor combustion (sooty pans, yellow flame tips, unsatisfactory exhaust gas values).

4.1.1.6. Supply of primary air to the nozzle (injector):

There exists 2 different appliance concepts :
a) nozzle (injector) is located inside the appliance, s the primary must have the possibility to come into the hob interior of gas hob. Mostly this is realized with a rear profile which contents open areas for air inlet. This air inlet must not be blocked on burner use, as otherwise on use there will appear functional problems and bad flame aspect after some minutes. (flame gets yellowish, gets weak or instable and is "searching for air" because of lack of air Consequence is that thermocouple may not longer been heated properly and flame is shut off than
Because on this concept there is possibility that air pressure fluctuations inside hob could blow out the flame via the primary air on this concept the hob base must be tight against a drawer or cabinet below.
b) The injector nozzle is located function -wise above the hob top. The primary air must not flow into the hob interior but flows to the burner above the hob top (see right side). .

4.1.1.7 Burner with primary air intake above the hob

Burner patent Sabaf and Defendi:



This burner is supplied with primary air above the hob, but below the burner attachment
(in other designs an opening is required in the hob sheet for the primary air supply, usually on the rear edge of the hob behind a raised strip).

Otherwise the primary air is premixed via the dimensioning and design of nozzle and burner flute.

An incorrectly attached burner attachment here causes a change in the primary air gap (sharper flame at high setting, on liquid gas small flame has tendency to backfire).

4.1.2 Problems with flame aspect / combustion characteristic

Incorrect setting or supply with primary air causes the following **fault mechanisms:**

Too much primary air:

Large flame: flame hisses or lifts off, flame ignites poorly

Small flame: flame may backfire (if liquid gas, especially propane is used, the flame goes inside the burner towards the nozzle and goes out with a “pop” or may continue burning on the nozzle, especially if the burner parts have been assembled incorrectly)

Too little primary air:

Flame burns soft and yellow, flame is sooty (residue on pans, flame ignites poorly, unsatisfactory exhaust gas values (CO content increases), too low burner power

4.1.2.1 Flame burns yellow or too soft

Possible causes:

- ▶ Poor primary air supply due to incorrect air setting or installation fault on the burner or too low air supply to the hob (primary air supply openings into the hob incorrectly positioned or covered (maybe only parttime by customer)
- ▶ Low oxygen content in the combustion air (room too small, no circulation due to side walls or pans too large)
- ▶ Burner overloaded (wrong nozzle, wrong gas)
- ▶ Poor primary air entrainment on the nozzle due to damaged nozzle (dirt, burr or edge on nozzle outlet, nozzle installed incorrectly) or due to flow fault in the mixing pipe (foreign object, insect, cooking residue)
- ▶ Leak on the burner foot or gas tap, gas escapes and enters the primary air intake (as a result increased gas flow and too low air flow on the burner). If this occurs only after the appliance was in an idle state, check for a gas leak in the hob base (leak in idle state before safety valve, accumulation of leakage gas, see leakages).

Examples for flame aspect

Flame ok (bluish)- (Sabaf burner used with natural gas)

Flame not ok (it is Sabaf WOK, used with natural gas nozzle and LPG 30mbar)

4.1.2.2. Flame burns reddish –redish - orange flame tips

In difference to the yellowish flame a reddish flame is not a direct indication for a faulty burner function. Combustion values, performance and general function are in many cases fully correct (different reasons see below)..

Root cause for reddish flame are mostly particles which are burned together with the gas. These particle could have following sources.:

- High air density or dust (i.e farina)
- salty air (i.e. with heavy salted water this effect will appear after longer period of warming the water when there are taken salt particles with start of boiling into the air above the cooking zone.
- Metallic particles from the gas pipe (outside or inside the appliance) ort the gas bottle.
- Dispatched enamel particles from the burner cap. On certain burner types the flame can touch enamelled parts of burner cap. This leads , mostly after 5-10 minutes of use – to an dispatching of some few small particles, which causes the reddish flame colour. There are no damages visible at burner cap, burner can be used for years with this situation. On most cases this effect is more obvious when burner is used without pot, because than the flame rise steeper from the burner mouth and touch the enamelled parts of burner cap..

If there are not detected other reasons, mostly the matter „enamelled burner caps“ is causing the effect.

Examples:

Ceran flat burner
Bluish flame (after burner start)

Ceran flat burner
reddish flame (after 10 min)
because of touching flame at the enamel
no fault

Sabaf Dual Wok
reddish tips (after 10min)
no fault

4.1.2.3 Flame hisses and lifts off

Too much primary air due to incorrect setting or incorrect installation of the burner (mixing pipe inlet too far from nozzle)

Too high connection pressure

Too high gas flow (incorrect nozzle)

4.1.2.4 Flame backfires (melted burner parts)

If the flame can cross the “burner moth” from the outer region and jumps into area beneath the burner ring this is called backfire or flash back of burner. (basically the speed of gas flow at burner is lower than the flame speed of the given gas – air mix).
Possible factors which enable a backfire – flash back of flame.:

- ► Too much primary air (incorrect air setting)
- ► burner parts assembled incorrectly) or placed with incorrect position, e.g. incorrectly installed burner ring, burner cap.
- ► Strong air draught in burner area

Backfire or flash back occurs most frequent with liquid gas (higher risk with propane) but is possible with all gases. Usually it happens when power setting is changed toward small setting and back (turning the gas tap). Because of reduced speed of gas flow flame can “jump“ through the burner mouth (holes or channels at burner ring) and burns inside in the near of the injector nozzle. In most cases flame extinguishes there because in this room is to low air supply. If flame remains inside the burner it can be shut down later by safety device because in a majority of cases the flame at the outer region - and so at the thermocouple – disappears. However in certain cases a part of flame can burn inside for longer time in that area causing damages of the burner by heating up burner material into the near of melting point.

In most cases the backfiring is accompanied with a sudden and sometimes loud “blopp” noise which is followed - if the flame does not extinguish inside the burner – by a hissing noise inside the burner.

Melted burner are always a result of a backfire. (without backfire burner parts can not melt alone because of an overload of burner).

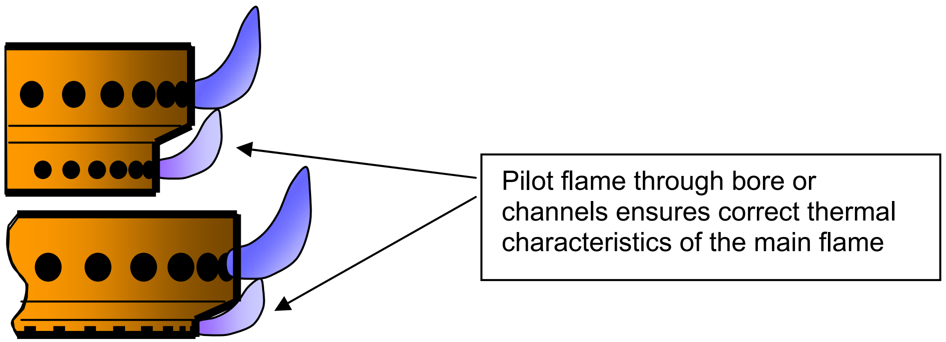
Dual WOK burners are more likely to get damaged by backfire because the backfire can happen at outer circle and the inner flame (correct working) keeps the safety valve open for long time.

Above: Sabaf burners with signs of backfire (left) and melted.(right)

left: Isphording Wok burner where the backfired flame of outer burner has melted the socket for inner burner

4.1.2.5 Flame breaks away on one side

Incorrectly positioned pilot flame channels result in poor thermal characteristics on the burner



Incorrectly positioned bores/ channels on the burner cap result in an overload of the remaining bores: flame burns unevenly

4.1.2.6 Flame asymmetrical

- Gas jet does not enter the mixing tube centrically (base of the nozzle in the burner foot or nozzle bore not straight).
  For test: rotate main nozzle by 180 degrees; if the asymmetry rotates with it, either the nozzle or the burner foot is the cause of the fault
- Mixing pipe or burner dirty or modified (corroded)
- Flue effect if operating several burners with pans on burners, the flame pulls towards the middle between the burners (not a fault)

4.1.3 Flame extinguishes

Different configurations are known. A distinction must be made between burners without safety device and burners with safety device r (see overleaf).

4.1.3.1 Flame extinguishes on burner without safety device

It is almost exclusively the small flame which goes out.
Possible causes:

- Too low small flame setting
  Bypass nozzle or small flame channel in the gas tap incorrectly positioned, see Overgreasing,
  Bypass nozzle incorrect or incorrectly adjusted, see Small flame nozzle and setting the small flame.
  Test also when other burners are operated on maximum (=more demanding condition due to pressure loss), see also Connection pressure, potential faults,
  Note:
  Frequently a bubbling can be established (partial extinction and re-ignition), indicating that the small flame gas flow is inadequate and that complete extinction is possible under additional unfavourable conditions
- Draught above the hob
  e.g. through window or extractor hood
- Draught inside the hob (in the area of the primary air intake of burner)
  e.g. by opening or closing a drawer or door under the hob.
  Many appliances (which have primary air supply into the inner of appliance) today are designed with a hob base which is sealed below and which can therefore withstand a so-called door impact test without the flame going out (check seals); on other models with a built-under door or drawer an air-tight furniture partition must be installed, installation instructions).
- Bad primary air supply into the hob base with use of other burners with maximum setting. (maybe strip for primary air supply into the hob base is covered by cooking accessories or with tea towel or other objects?). This problem may occur only part-time, depends on behaviour of customer !) Bad primary air supply should be visible also in bad flame aspect in maximum setting
- Flame goes out if there is a slow switchover from large to small flame
  To much grease in Gas tap, see Overgreasing
- Flame goes out if there is a quick switchover from large to small flame (liquid gas)
  Fault with burner supply line and burner dynamics. Check burner parts (mixing tube) and burner supply tubing for dirt or other objects (insects)

4.1.3.2 Flame extinguishes on burners with safety device

The same causes are possible here as for burners without safety device . Unlike an unprotected burner, the flame here does not go out gradually due to constantly inadequate gas, but the flame is usually switched off by the solonoid valve (safety device) .

In addition to a low gas flow for the small flame, fault mechanisms as described in Complaint "Flame is not maintained" are possible. However, only under certain conditions during operation does inadequate thermal e.m.f. occur and therefore disconnection of the burner.

In particular, this may be actuated by:

Burner small flame goes out:

- Too low small flame setting
  Bypass nozzle or small flame channel in the gas tap incorrectly positioned, bypass nozzle incorrect or incorrectly adjusted, see, Small flame nozzle and setting of the small flame. Test also on other operating burners due to pressure loss, see Connection pressure, potential faults
  Note:
  Possibly only the heating bore for the thermocouple is just adequately supplied (heating flame bubbles, bore free and positioned correctly?)
- Small flame passes over the thermocouple (weak supply to the heating bore or unfavourable (= too deep) position of the thermocouple with respect to the burner and the flame (see also Influence of the burner installation on the ignition)
- Brief heating fault (brief faults are generally detected by the thermal inertia of the thermocouples; especially on modern, rapidly responding thermocouple combinations, however, disconnections are quite possible within seconds in the course of flame faults.
  Causes of brief faults:
- Draught above the hob
  e.g. through window or extractor hood
- Draught above the hob due to thermal characteristics as a result of the operation of other burners with pans on burners = flue effect.
  Problem: This effect is apparent only when the actuating situation is corrected
- Draught inside the hob (primary air intake)
  e.g. by opening or closing a drawer or door under the hob.
  Many appliances today are designed with a hob base which is sealed below and which can therefore withstand a so-called door impact test without the flame going out (check seals);
  on other models with a built-under door or drawer an air-tight furniture partition must be installed, installation instructions).
- Bad primary air supply into the hob base with use of other burners with maximum setting. (maybe strip for primary air supply into the hob base is covered? by cooking accessories or tea towel or other objects. This problem may occur only part-time, depends on behaviour of customer !) Bad primary air supply should be visible also in bad flame aspect in maximum setting. This may cause also a switching off in maximum setting (with pots on the burners)

Burner large flame goes out: see overleaf

Burner large flame goes out:

- **Flame lifts off due to air setting**
  too much primary air
- **Flame lifts off due to burner overload**
  incorrect nozzle, too high pressure
- **Flame lifts off due to flue effec**t (thermocouple does not heat correctly if several pans are on burners, possibly only occurs if pan with cold contents is placed on burner)
  Remedial action: optimise heating of thermocouple, position
  Likely to happen on specific burner (sourdillion burner with chamber for thermocouple, which has a reduced air supply)
- **Flame lifts off due to humidity evaporating** on the burner (occurs only occasionally if water comes into contact with the burner and evaporates for several minutes during the heating process)
- **Thermocouple too high in flame**
  when the pan is on the burner, the flame goes flat under the thermocouple tip or also heats the cold solder joint,
  see Complaint “Flame does not hold”
  Remedial action: optimise heating of thermocouple by position
- **Thermocouple too close to burner orifice**
  Result: Thermocouple is not heated correctly**,** as it is in the cold zone of the flame
  Remedial action: optimise heating of thermocouple by position
- **Flame “swims”** (does not burn sharply) due to **inadequate primary air supply**
  Primary air supply into the hob obstructed (e.g. by incorrectly seated hob seal, user has diverted primary air supply with tea towel or other objects)
  The effect may also occur after several minutes operating time when the air supply in the hob base is used up
  Remedial action: ensure primary air supply, optimise heating of thermocouple
- **Flame does not burn sharply due to gas leaks in the hob**
  If the gas system in the hob is leaking, the leakage gas flows into the intake area of the primary air (larger gas flow rate, less air) and the flame deteriorates.
  Result: Thermocouple heated poorly, flame does not hold or switches off,
  Remedial action: **test for leaks**
- **Flame “swims” due to inadequate secondary air supply**
  (especially two-ring burners or thermocouple in chamber)
  Hob installed in recess with poor air replacement,
  secondary air obstructed by large pans,
  thermal characteristics in start-up status deteriorated due to cold pans
  Remedial action: appliance installation according to specifications, optimise primary air, optimise thermocouple position.

4.1.4 Burner power - time to boil

It is difficult to specify the power used by a hotplate burner. Furthermore, the power is dependent on several influencing variables such as gas type and especially type and size of the pan

Burner load;
Therefore, the burner power under specific conditions is indicated by the **energy supplied in the gas** to the burner. This value is called the burner load.

This energy is the product of

- volumetric flow per unit of time (dependent on nozzle bore, pressure, flow characteristic of the gas)
- Energy content of the gas

Burner load $\mathbf{Q = V * H_s}$

Specification of the burner load:
In accordance with standard EN30 the calorific value of a normal gas (under so-called refernce conditions = 15 ° gas temperature) is used to specify the burner load. This means that a gas which deviates from this reference gas also has other power ratings on the burner. The deviation by another gas condition can be calculated from the comparison with the Wobbe index.

Examples (with maximum possible power loss due to lower calorific value of the utlised gas in comparison with normal gas):

Type of gas	Standart gas (Calorific value/ Wobbe index W_{sref})	Gas actually available (Calorific value/ Wobbe index)	Power reduction in %
Natural gas	G20 11.0 kWh/m³ 14.1 kWh/m³	Natural gas L (e.g. in DE) 9.1 kWh/m³ 11.4 kWh/m³	**26 %**
LPG (30/37 mbar) ³	G30 Butan (30mbar) 35,1 KWh/m³ 24,2 KWh/m	G31 Propan (37mbar) 27,0 KWh/m³ 21,4 KWh/m³	**0%** compensated by higher pressure 37mbar

To test the burner power only the gas flow rate can be tested in the customer service case.

Flow rate values for natural gas (at correct connection pressure) can be found in the table under the connection pressure topic; Natural gas: Assessment of flow rate via gas meter .

Also on liquid gas there can be measured the gas flow, but not directly but by measuring the weight loss of the gas bottle. (special gauge with great range but detailed scaling necessary, ET 340695), Use of 72 gram LPG/h means 1 KW)

4.1.4.1 Boil start complaints:

The “swiftness” of cooking on gas hotplates is often praised in advertising. However, on closer examination this applies only to the quick response to a change in the flame (no thermal inertia by transfer of heat to sandwiched materials, such as individual hotplate or ceramic).

The boil-start times themselves do not differ significantly from electric hotplates used in a similar way if usual amounts of water are used in practice. Just like in the electrical areas, boil-start times are much more dependent on the pan (mass, size, shape) than on the design of the hotplate.

Typical values for some burner variables can be found in the table opposite.

If these times are not reached by an individual burner, poor combustion (air setting) or wrong nozzle can be considered as a potential fault.

If the problem occurs on all burners, the calorific value of the gas must be considered, probably inadequate connection pressure.

An exact measurement of the boil-start time is relatively problematic, as many influencing factors must be taken into consideration, *i.a.*:

- Initial temperature of the water,
- Boiling time not defined exactly (in general: measure time until 95 °C is reached, measure preferably with liquid thermometer, special pan lid required)
- Influence of pan size, material and shape
- Influence of the energy content (Wobbe index) of the gas, deviations up to 25 % of the nominal value possible (see previous page)
- Different burner loads (nominal values) of the installed burners

Example- Table of boil-start benchmarks:

1 litre of water from 20 °C to boiling point, enamelled pan (Silit) and aluminium, with attached pan lid

Gas type (Wobbe index W_{sref} in kwh/m^3)	Pan/base diameter 180/165 mm on standard burner (1.7–1.85 kW)	Pan/base diameter 220/185 mm on high-capacity burner (2.9–3.0kW)
Natural gas with Wobbe index at nominal value of the test gas Natural gas H (14.2)	Enamelled 7:50–9:00 Alu: 6:50–8:00	Enamelled 5:50–6:40 Alu: 5:10–6:00
Natural gas at reduced burner power Natural gas L (11.5)	Enamelled 9:40–10:50 Alu: 8:30–9:40	Enamelled 7:30–8:30 Alu: 6:30–7:20
Liquid gas burner power according to EN437 butane (24.2)	Enamelled 7:50–9:00 Alu: 6:50–8:00	Enamelled 5:50–6:40 Alu: 5:10–6:00
Liquid gas burner power with 95 % propane mixture = Germany DIN 51662 (21.4)	Enamelled 8:50–10:00 Alu: 7:50–9:00	Enamelled 6:50–7:40 Alu: 6:00–6:50

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4.2 Gas tap

The gas tap:

- enables the gas flow which is set by the user
- specifies the small flame flow by the utilised small flame nozzle

4.2.1 Designs

- Gas tap without thermal release (without safety valve)
- Gas tap with straight thermal release
- Gas tap with angular thermal release (angular tap, actuation spindle at 90° angle to the valve spindle)

For some time the gas appliances have been using in general only gas taps which include only the small flame nozzle (bypass nozzle). The main nozzle (injector) is then situated in the burner.

However, there are also older gas tap designs (years of manufacture up to 1992) which had an integrated main and small flame nozzle.

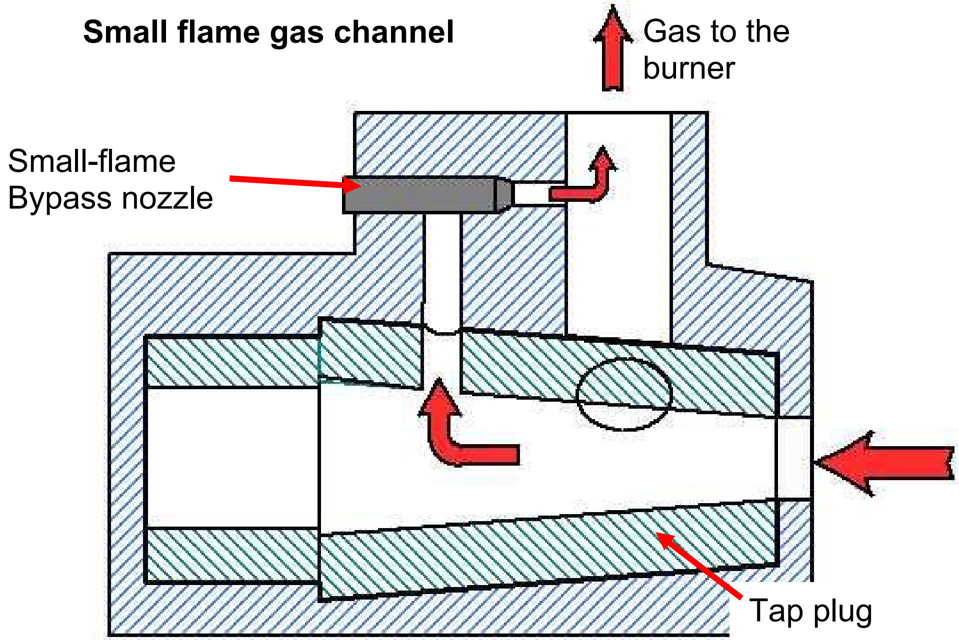
4.2.2 Low power setting

4.2.2.1 General information:

In one series gas taps are used which have an identical housing and identical tap plugs (rotating part in the gas tap).

The difference between the individual gas taps in a series is only in the size of the utilised small flame nozzle or the adjustment of the small flame nozzle.

4.2.2.2 Small flame nozzle and setting of the small flame

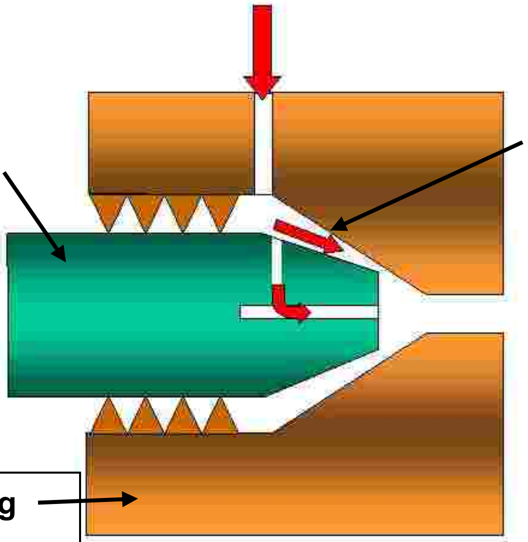


Each burner requires a specific minimum gas flow rate to ensure a stable burning behaviour. (If this gas flow rate falls below the minimum value, the burner goes out, however excessively large gas flow rates for the low setting result in customer complaints: “Food is burning”).

The required minimum gas flow rate is defined exactly by the use of special small flame nozzles (bypass) for each gas type and burner power. (see overleaf)

a) Small flame setting with positive stop:
The small flame nozzle is rotated all the way into the holder, the small flame gas flow rate is determined by just the size of the nozzle bore. If liquid gas is used, the smallest nozzle diameters are required (on account of the high energy density of the gas and relatively high connection pressure 30 or 50 mbar). The nozzle sizes are stamped on the nozzle head (e.g. 32 = bore diameter 32/100 mm).

b) Small flame setting to "annular gap":
By slowly unscrewing the small flame nozzle, a conical gap forms between the nozzle tip and tap housing (= "annular gap"). The gas flow rate via this annular gap can therefore be increased steplessly, the small flame can be adjusted.
No practical measurement method, adjustment by appearance only: Requirement: "as small as possible, as large as required", flow rate measurement would require precise data about the low setting flow rates, no measuring instruments = gas meter for liquid gas).



Requirement: The bore in the existing nozzle must cause a lower flow rate at the positive stop than required for burner.

Check stable burning behaviour (burner at operating temperature, other burners set to large flame, quick switchover from high to low setting, moderate draught due to fanning at low setting).

Occasionally appliances are delivered from the factory in natural gas setting but the minimum (small flame) setting is done via annular gap by a nozzle with boring for liquid gas 30mbar (so realizing a small flame adjusted for natural gas use.

For conversion to LPG 30mbar the bypass nozzle has only to be driven in until the stop.
If the appliance should be used in LPG 50mbar however it has to be used specific bypass nozzles (with smaller boring, delivered with nozzle set) or it has to be accepted a slightly higher minimum power (when the existing nozzle designed for G30 /30mbar) is not exchanged but used in stop position for G30 /50mbar).

4.2.3 Using spare-part gas taps

If a gas tap is ordered as a spare part, a gas tap is frequently delivered which has an unsuitable small flame nozzle for the gas type and burner size required by the appliance.

The small flame nozzle in the "old" gas tap must be removed and inserted into the new tap!

4.2.4 Control characteristics – flow regulation

The components of a gas tap housing which determine the flow rate have identical cross-sections, but are regulated:

- different burner strengths (burner power settings)
- different gas types (different flow rates for the same burner power)

This configuration results in the following **control characteristics:**

Especially at low burner power settings and if using liquid gas, the control cam is moved towards the stop (low setting) and compressed. In some cases this behaviour results in **customer complaints:** (“cannot be controlled properly, cannot be adjusted properly, flame becomes smaller just before end stop”).

However, in almost all cases this phenomenon is not a technical fault and occurs on all appliances, the gas taps of which have been designed for different gas types. Even the competition uses such gas taps.

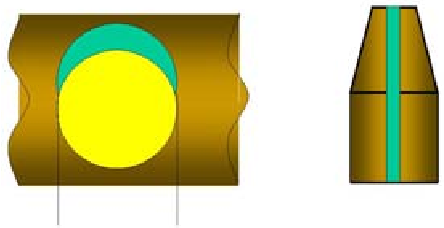
This phenomenon also occurs on natural gas operated appliances, the gas taps of which have also been designed for use with town gas (large bore required on account of large flow rates or low energy content of the gas).

In theory the occasional blockage of the bores in the gas tap (caused by too much tap plug grease) may also cause this phenomenon. However, experience shows that such blockages occur very rarely.

4.2.4.1 Reason for control characteristics: example

Gas flow cross-sections:

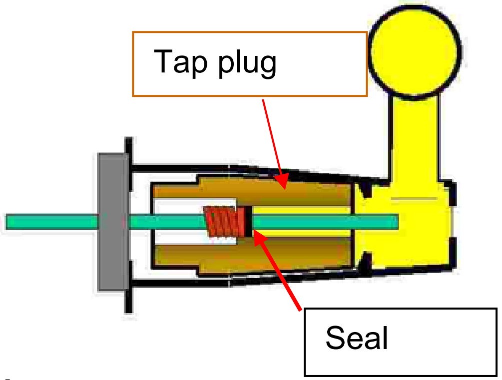
Tap plug   Main nozzle



Example: Liquid gas operation
A change in the cross-section from 9 to 2 mm^2 does not signify an appreciable change in the flame size, as the nozzle bore is still significantly smaller (0.3mm^2)

4.2.5 Tap plug:

The tap plug is the rotating part in the tap housing and has been ground conically to the respective housing. It is pressed into the housing wall by spring pressure. The bores for gas regulation and small flame are located in the tap plug.



Tap plug grease:
Special grease (tap plug grease, e.g. Staburags N32, spare-part no. 310354) ensures leak tightness of this fit and rotatability of the tap plug in the housing.

4.2.5.1 Undergreasing

Undergreasing or resinification of the grease causes mechanical friction or jamming of the gas tap and increased wear of the components.

4.2.5.2 Overgreasing

Overgreasing may occasionally cause incorrect positioning of the bores in the housing. ⇒ possible fault descriptions:

- Small flame goes out:
  ⇒ Small flame bore incorrectly positioned
- Part of the main bore incorrectly positioned:
  ⇒ Flame goes out between large and small flame, especially if setting on the gas tap is changed slowly

Remedial action:
In principle it is possible to open the gas tap in the area of the tap plug: however, there are exceptions!

Remove front plate, clean or regrease tap. Do not use hard tools to clean the tap and tap plug; scratches on the brass ⇒ leaks!

Attention: On quite new appliances do not open and work inside the gas tap (exception: exchange of safety valve)

In the case of angular taps the gas tap should be replaced generally (exception: exchange of safety valve) on account of the more complex mechanism.

If gas taps are made of diecast aluminium do N O T open the tap on the tap plug !

Diecast aluminium tap: do not open!

4.2.5.3 Mechanical friction of the gas tap

If there is inadequate or uneven greasing, resinified grease, unfavourable tolerances or signs of wear, gas taps may become difficult to move. This often occurs in the heated state (caused by reflection from burner or built-under oven).

Regreasing can be a permanent remedy for inadequate greasing only. (use correct tap plug grease; follow instructions for new, or diecast aluminium taps and angular taps!)

Attention: On quite new appliances do not open and work inside the gas tap (exception: exchange of safety valve)

4.2.6 Leak in the gas tap (tap plug):

Leaks in the gas tap may be actuated by:

- Grooves/ scratches in the walls,
- Foreign objects in the housing
- No spring pressure
- badly fitting seal on the spindle

Result: ⇒ Gas escapes from the tap spindle or from behind the front plate.

If several taps on an appliance leak, it may be assumed that the cause is a sporadically high gas pressure (e.g. defective pressure regulator on a liquid gas device).
The pressure regulator should then be tested or replaced.

See more about this in separate chapter gas leakages and smell of gas

Gas taps without safety device (thermal release):

Depending on the design of the tap, the leak may also occur in the zero position.

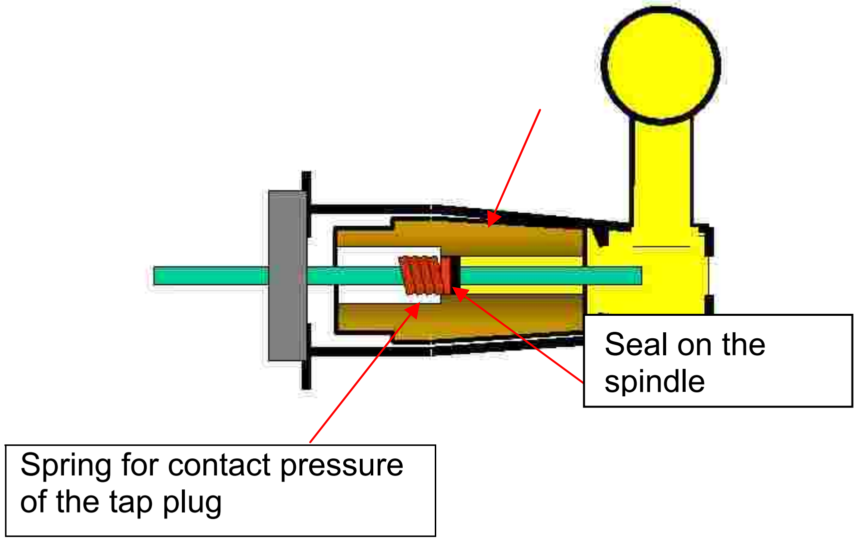
Gas taps with thermal release:

When positioning the safety valve at the gas tap outlet (e.g. for some angular taps), gas may also escape continuously from gas taps with thermal release, even when the tap is in zero position.

If gas taps feature a safety valve at the tap inlet, gas can escape only when the burner is operating (valve open).

See more about this in separate chapter gas leakages and smell of gas

Probably the leak also occurs only at specific settings of the tap or only occasionally.



Always replace leaking gas taps!

4.2.7 Leaks at the gas tap connection

There are different systems for connecting and installing the tap and tap pipe: Examples:

- Attach + seal via cutting-ring screw fitting on a spigot on the tap pipe (tap gallery)
- Attach with clamp, seal with silicone sealant and insert sleeve into the tap pipe

The second variant is usually used in current gas appliances.

Always ensure that this connection is leakproof. If a fault occurs, gas will escape continuously!

Experience shows that this connection is easily controllable provided installation is correct. However, always ensure that:

- the silicone seal is fitted correctly
- the seal is undamaged
- the tap does not exert excessive load on the connection (during installation work stabilise, counter and, if required, remove tap
- the fastening screws are tightened evenly and at the correct torque *

* correct torque : the torques usually used here are relatively low (examples 130 Ncm, 200 Ncm), i.e. in the customer service case the screws should not be tightened too hard (caution when working with open-ended spanner, lever arm !)

4.3 Gas tap with safety device - thermal release

In many appliance models the flame is monitored by a thermal release, or the gas supply is automatically interrupted by a safety valve in the gas tap if the flame goes out.

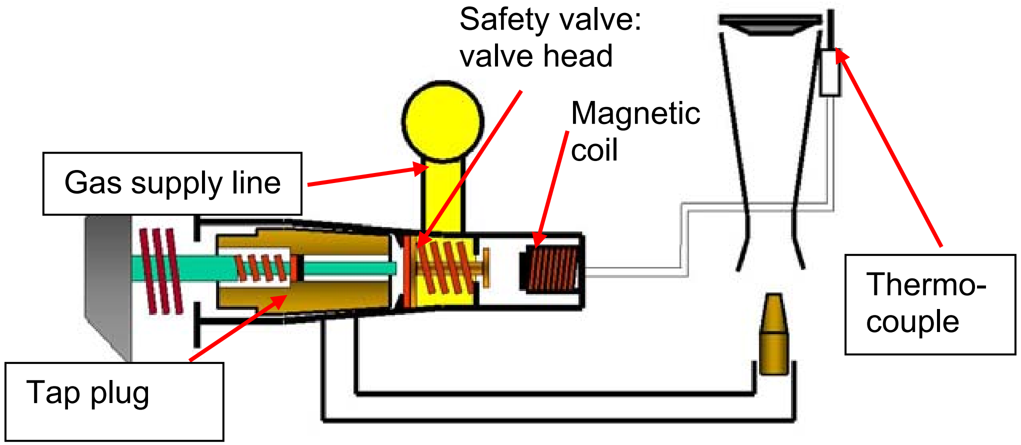
In Europe since 2009 it is not allowed to bring into market household gas appliances without safety device. In some other countries safety device was obligatory many years before.

Currently almost all systems in use feature a thermoelectric safety pilot (thermocouple automatically generates voltage according to the Peltier effect).

4.3.1 Thermoelectric safety pilot

Design and function: (illustrations without small flame nozzle)

4.3.1.1 Burner in idle state:

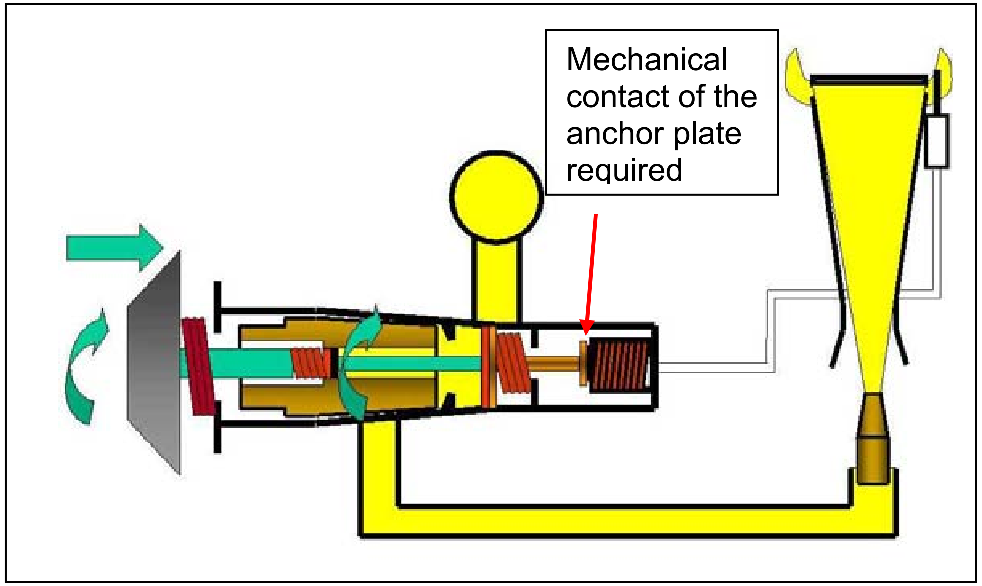


In the idle state the spring presses the valve head of the safety valve onto the stop and therefore closes the gas supply into the tap.

Therefore, in the idle state there is no gas pressure on the tap plug. A leak in the area of the tap plug would therefore have no consequences:

- no leaking gas in idle state
- no pressure loss when testing for leaks in idle state

4.3.1.2 Burner in operating state



Starting the burner: following processes

- Press in gas tap: ⇒ pressure is applied to safety valve
- Turn on: ⇒ gas to the burner
- Ignite: ⇒ Flame heats thermocouple
- Thermal e.m.f. is generated ⇒ current in magnetic coil
- Magnet holds ⇒ after 3–10 sec. if mechanical contact
- Requirements: good heating of the thermocouple, mechanical contact between anchor plate and magnetic coil in the safety valve

Safety function: If the flame goes out, the thermal e.m.f. drops ⇒ magnet is released, no more gas can escape.

4.3.1.3 <u>Safety valve (magnetic insert)</u>

The valve head, return spring, anchor plate and magnetic coil are integrated in the magnetic insert. If gas taps feature a thermal release, this magnetic insert can be replaced as a spare part.

The leak in the rear area of the tap (aluminium screw cap) is generated by contact pressure of the magnetic insert collar against the sealing surface in the tap. The contact pressure is generated via the thread of the screw cap.

Therefore this screw cap is screwed very tightly and is often very difficult to loosen.

When opening the screw cap:
Always counter the gas tap to prevent damage and leaks in the tap seat on the supply line!

In many tap designs (straight tap, see previous page Angular tap with valve at the inlet) the sealing surface between magnetic insert and gas tap is under gas pressure even when the tap is in an idle state

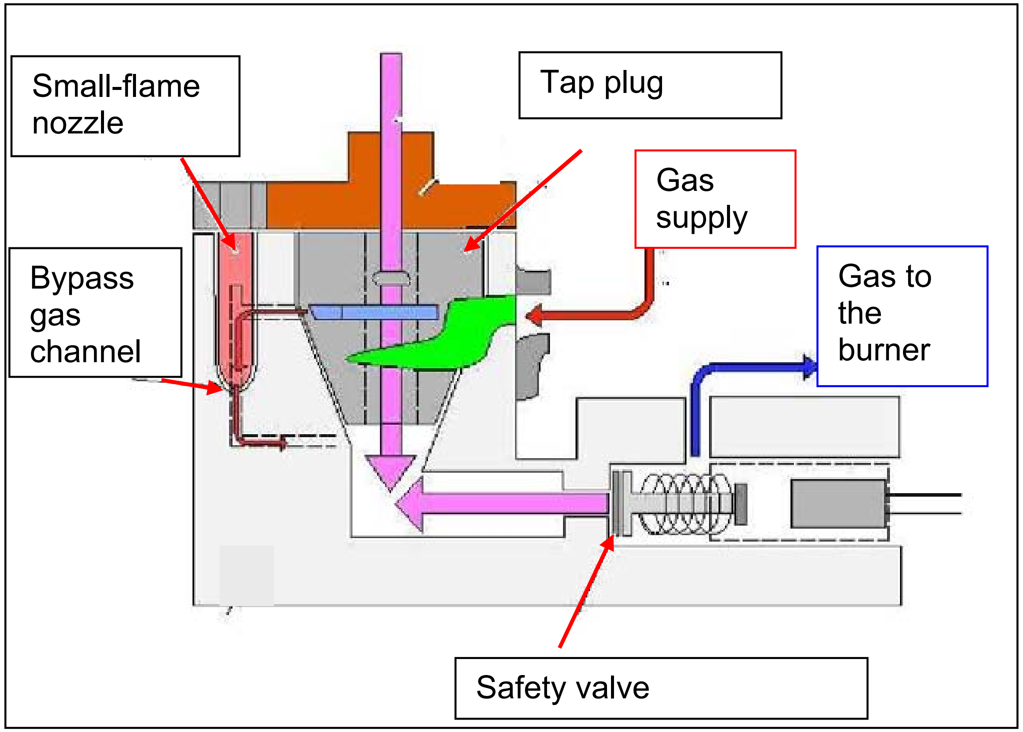
⇒ **Important:**
After replacing the magnetic insert, test the screw fitting and the tap seat on the tap pipe for leaks!

Contact surface between thermocouple and safety valve:

There are also designs which feature a plug-and-socket connection.

In each case a very good contact is required on account of the low thermal e.m.f. (contact resistance towards 0 ohm). The very low resistances prevent the valve from automatically remaining open.
Complaint “Flame is not maintained”

4.3.2 Angular tap with thermal release:

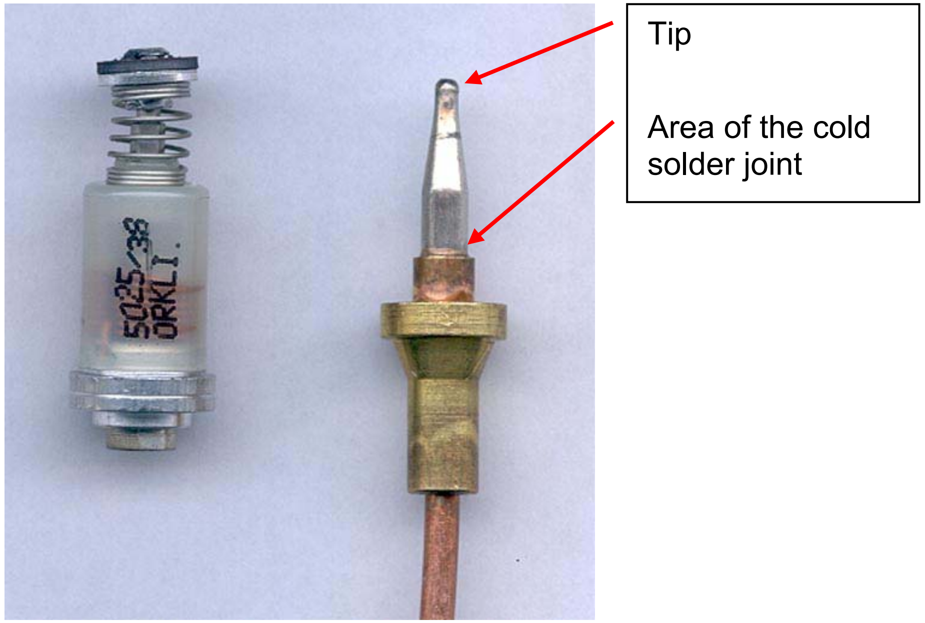


The function of the angular tap with thermal release is principally the same as described above (straight gas tap with thermal release). However, there are **3 differences**:

- Actuating travel control spindle – safety valve diverted by 90 degrees (plunger system, tendency to wear), this can also be the reason for “flame does not hold, if the actuating way of the spindle is not completally given to the magnet valve which leads to the problem “no mechanical contact of anchor plate to magnet”.
- In some designs the valve is situated at the tap outlet (gas channel towards burner), not at the inlet.
  Leaks in the area of the tap plug/ tap spindle may also cause gas to leak when the safety valve is closed. In some designs even the small flame nozzle is always under pressure (even when the gas tap is in the idle state)
  ⇒ Test for leaks even after changing nozzle.
  Hint: This design is not used in BSH appliances since 1998, on appliances produced afterwards the magnet valve has to be positioned in the gas inlet to gas tap .
- In the case of angular taps there may be an increased mechanical load (tendency to wear) on the tap plug. **Angular taps which are stiff or are jamming should not be regreased, but replaced** (see also Tap plug and Leaks)

4.3.3 Requirements of the thermal release

The thermocouple, when correctly heated, automatically supplies a thermal e.m.f. by the Seebeck effect; depending on the design and heating, the thermal e.m.f. is between approx. 5–30 mV (measured in unloaded state, circuit not closed).
On account of the low thermal e.m.f. the very low contact resistances in the system (contact on the magnet, solder joint on the coil) prevent the valve from remaining open (“flame does not hold”).
The temperature difference between the tip and the so-called cold solder joint of the thermocouple is essential for adequate voltage generation.



There are different designs of thermocouples and solenoid valves. These are distinguished i.a. by their electrical, thermoelectrical and mechanical properties (holding current, level and increase behaviour of the thermal e.m.f., retention and release force of the solenoid valve). In the appliances these designs are combined in such a way and tested with the existing burners that the system functions as required.

Only those components may be used and combined which are documented in the particular spare-parts lists!

4.3.3.1 Hold and drop-out times of the thermal release

The thermal release must ensure the following functions:

- **Hold time** (time after which the thermal release is automatically held):

  In accordance with DIN EN 30: max. 10 sec.
  From experience hold times above 5–8 s result in customer complaints
  “usual”: 4–7 sec.
  Note:
  There are also system which hold more quickly or which operate with a special quick-start device by means of an external voltage

  Longer hold times can be attributed to component tolerances (burner, thermocouple and magnet), however the component in question cannot usually be localised.

- **Drop-out time** (time after the flame goes out, during which the thermal release must switch off at the latest)

  90 sec. for hotplates

  60 sec. for oven

  This ensures that even if the flame goes out only small amounts of gas can escape unignited.

4.3.4 Malfunctions – causes – fault localisation

In principle the components are not subject to natural wear, nor is the thermocouple.
However, malfunctions occur frequently. The main problems with the components can be found in the following checklist:

The component in question cannot always be exactly diagnosed by customer service. Nevertheless, it is possible to proceed systematically.

4.3.4.1 Complaint --Flame does not hold--

Graduated procedure: Work through the points until the fault has been eliminated

a) **Visually check heating and position of thermocouple:**
how is it situated in the flame? in small flame, in large flame?
Optimum heating when **tip is situated just in the edge of the flame**, see also Influence of burner installation
Flame aspect o.k. (heating flame tearing away or misfiring)?

b) **Operation by customer**:
Is the spindle pressed far enough and at the correct time?
(Tip: "Before releasing, briefly press in again firmly")

c) **Mechanism:**
Can the tap spindle be pressed in far enough with attached knob?
Test without knob or (cooker hobs with internal gas taps) without telescopic linkage, if required align tap pipe, adjust telescope!
inner mechanic of gas tap (on angular tap, difficult diagnoses)
change tap
in any case valve must be pressed far enough to give an mechanical contact between anchor plate and magnet itself

d) **Electrical connection between thermocouple and gas tap:**
Screw connection tightened correctly? Loosen the screw and check/ scrape off contact surfaces and retighten! Check whether insulation between inner and outer conductors is o.k.?

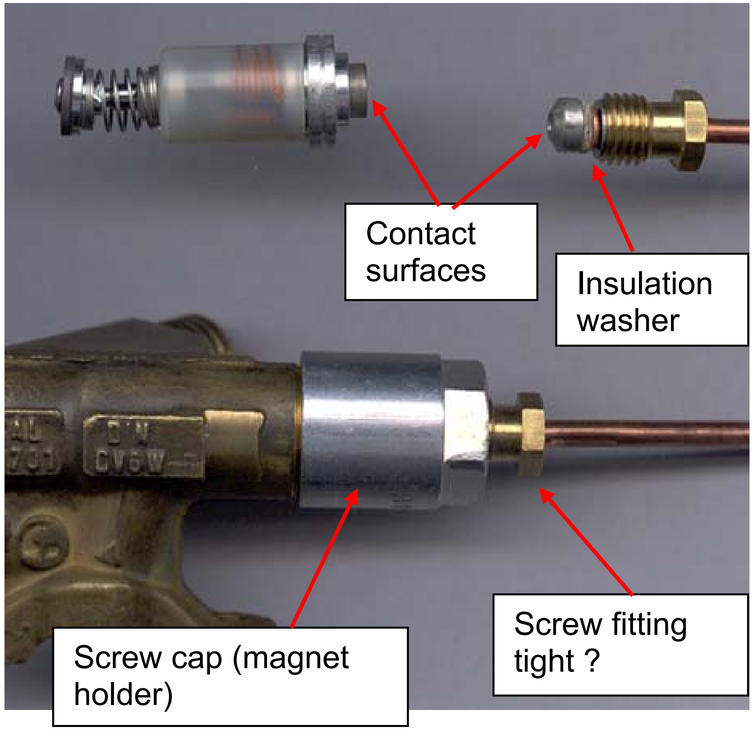
e) **Thermocouple function** Replace thermocouple!*

f) **Magnet function** Replace magnet!*

***Remarks on thermocouple – magnet function**
Diagnosis measurements (thermocouple ok? thermal e.m.f. adequate?) are difficult, time-consuming and have risk of measurement misinterpretation .

Conducting a test with a new part is more rational; as a result, contact surfaces which may indicate contact resistance due to oxidation are also replaced

However, it may be possible to localise faults reliably by exchanging the connection with a functioning adjacent burner.
Hold function with connected thermocouple of the adjacent burner ok?
(Actuate both taps for this purpose)
⇒ Thermocouple defective
Magnetic inserts may indicate faults also only sporadically (foreign objects on anchor plate)



4.4 Ignition systems

4.4.1 Operating systems and primary side

Modern gas appliances feature an electrical ignition system, usually with the generation of the ignition voltage from the mains voltage by an ignition transformer.
Exception: Piezoelectrical generation of the ignition voltage (impact on piezo element) or generation from battery voltage

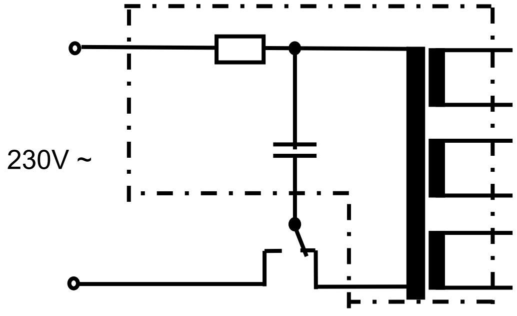
Different terms are used:

Single-handed ignition: The ignition sparks are released by actuation of the gas tap (by pressing in or rotating)

Two-handed ignition: Ignition also requires actuation of a switch (with second hand)

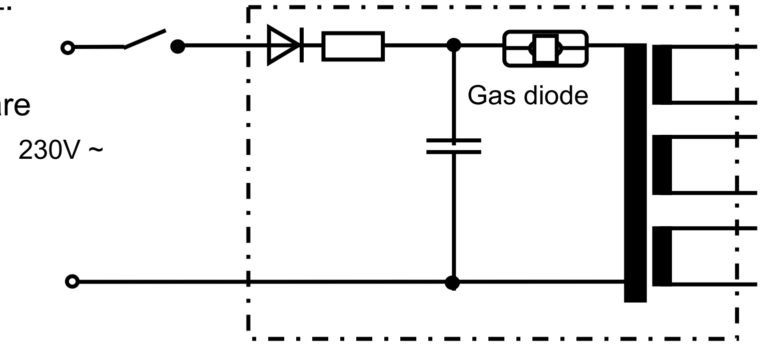
Single spark ignition: Each ignition spark requires a play (change) of the ignition switch

All ignition points are ignited together.



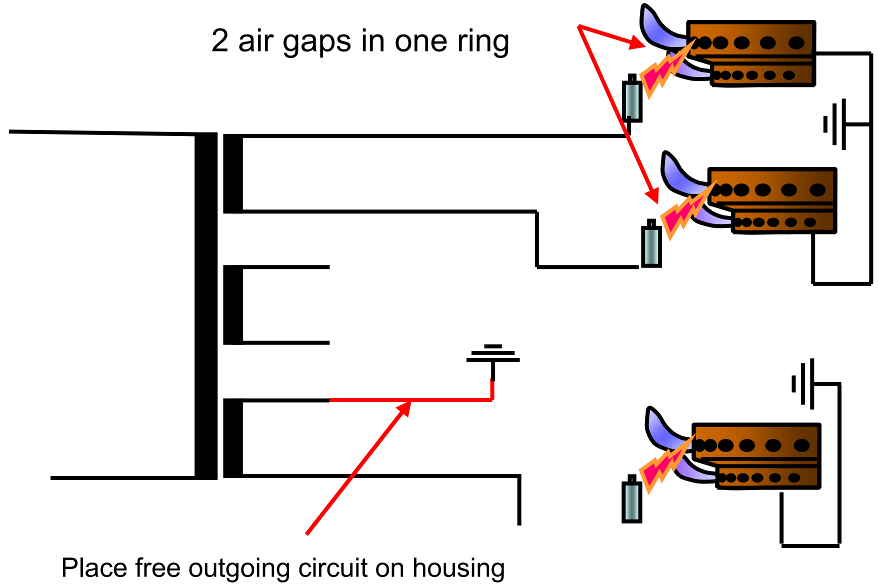
Clocked spark ignition: When the ignition switch is closed, a continuous clocking of the ignition spark follows automatically. The clock frequency depends on the components and is usually slightly above 1 Hz.

All ignition points are ignited together.



4.4.2 Secondary side:

Usually ignition voltages are approx. 5–20 kV. 2 ignition gaps are combined in one ring, i.e. supplied by one secondary winding. Therefore the total air gap which must be crossed by the ignition voltage is double the distance from a spark plug to the burner

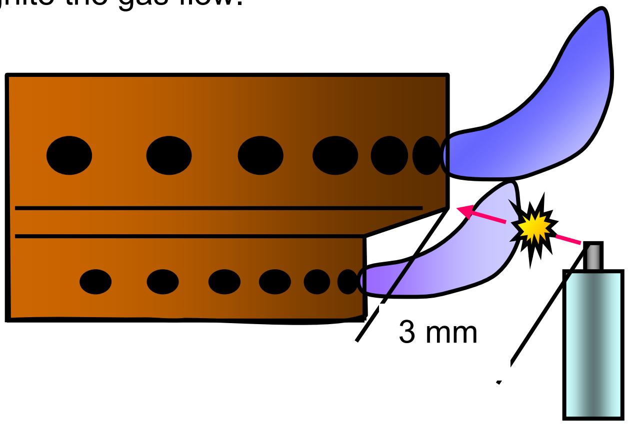


If the appliance has an odd number of burners, the free outgoing circuit from the ignition device must always be connected to earth. Otherwise the ignition energy is discharged in the coil and may also destroy the other coils.

4.4.3 Ignition gap – ignition probability

In most burners part of the gas flow ignites at a lower outflow rate (so-called ignition or pilot flame) and as a result ignition is more likely to occur.

A standard value for the ignition gap (air gap between ignition electrode and burner) is 3 mm. Therefore a good compromise is reached between the ability to cross this (double) air gap and the suitability to ignite the gas flow.



On many burners the ignition spark jumps in such a way that only part of the gas flow is penetrated, e.g. towards one edge of the burner ring under the main flow of the gas, see above.

4.4.4 Burner does not ignite – no spark

Even if the primary circuit is functioning correctly, there may be a problem with ignition of the flame.

Check whether:

- sparks are not being generated by any spark plug
  => ignition device defective)
- sparks are being generated by one spark plug only
  => Either the cable has been punctured (ignition spark to the housing, also possible on the body of the plug) or a coil in the ignition device is defective)

4.4.5 Burner does not ignite even though there is a spark

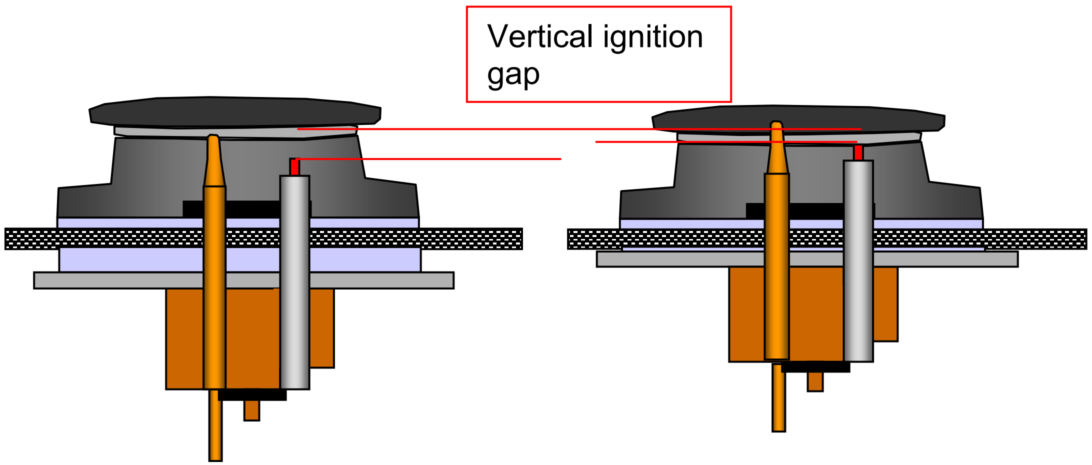
To ensure that an ignition spark can ignite the gas, several requirements must be satisfied. By optimising the influencing factors, an attempt can be made, even if there is no ignition, to restore the ignition.

- Gas flow rate (lower gas flow rate ignites better, setting by customer, advise customer)
  Also ensure that the bores in the area of the ignition gap are unobstructed and correct (flame aspect)
- Air setting, nozzle (high primary air setting ignites worse, however also an excessively "rich" gas-air mixture with low air content)
- Direction of the ignition gap (spark jumps correctly to the correct place on the burner
  If the ignition gap is too large or the ceramic body of the plug is damaged, the ignition spark may not jump correctly to the burner, but to wrong burner parts or to other metallic parts
- Length of the ignition gap
  if the ignition gap is too short, the ignition energy is lower and ignition propensity less. Check 3 mm dimension, probably the ignition gap can also be extended beyond the 3 mm dimension (do not select excessively long gap, otherwise the spark will jump "incorrectly")
  There are different options depending on the appliance (adjusting the attachment, checking or changing the burner installation, machining the electrode, levelling out tolerances by replacing the spark plug)
- Burner temperature – cold burners frequently ignite worse, impeding the assessment as to whether a repair procedure was successful

4.4.6 Influence of the burner installation on the ignition

Example: An incorrectly installed burner substructure is too near the burner head, other configurations are possible depending on the burner design.

Especially on burners where the position of spark plug and distance to burner is influenced by the assembly of burner into the hob a deviation in assembly can cause ignition faults, i.e. at the flat burners used since 2006 in ceran hobs.



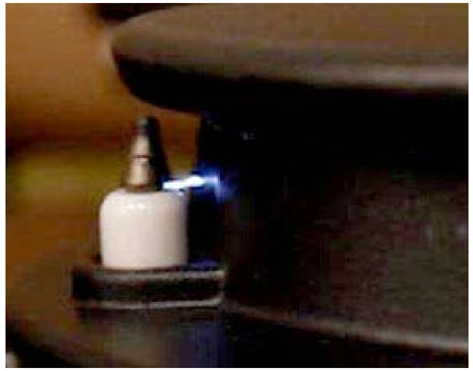
Possible cause: Seal on the burner is missing or too thin, as a result :

- the ignition gap is reduced (ignition probability drops)
- the thermocouple is situated higher in the flame (tendency: large flame does not hold well)
- If the flame becomes softer (if the free primary air gap is also shortened), the ignition propensity may also change: deteriorate if the mixture was previously too "rich", improve if the primary air content was too high.

Hint: also tolerances in the horizontal position or at vertical orientation (i.e. slightly declined towards the burner) will influence the length of the ignition gap and with it the direction of the spark and the ability to ignite gas.

Of course the exact opposite situation is also conceivable – burner substructure too far under the burner head.
Consequences:

- Ignition gap too long (spark jumps incorrectly)
- thermocouple too deep (flame switches off, especially small flame)
- primary air gap too long (flame too sharp or tendency to backfire increases)



example: Spark jumps downwards respectively horizontal - not to burner cap – burner does not ignite

Example: spark jumps correct to burner cap – burner ignites

Hint: in principle all above consequences exists parallel, but in the real live a deviation in assembly from specified position will be visible in nearly all cases first at the ability to ignite burner.

4.4.7 Continuous ignition – sporadic ignition sparks

Continuous ignition (prolonged ignition cycle) may be caused by a jamming ignition switch or a bridge over the ignition switch- frequently due to humidity in the wiring. In general the cause is easy to find.

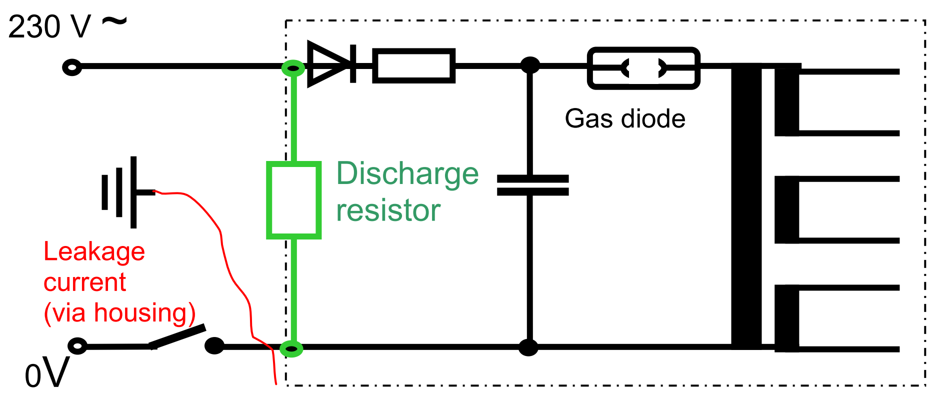
Sporadic ignition sparks (individual ignition sparks jump only very rarely, intervals can vary between several times an hour to once a day).

Cause: very high-resistance shunts (even via housing parts), causing the ignition device to charge very slowly. The cause is often difficult to find.

Remedial action:

1. Rotate mains plug
   This is only effective if the shunt occurred via the housing and the ignition switch has actuated the neutral conductor
2. High-resistance shunt resistor into the inlet of the ignition device. (as a result the there is a potential divider (of "Discharge resistor and bad insulation of wiring), which decreases the maximum voltage at the condenser and so prevents a self triggered sporadic sparking).
   Resistor 795533 (680 kohm, 0.5 W) has proved itself

Hint: most spare part ignition devices are delivered since some time already with integrated resistance..

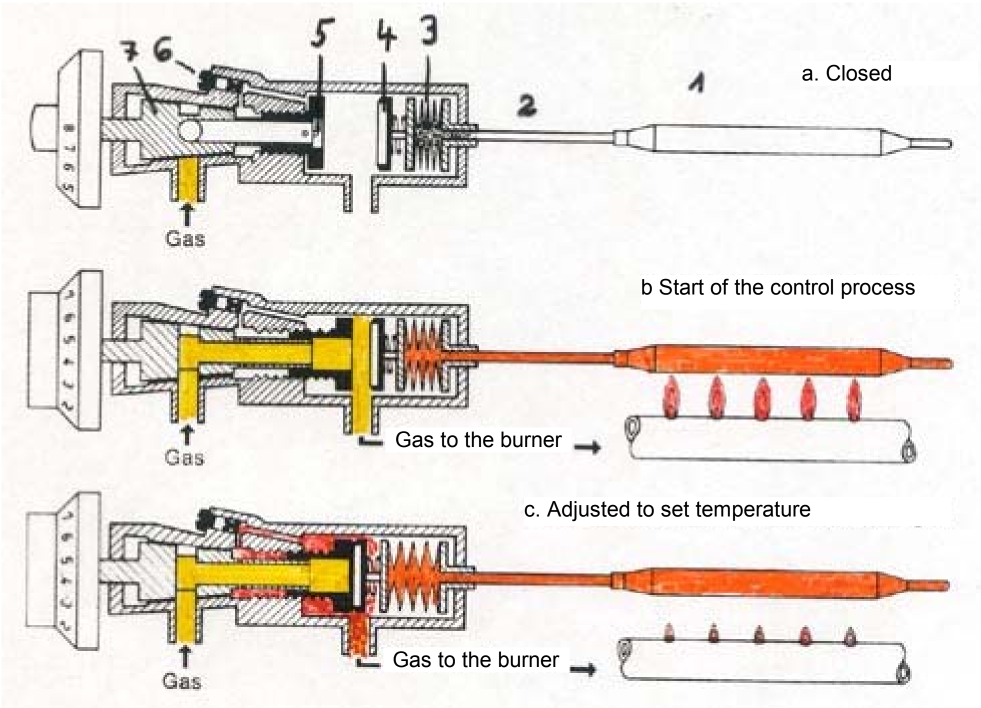


4.5 Gas oven controller- gas thermostat

4.5.1 Function

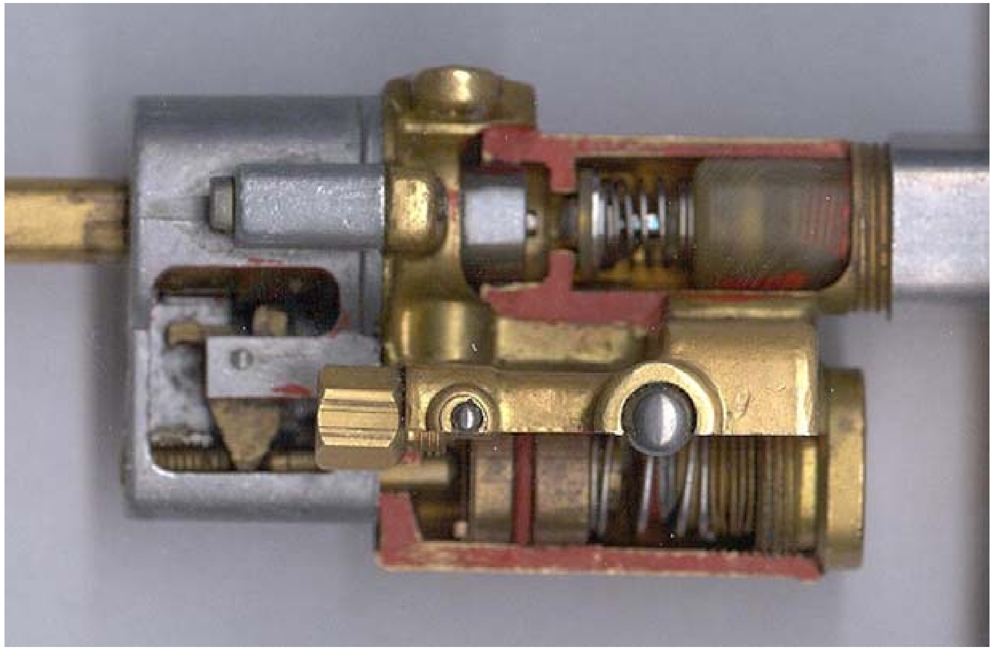
Thermostatically controlled gas flow rate allows precise temperature control with only gentle overshooting of a set temperature by a few °C (dependent on oven geometry and burner).

The tap plug (actuated by a spindle) has only one function in the controller: gas supply on/ off. The gas flow is metered by a valve head which is positioned via bellows of the temperature sensor (capillary tube).



In a cold state there is maximum gas flow through this valve head, irrespective of the temperature setting. The controlled maximum burner power is specified by an external main nozzle (in the oven burner).

When the sensor is heated, the valve head is pressed back by the bellows and the gas flow rate is gradually reduced.



The set angle of rotation of the control spindle (temperature preselection) clamps a counterpiece to the valve head via a spindle and plunger system and therefore affects the gas flow rate and finally the stagnation temperature in the oven

If the temperature is reduced while the sensor is heated, the gap closes between the valve head and pretension head. Now only the bypass gas channel (via small flame nozzle) supplies the burner. In this state the small flame flow on the oven burner can be assessed or changed by rotating the small flame nozzle.

There are also oven controllers in which the control gap can be mechanically closed to adjust the small flame (push through with test needle 015459), thereby rendering heating-up unnecessary.

4.5.2 Repair instructions

In principle, the same instructions for function of the thermal release and small flame setting (bypass nozzle) as for the gas tap apply to oven controllers with capillary tube controller.

In particular, this applies to the required replacement of the small flame nozzle when installing a spare part! (see Testing small flame)

However, the front plate on the gas oven controller should not be opened and the tap plug worked on (greasing, cleaning, etc)! Otherwise there is a great risk that the complex controller mechanism will no longer function.

4.5.3 Testing the control function

A temperature measurement is required to test the control function. However, the following points should be tested beforehand:

4.5.3.1 Testing small flame / flame aspect

- Flame aspect / air setting of the burner o.k.?
- Small flame setting o.k.?
  Quick test with test needle 015459 or
  10 min heating-up and turning back to lowest temperature, flame as low as possible, but stable burning behaviour).

4.5.3.2 Measurement / settings:

Place sensor for gaseous media on the wire shelf in the centre of the oven, avoid bringing the sensor tab into contact with the wire shelf.

Hot air:	160°	Tolerance*: +/- 5° or +/- 10°
Conventional:	190°	Tolerance: +/- 10°

* +/- 5° on appliances with separate controllers for hot air and conventional

Overshooting by approx. 5–10° degrees is normal. Wait to assess the steady-state condition without changing the setting (approx. 10 min from cold state)

4.5.3.3 Temperature adjustment of the controller:

On some controller designs the temperature curve can be moved with a socket-head screw (1.5 socket wrench).

Towards + denotes a higher temperature,
one graduation mark corresponds to 15 °C

Only the control curve is moved, maximum and minimum temperatures are dependent on main and small-flame gas flow (nozzles) as well as on gas quality and oven design.

4.6. Gashobs – hob top – glass hob tops

Gas cook tops and freestanding gas ovens show as common construction feature a covering of the burner area, which can be produced with different materials. Depending from the construction of the hob top:

- there are used different burner constructions respectively different constructions to assemble the burners
- different cleaning products and methods for cleaning necessary.
- Different damages on the hob top possible.

4.6.1. Hob tops made from steel, tempered and ceramic glass

Used materials in appliances from BSH are:

- stainless steel:
  possible problems: tempering colours, corrosion
- steel enamelled:
  possible problem: chipping off of enamel
- Tempered glass (hardened glass):
  8mm thick glass: very high mechanical stability
  possible problem: shattering after high temperature load g
  (“ explodes” in many small glass fragments)
- Ceramic glass: (ceran glass):
  4mm thick glass: very high temperature stability
  possible problem: broken glass, fractures because of to high mechanical load, (breaks into bigger segments)

4.6.2. Fractures and breaking of hob tops from ceramic glass

4.6.2.1. Specific characteristic of ceramic glass (ceran):

- ► Low transportation of heat
- ► Good stability on temperature changes
- ► Very good transition of warm radiation (infra red radiation)
- ► High ability to withstand temperature load (up to about 530 °C)
- ► Surface is hard and not sensitive for mechanical load (with exception of very hard load which is focused to one point load Whereas the lower side and especially the small sides thin side at burner holes and holes for gas tap axles) are sensitive and can show small chipping off areas from where can develop longer fractures later on..

4.6.3. Causes of the fracture on ceramic glass

Ceramic glass does not have mechanical properties as good as tempered glass in the event of heavy impact; therefore, the glass can show damages with an smaller load. Different kind of fractures are possible:

4.6.3.1. Mechanical stress

A) Crack starts at a burner hole:

Wrong positioning of the burner seal or missing centering ring at glass can produce a direct contact between metal edges of burner and glass. Especially the small side of ceran is sensitive for mechanical stress and so this can lead to cracks or small detached pieces of glass which lead later on use to a crack. This kind of damage is produced mostly on first days of using .

Crack due to contact of the glass with metal edge component

This case is covered by warranty if there has not been any previous repair or opening of hob which could have caused the fracture!

Be careful with the assembling of the seal. Mount always the seal in good conditions and well positioned. Maybe it is necessary to renew the burner seals. Tighten the burner screws carefully and homogenous, do not use electric screwdrivers.

B) Crack starting at the edge of glass:

it can be produced by a wrong positioning of the seal between housing and glass, resulting in crack of the glass. Check good conditions and good positioning of the seal.

Crack due to handling in factory

This case is covered by warranty if there has not been any previous repair or opening of hob which could have caused the fracture!

Break could be also caused in transport (wrong packaging) Normally the crack starts from the edge of the hob top. This problem is always detectable before any using of the appliance, once the appliance is unpacked. The packaging must be in good conditions otherwise it is a transport damage.

C) Built-in dimensions not complied:

It is necessary to comply with the dimensions specified in installation manual, if not, the ceramic glass could undergo to mechanical stress resulted in fractures. Crack appears after the first uses in this case. Check built-in dimensions

4.6.3.2. Mechanical impact:

Mechanical shock:
due to the high impact i.e. falling down. of recipients or other hart and heavy pieces In many cases is easy to diagnose the origin of the impact.

Breakage due to impact of recipient

This case is not covered in warranty!

4.6.4. Breakage in tempered glass hob tops

4.6.4.1. Definition of tempered glass

Manufacturing process of tempered glass:
It is called tempered glass because once the glass is manufactured, it is subjected to a thermal process called tempering in which the glass is heated uniformly above 600ºC and it is cooled with a pressure that is inversely proportional to its thickness much more quickly.
In this way, the glass is caused to undergo internal stress (external compression and internal traction) which give it significant mechanical properties in comparison to the original glass.

Properties of tempered glass:

- ► Good mechanical behaviour when subjected to impact and bending stress
- ► Its behaviour improves notably with thermal shock as compared to common glass (it continues to be worse than glass-ceramic in this aspect)
- ► It breaks into small pieces, preventing the risk of cuts for the user

4.6.5. Identification of the type of glass

There exists two attributes which allow the differentiation the drip tray of the gas hob made of tempered glass in comparison with ceran glass:

- ► All tempered glass drip trays have a thickness of 8 mm; thus, the thickness of the drip tray can be checked with a calliper measuring the thickness from the upper face of the glass to counter
  Ceran glasses are only 4mm thick
- ► When tempered glass breaks, it fractures into many small pieces, unlike glass-ceramic, which cracks

4.6.6. Cause of the breakage

There are 3 principle reasons known for a breakage of tempered glass:

- ▶ Extraordinary mechanical load by very hard impact
- ▶ Accelerated aging due to high temperatures
- ▶ Defect in Material (glass structure) itself

Detailed description and possibilities for differentiation are given below.

Hint:

Breakages in tempered glass often happen suddenly with an explosion like loud noise. Sometimes customers are very concerned because they think about gas explosion. In order to take over the concerns and to allay this there has to be done a good explanation and sometimes a proof for gas tightness of hob.

4.6.6.1. Mechanical impact

Tempered glass has good mechanical properties in the event of impact, but can break when the load is excessive. In general, this type of defect occurs due to the impact of recipients with the hob top when resting them on it or with the impact transmitted from the recipient to the pan support and from the pan support to the hob top.

Hob top broken due to impact

Application point of impact

In these types of cases, the application point of the impact can be appreciated, as seen in the photo, above right.

Not covered by warranty!

4.6.6.2. Accelerated aging due to temperature

The repeated application of high temperatures causes the accelerated aging of the glass.

Normally this is due to the next reasons:

- Built-in dimensions not complied: it is necessary to comply with the dimensions specified in the installation guide so that the gas hob could be refrigerated and not transmit excessive heat on the hob top. Check built-in dimensions, minimum distances and ventilation.
- Dimensions of the recipients not in accordance with the size of the burner or improper use of utensils: each burner is designed to work with a specific range of diameters of recipients, so that if the recommended size is exceeded, the heat extends from the recipient to the hob top, and may cause this damage. In the instruction manual it is specified the correct range of diameters for each burner. Check recipients dimensions normally used. In the case of Wok burners, check if it is used the additional wok pan support.

Hob top broken due to the use of thermal diffusion plates

- Unsuitable recipient material: Refractory materials such as ceramic act almost like thermal insulators and reflect a large part of the heat on the drip tray, and may cause it to break. Check the material of the recipients normally used.

Drip tray broken due to the use of a recipient of refractory material of large diameter

- Incorrect gas setting: to cook with an inadequate flame, for example, wrong nozzles, can produce the accelerated aging of tempered glass due to an excessive temperature in burner components transferring it to the glass. Check flame aspect (correct nozzles and gas setting).

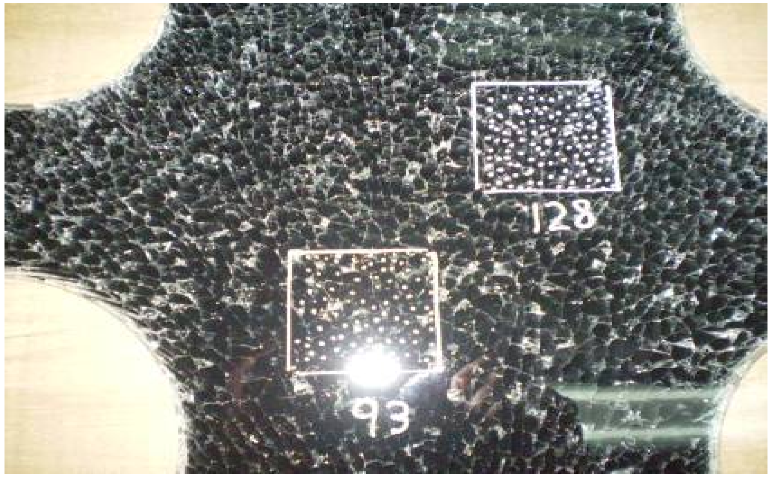
Attention: non of this cases is an appliance fault. Damage is not covered by warranty!

4.6.6.3. Defect in the material itself

It is very unlikely that this phenomenon will occur in the market, as it is controlled strictly in the factory. On each batch of glasses there are done some hart tests. Especially for the mechanical strength there is done a test with a very hard impact in order to destroy the glass. The result is analysed as it offers information about the right inner structure of glass. The analysis used in factory is as follows:

Draw a 50x50 mm square on the destroyed glass and count the pieces:

- If the no. of fragments < 130 → It is a defect of the material
- If the no. of fragments > 130 → It is not a defect of the material



Method of verification of the type of fracture

ATTENTION!
This test only can be made in factory because it is only valid without the using of the appliance because the glass properties change after the first use!

4.7 Connecting the appliance to the gas installation

Currently all our appliances have a **gas connection spigot with ½ inch** external thread (right-handed thread)

The connection to it is possible:

a) **with ½ inch** (pipe or hose 2 different options)

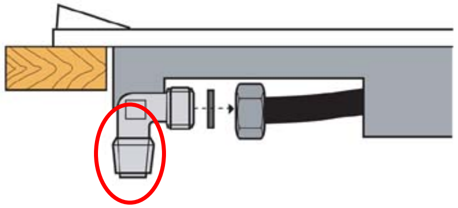
b) with adapter for liquid gas pipe or hose

After working on the gas connection, you should test for leaks.

4.7.1 Gas connection to ½ inch pipe

2 different connection types are possible. **Always observe the national regulations!**

A): ½ inch connection to conical external thread (ISO 7).

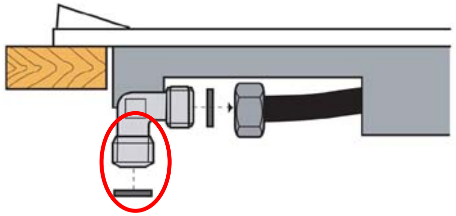


The thread towards installation tappers slightly means diameter is reduced towards front side about 0,5mm (exactly 1mm reduction in 16mm thread length)

Tightening principle: Sealant is to be put onto the conical thread to create tightness

Details please find overleaf

B): ½ inch connection to parallel external thread (ISO 228)



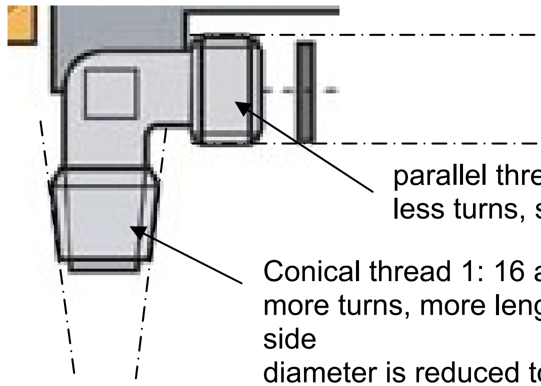
The connection thread towards installation does not taper.

Tightening principle: tightness is given by a flat sealing pressed to a flat area on the counterpart.

Details please find overleaf

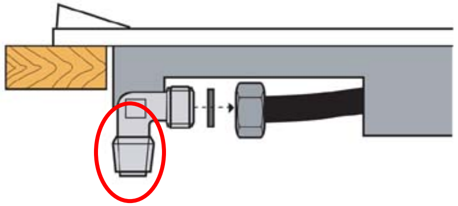
Remarks:
Many appliances are delivered with 2 connection pieces. (for ISO7 and ISO228 connection). For this reason the wrong type of connection may be selected. Also the elbow for ISO 7 could be fitted incorrectly (conical part towards the appliance). These potential faults may cause leaks.

It is not easy to see and detect the difference only by the slightly tapering of IS0 7 conical thread. However on all the BSH used adapters the tapered side has a clearly longer thread with more turnings as on a ISO228 thread. (however the exact length and number of threads is not defined by standard)



Details for the 2 connection principles:

A): ½ inch connection to conical external thread (ISO 7).



Example: connection via elbow:

The seal is made with sealant (hemp) placed onto the conical thread. (At the male thread the diameter of elbow tapers slightly – the female counterpart has a parallel thread).

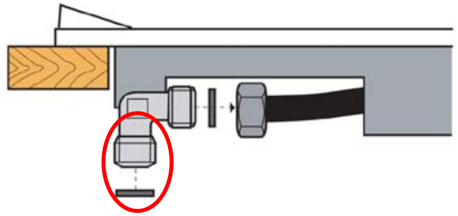
This type is stipulated in most European countries (e.g. in DE) and is pre-installed in most appliances at the factory.

Connections made with an elbow as illustrated here are sealed only on the appliance side with flat packing and a sleeve screw. The elbows must always be fitted correctly (conical side towards the installation).

On installation side the tightness is given on the thread by adding hemp or other approbated sealing material in a certain way. Thread has to be broken a bit by scratching with a saw blade (made more rough) before putting the sealant in order to avoid sealant turning with the nut.

Example: elbow with conical thread (ISO 7) which has put on hemp and fermit for tightening

B): ½ inch connection to parallel external thread (ISO 228)



The connection thread does not taper.

Here flat packing is used as the end piece to seal the pipe or hose on the installation side.

This end piece must be shaped accordingly (sealing surface for the flat packing, right length of thread)

If the counterpart is unsuitably shaped, the flat packing **will not be leakproof**. If the counterpart is to deep, than the flat seal will not be pressed hard enough to flat area of counterpart. In this case do not double or triple the flat seal in order to get the pressure, the seals will reduce in thickness and than the connection elbow gets loose and a big leak can be created!

This type of connection is stipulated in FR and on free standing appliances for BE. In some other countries it are allowed both kinds (ISO7 and ISO 228), but it has to be ensured always that the counterpart is matching.

Important: On all ISO 228 connections (flat sealing) the elbow parts has to be tightened with appliance screw with a quite high momentum (10-15Nm). If the momentum is to low or there are forces that move the elbow the connection can get loose suddenly and will get a high leakage rate. (however momentum above 30Nm can destroy the flat seals when made from a kind of paper)

Avoid to bring the momentum onto the manifold (by turning a tightened connection with the fixed elbow)!

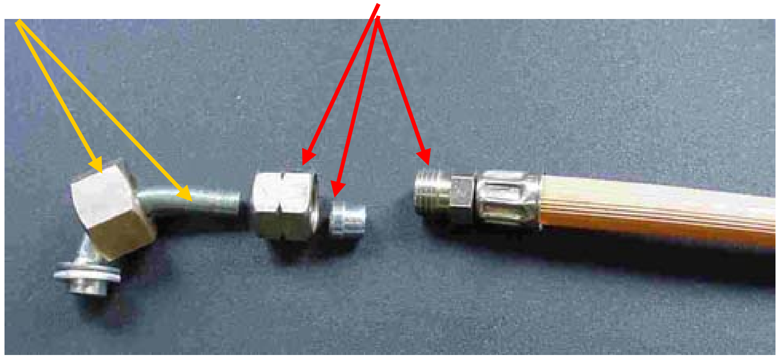
4.7.2 Adapter for liquid gas connection

Our pipes or with an adapter for special liquid gas hoses or pipework. There are also specific appliances can be connected to liquid gas devices with ½ inch national features.

Adapter for hose via steel pipe:

In some countries (e.g. DE and AT) hose are connected via so-called cutting-ring pipe unions. This requires a smooth 8 mm steel pipe adapter

Adapter (**set 047785** - for Germany and Austria only)
for appliance. Installation material



The plastic liquid-gas hose (R1/8 left-hand thread) may be max. 40 cm long and is used only to connect the appliance to the gas cylinder. (Observe heating protection, standard temperature resistance of the hose only 70 °C). Otherwise fixed pipework is required.

Hose connection with corrugated nipple is not permitted in germany.

After working on the gas connection, you should test for leaks.

Adapter for liquid-gas hose via corrugated pipe

This adapter (part no. 16 9828) can be adapted to connection hoses (inner diameter approx. 11–12 mm) by means of a hose clip.

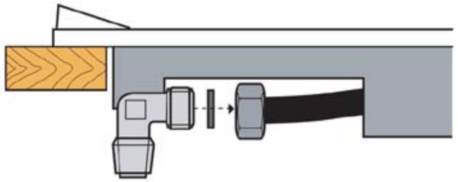
Connections of this type are not permitted in some countries (e.g. DE, AT)!

Adapter with short copper pipe (another installation must be connected to this pipe by soldering)
copper pipe: spare part 038313
Connections of this type are not permitted in some countries (e.g. DE, AT)!

4.7.3. Leakages at gas connection

Experience shows that most leakages on new installed gas appliances are caused by faults in installation and gas connection work. .
Especially on connection work there has to be ensured::

- ► That it is used correct adapter parts (applying to country specific regulations and matching to the used connection area of pipework or tubing of installation)
- ► It is used the right connection and tightening technology .
- ► That tubing and pipework can not be touched by moving parts of kitchen (i.e. drawers) in order to prevent damages or leakages because of repeated movement and forces to the connection area..



On the most gas hobs the connecting elbow or adapter is already assembled. If there is used an elbow this part is orientated 100% exactly vertical downwards. (only with this the factory internal tightness test can be passed).

An adapting elbow which is turned from this exactly vertical orientation is a clear indication that there was some manipulation in installation process. If there is a leakage in this area it is clear therefore the this is not in responsibility of factory but in responsibility of installer.

4.8 Gas leakages and smell of gas

4.8.1. General information

Gas leakages always are a severe fault on gas appliances and has to be treated with special care.

To avoid leaking appliances in field BSH production has very strong regulations – stronger than requirements from standards. (allowed leakage rate according standard EN30 = 100cm³/h , BSH 40cm³/h – measured with air pressure 150mbar, see leakage test)

Since many years each appliance is tested for tightness individually at end of production. Only very low leakage rates are allowed. Additionally the tightness is tested before at different assembly steps before appliance is completed.

Nevertheless there may appear leakages at our gas appliances. Experiences show that most of them on quite new appliances are related to external conditions. Of course there can appear leakages with wear on appliances which are in use since long time or on very hard conditions.

Leakage cases are always a fault which is critical to safety.

Therefore in any case of leakages on gas appliances which are inside the warranty period and leakage can not be clearly traced to an external root cause (kind of installation fault or misuse, see below), it should be created a FSB. Our factories are extremely interested to find the causes and work against leakage faults.

Also on cases with older appliances a FSB can be helpful for all departments in order to be aware about leakage faults.

Sometimes leakage detection and leakage judging can be a difficult task. Because of this there are sampled some experiences and hints below.

Remark: After working on gas leading connections always perform a tightness test (see also chapter leakage test).

4.8.2. Possible consequences of gas leakages

4.8.2.1. Explosion in room

If there is leaking gas from an appliance or its surrounding there is a small but existent risk, that the gas can accumulate to a concentration which is ignitable. If this happens at a bigger room there can happen a gas explosion. This most extreme consequence of gas leak however is very unlikely at it needs for a bigger room (i.e. a kitchen) or whole house a big and undetected leak to get the necessary concentration. This high gas concentration in room is prevented as there is always also an exchange of air which keeps the gas concentration low as long as the leaks are not to big.

However we always have to consider about that maximum risk because an explosion in a room has serious impact and means risk for live.

Our Appliances were never the source of a heavy explosion. Heavy gas explosions are mostly caused by big leaks in main supply (gas tubes in ground), severe misuse or manipulation of installation or appliances or suicidal actions

In general LPG (Propane, Butane)installations have higher risk because:

- lower value for ignitable gas concentration (1,5 % - 11%, compare with natural gas ignitable between 4 to 16 %)
- LPG accumulates, as it is heavier as air (it may accumulate in deep areas of appliance or fall down into areas of furniture)
- LPG is more difficult to smell, as it does not rise up into room (and nose)
- Higher pressure (30, 37 or 50 mbar against 20mbar of natural gas), which presses more leak gas through the same leaking area
- Additional risk to create leaks because of problems with regulator and wrong use
- Higher probability for selfmade and insecure installation

4.8.2.2. Flash flames or deflagration in appliance or furniture

Deflagrations are explosions with slower expansion, lower energy and lower pressure.

For deflagrations and flash flame there has to be also a region where the gas concentration is in the right concentration range. This can be reached with a higher probability in smaller rooms (i.e. hob interior, drawer), where also is higher risk of low air exchange rate (no gas thinning).

As above, the risk to get that incident is higher on LPG use. If there are reported flash flames or deflagrations there has to be done an extensively leakage search whenever this incidents can be also caused by other reasons, i.e. bad ignition, wrong air or nozzle setting.

4.8.2.3. Gas smell, gas odour

Gas smell is a typical indication for gas leakage. Natural gas as well as LPG gets included some ingredients which give the gas a typical odour. Mostly this is reached by using sulfur (typical smell of rotten eggs), but there are also some other methods in use.

The smell has the task to alarm the users and typically it has to be recognized -by average persons –at a gas concentration which is well below the ignition concentration (typically at 20% of ignition concentration). However there exist situations with LPG where inside the appliance can be reached a higher concentration but there escapes only a low percentage to the environment above and it cannot be recognized .

There exist some basic safety rules when there is recognized gas smell using its alarming character:

- Stop open flames
- Shut off gas supply (gas valves, main supply)
- Ensure a good ventilation (open doors and windows, create cross ventilation)
- Avoid ignition sources like fire, light or switching electric contacts (ring, phone)
- If gas smell does not disappear after closing the main valve call the gas supplier or fire brigade (emergency call).
- Gas smell has always to be investigated. Never leave gas smell without action for finding the reason and stopping the leakage.

Customers are advised by gas supplier and general safety rules to call an expert for help in case of gas smell, so we get calls for this reason. Most cases and calls to our appliances with gas smell are however not caused by the appliance fault itself, but by connection leakage (see connection of our appliances). Additionally there can be some constellation where smell of gas is not created by a leakage but by bad combustion or other sources for gas like smell caused by seals.

It may be difficult to locate the real source of smell respectively the area of the leak as the leak gas and the smell is distributed to other areas. This depends also on kind of gas, i.e. on LPG a leak inside gas hob with open hob base may be detected in the cabinets below hob, whereas on natural gas a leak at connection may be recognized by smell above the knobs.

In any case we have to investigate the source of gas smell, at least we have to exclude our appliance if we are not able to find a leak. The most reliable method to exclude our appliance as source for gas smell and to prove its tightness is to execute a pressure test (see tightness testing). Other methods as use of foam (specific foam for leakage searching urgently recommended) or electronic gas detectors (snooper) can be used too, but have some disadvantages in this constellation.

4.8.2.4. Gas “smell” detected by electronic gas detectors (snooper)

This kind of leakage testers are often used by installers, sometimes also by service.

This devices are designed mainly to find leakages in bigger rooms where it can be a great help.

It can be used also in smaller areas like appliances but there are some situations where it can give wrong alarm and users have to be aware about this problems so that the interpretation of the signals is correct.

The devices sucks some air or air gas mix into an internal area where this is analyzed for Carbohydrates (CH) molecules. On most devices the sensibility for gas alarm can be adjusted to a very low level. Additionally there is some time delay between getting clean air (without CH molecules) and alarm stop, means if in the analyzing area there remained some gas the alarm will keep on whenever there is no new gas in inlet area.

This will happen inside gas appliances where some gas is escaping unburned when burner is started and stopped. Especially when a gas tap is turned down there remains a lot of gas between gas tap and burner nozzle in the burner supply tube, which than escapes slowly and gradually and can be recognized (if taken a sensitive setting) up to half an hour later escaping at the nozzle.

Additionally a very sensitive setting can lead to gas alarm at certain points when the appliance has some very small leak but which are below the limits.

4.8.2.5. Leakage detected by pressure drop on manometer

On LPG installations with bottled gas some pressure regulators are equipped with a manometer which shows the bottle pressure. This small manometer can be also used to control the tight connection of regulator to bottle valve as well as to do a simple control of the installation and appliance.

However a distinct pressure drop in longer time periods is unavoidable and normal. Reason is, that there is only a very small room between bottle valve and regulator which is “filled” with that high bottle pressure.

Very small leaks at the much bigger volume of secondary “low pressure” side lead to a more remarkable drop at the inlet “high pressure” side; i.e. a leak at the allowed limit of 40cm³ at appliance would lead to a pressure drop at manometer of about 0,4 to 0,8 bar /h on 20°C propane (which means 8 bar pressure at inlet, exact value of drop depends on volume of secondary side).

Summary: an overnight drop of about 3-6 bars may not mean a serious leak but it could create customer concerns. Check and show with the CS tightness test method.

4.8.3. Gas leakages –reasons and leaking areas - general

Gas leakages can be caused by different reasons. To know about the possible reasons can help in searching the fault, prevent repeated faults, address the responsibility for the fault and charge the costs for repair (especially when the appliance is not the real root cause)

4.8.4. Leakage at gas supply connection

Experience shows that most leakages on new installed gas appliances are caused by faults in installation and gas connection work.
Reasons for faults may be:

4.8.4.1. Connection leak 1- wrong adapting pieces used (conical or parallel thread).

On conical thread the sealing material like hemp has to be used on the thread, on parallel thread the tightness is given by right use of flat seals. It has to be used always parts which are according the country specific guidelines and installation material. Further details see gas connection.

If there is a leak and you do a tightness test with foam you will find there bubbles in the connection area. Sometimes this area is not easy to access for testing. For testing this area for tightness it is favourable if pressure gauge can be connected to the connection hose, so testing the hose, the appliance connection and the appliance itself for tightness.

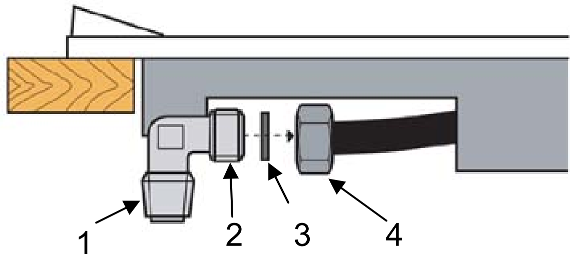
Remark: Leaking gas may bring the smell to other areas, depending on kind of gas. LPG falls down and is likely recognized in area below hob (maybe cabinet or drawer) natural gas will rise into the hob and escape through the knob holes, than the gas smell can be recognized above hob. Of course the distribution of leak gas also depends on gas appliance construction, i.e. hobs with open hob base (holes) or hob base closed and tightened.

4.8.4.2. Connection leak 2 - turned or loosened elbow.

If the elbow has to be turned in order to change the orientation the fixing nut at appliance has to be loosened and than tightened again. (only turning a fixed elbow can damage the flat seal or reduce the tightening moment, so that leak is probable).

Remark: on some appliance constructions turning the elbow without loosening it may also cause damages in the appliance (see below – gas tap fixation on 60R hobs)

Repeated movement of supply hose bring forces to elbow and may loosen the nut. This may happen not at once but in further use of hob resulting in a leak behind the nut



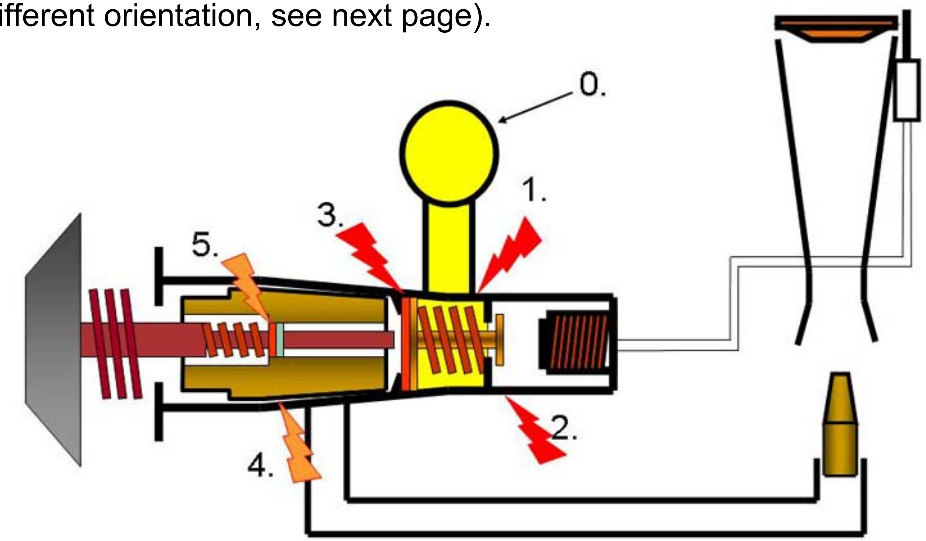
1: Thread for installation side – most countries use a conic thread to be tightened with hemp or similar.
2. Thread for connection to appliance manifold – parallel ISO228 thread
3. Flat seal
4. Loose nut on gas manifold, has to be screwed tight with high momentum against the elbow. Do not turn a fixed elbow without loosening that nut.

On the most gas hobs the connecting elbow or adapter is already assembled. If there is used an elbow so this part is orientated 100% exactly vertical downwards. (only with this the factory internal tightness test can be passed).

An adapting elbow which is turned from this exactly vertical orientation is a clear indication that there was some manipulation in installation process. If there is a leakage in this area it is clear therefore that this is not in responsibility of factory but in responsibility of installer.

4.8.5. Leakage at gas tap - overview

Gas taps are the most complex part in gas appliances and fullfill several tasks. There can appear leakages on several areas with different consequences and reasons for fault.
Below a principle graphics with the different most important potential leakage areas. This represents a standard “straight” gas tap with safety device, where the spindle (axle) and the safety valve are in same direction. (this kind of gas taps is mostly used in freestanding ovens or some specific oven hobs. Most autarkic hobs use a different version which is angled, means that gas tap axle and safety valve are in 90 ° different orientation, see next page).



0 = Gas supply – gas manifold – gas pressure in idle state

1 = leakage at connection to manifold

2 = leakage at fixation (nut) for safety valve

3 = leakage at safety valve (valve plate)

4 = leakage at tapered plug (area to housing)

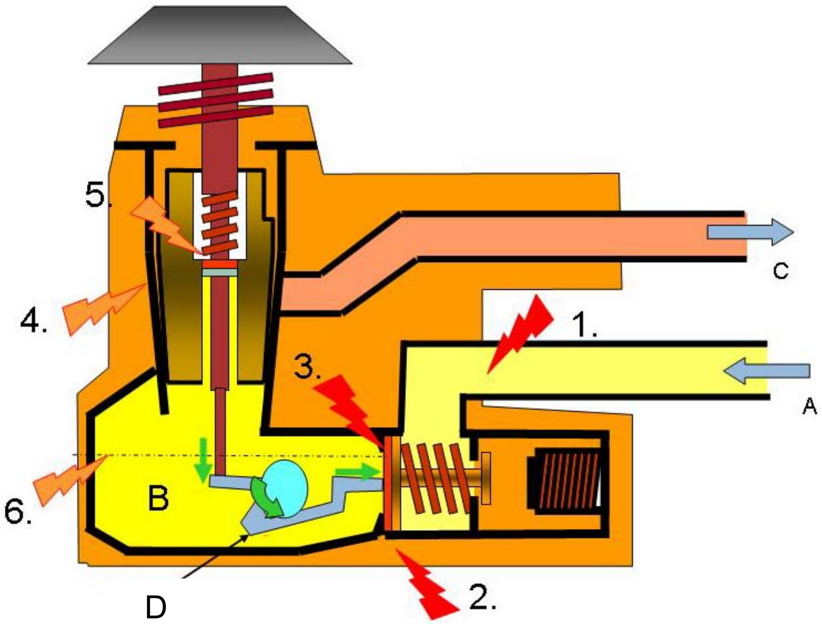
5.= leakage at spindle – O- ring for tightening to front area

Remark : Do not open gas taps with exception of the magnet valve area on quite new appliances: Danger of wrong assembly and bringing particles into sensible areas which can cause leakages in further use

- (1) Gas tap connection to manifold
  mostly with kind of silicon seal and a bushing which dives into hole of manifold. For tightness there is necessary correct fixing momentum given by screw. Cases known, where a screw (from outside) was unscrewed by installer.
  Heavy forces to gas tap or torsion to manifold load this connection and can lead to damages at bushing or seal which leads to leakage..
- (2) Fixation nut for safety (solenoid) valve.
  (often it is used an aluminum cap as nut here). This has to press hard the collar of magnet valve body (see picture) to a flange on gas tap housing (metallic tightening- tightness is given not by thread but by contact of collar and flange). Therefore this nut is tightened with a high momentum. (be careful on unscrewing for magnet valve exchange- do not create damages on point 1
  (1) and (2) are especially critical for safety as gas escapes as long as the gas supply to appliance is opened.
- (3) Seal of safety valve (solenoid valve).
  At the front plate of safety valve there is a seal, which closes gas pressure from the rest of gas tap as long as valve is not opened (pressed in or in self holding mode).
  Remark :On most gas tap constructions this valve is in gas inlet, but there are exceptions. Effect of leakage in this area will be only, that gas flow is not stopped when valve closes. Therefore leakages at this area will be probably not detected by user as long as tapered plug is ok. Leakage could be because of particles inside gas tap or because of very high pressure (detached or cut seal)
- (4) Tapered plug (cone)
  This central part of gas tap has to be tight against the housing, but easy to turn. It is pressed into the conic housing by a spring. There is introduced a specific grease for movement and tightness. On leakage at this area gas will escape as soon as safety valve is opened. Sometimes this means no leak to outside, but only in direction burner (internal leakage). Reasons for leakage could be:
  lifted tapered plug because of overpressure or particles or broken spring,
  grooves and rills on surface (caused by particles or long wear)
  grease removed (i.e. chemical attack)
- (5) O- ring on spindle (Transmission pin)
  This seal tightens the interior to the front area, it can be pressed out by overpressure – consequences as on (4)

4.8.5.1. Angular gas tap – leakages - principle

Angular gas taps are used in autarkic hobs (axle and safety valve are in 90 ° different orientation)



In principle there are the same fault possibilities as on straight gas tap, but additionally on some exemplars used quite frequently there is an extra box for the leverage system (transmission of spindle to safety valve movement). This is under gas pressure and gives possibility Nr 6.

A = Gas supply – gas manifold – gas pressure in idle state
B = Gas in room for leverage system (so called backbox)
C = Gas to burner
D = leverage system (transmission of axle to safety valve movement

1 = leakage at connection to manifold

2 = leakage at fixation (nut) for safety valve

3 = leakage at safety valve (valve plate)

4 = leakage at tapered plug (area to housing)

5 = leakage at spindle – O- ring for tightening to front area

6 = leakage at backbox (seal, backbox plate screwed to housing)

(6) also at backbox plate there can occur leakages, i.e. seal can be placed incorrectly or been damaged (i.e. by overpressure or an specific depression effect on LPG). Leakage is active as long magnet valve is opened (axle is pressed or burner is working).

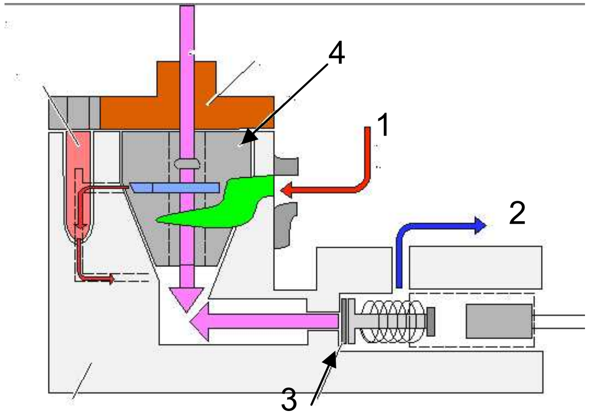
Backbox and seal for backbox plate of an angled gas tap

4.8.5.2. Angled gas tap – old principle

On some variations of angled gas taps the safety valve is at the outlet to burner. This means the tapered plug (cone) in valve is always under gas pressure, also in idle state of tap. This kind of gas taps is not longer used in BSH since 2006

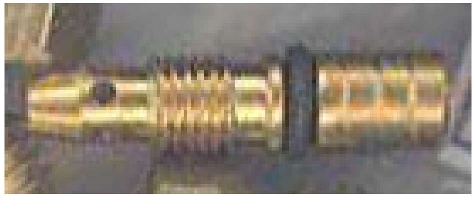
1:gas inlet
2 gas outlet to burner
3:safety valve in outlet
4 tapered plug always under pressure

(Remark: On this example it is shown another solution for activating the safety valve)



4.8.5.3. Leakages at bypass screw

Not shown on pages before is he bypass way inside the gas tap and so there is not shown the leakage possibility there. The bypass nozzle is screwed into gas tap and tightened from outside with an O- ring (seal).

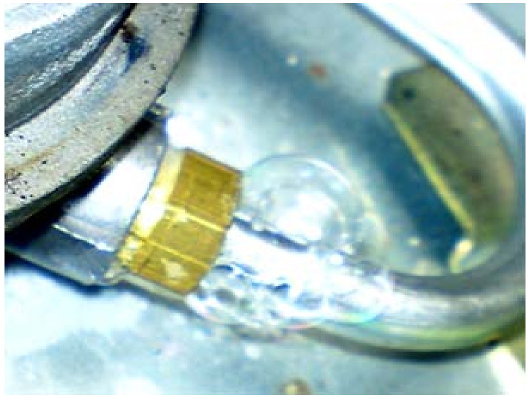


It depends on the construction of gas tap, in which using state there is gas pressure and effect of gas escape. There exists 3 possibilities:
a) Pressure only in using (opened valve) and axle turned to minimum
b) Pressure only in using (opened valve) but in any axle position
c) Pressure also in idle state
(safety valve in outlet, see old principle on previous page.

Whenever the bypass screw is often manipulated or exchanged in gas conversion work there are only very few cases known with a leakage in that area. (wrong or damaged seal).

4.8.6. Leakages in burner supply tubes

Burner supply tubes are connected to gas tap and burner itself by different connection systems. Often there is used
A) a nut and cone system (metallic tightening)
B) plug and O-Ring system (tube is only plugged into a conic area, tightness is given by a O- Ring, mechanic stability ensured by a spring lock.
With system A) there is necessary a high momentum and adequate tightening areas. Nut tightening can be changed by temperature cycles in lifecycle of appliance which results in a loosened nut and leakage at the connection (especially to burner).



Consequences and symptoms of leakage in that area depends on hob construction. On burners which take their primary air inside the hob the flame may become yellowish and to big, as with the primary air also leaking gas is sucked to injector nozzle and change there the burning behaviour.
On appliances where the burners get their primary air above the hob top (Sabaf, Defendi burners, where the injector areas is not connected to hob interior), there will not exist such phenomenon. On LPG use the leak gas will fall down nto area below hob (gas smell while burner use in furniture below), on high leakage rate the gas could escape at knob area and flames could appear there.

4.8.7. Possible symptoms of gas leak

The classic symptom for leakages is smell of gas. If possible try to get information, in which using state the gas smell is recognized, this can give clear hints, in which area the leakage has to be searched (gas smell in idle state, gas smell only when using specific burners?)

But there are other symptoms for gas leakages or phenomenon which could be caused by a gas leakage – this symptoms can be enlarged, yellowish burner flame, flash flame or banging noises (from an deflagration), burned knobs or visible flame at knobs area or on other openings of appliance.

The possible symptoms of gas leaks depend kind of gas, but also on area of leak and construction of burner.. On gas hobs we have 2 principles of construction, which influence the symptoms.

Please find below the description of the most important construction principles concerning symptoms of leakages.

4.8.7.1. Primary air supply inside hob – leak symptoms

Here the injector nozzle at burner gets primary air inside the hob base (on working burner primary air is sucked to the injector). At hob top there are openings which ensure the air supply to the burner areas (mostly on rear side). Than the hob base is closed and tightened to the lower environment (to prevent pressure changes caused by opening and closing doors and drawers of furniture which could blow out the flame).

Symptom 1 - Enlarged and yellowish flame – only part- time after start.

On this constructions leaking gas may accumulate in hob base, especially on LPG use. With LPG the gas is heavier than air and stays inside the hob so it can not be smelled in surrounding. In idle state of appliance only small leaks (low leakage rate) can create an ignitable concentration in appliance, as than the air exchange rate to environment is low (on natural gas the leak gas may rise up through the burner holes so it can be recognized easier and there will not arrive a high accumulation on smaller leaks). When starting the burners and there happens no deflagration inside the hob the gas which has accumulated inside hob base is sucked to burners and leads for the first minutes of use to an enlarged and yellowish flame, that than gets to normal shape on further use. This behavior is an indication for an leakage in idle state (i.e. connection of gas tap to manifold).
Especially on LPG use there can happen also a deflagration below hob.

Symptom 2 - Flame that grows and stays yellowish all the time (when distinct burners are in use)

In this case there may be a bigger leak which is only active when the burner is in use (i.e. leak at tapered plug or bottom plate of gas tap or at burner supply tube). This effect is not so much influenced by kind of gas, more by leakage rate.

Symptom 3 – gas smell from knob or burner area in idle state –

This is indication for leak on an area which is inside the hob and permanently on gas pressure. On LPG use there is more likely no gas smell, as LPG does not escape upwards.
A leak at the connection area will not lead to gas smell there because also natural gas can not rise into hob and than further upwards.

Symptom 4 – flames at knob area

This is also indication for leak at an area which is inside the hob and permanently on gas pressure.
(On a leak which is only active on burner use leak gas will more likely been sucked to the operating burners by the injector effect (see Symptom 2)

4.8.7.2. Primary air supply above hob (Sabaf – Defendi System)

On hobs that use the Sabaf or Defendi burner system, primary air is supplied above hob top. On this hobs the hob base is not tight towards furniture or cabinet below , but has holes and openings. Because of this a leak gas is not accumulated but can fall down to cabinet region, especially if it is LPG. On the other hand the burners have no direct connection to hob interior, leak gas can not be burned at burners or rise upwards at the burners. Natural gas (which is less heavy than air and “wants” to rise) will mainly escape upwards at the holes for the gas taps.

Symptoms see overleaf

Symptoms on hobs with primary air from above hob top:

Symptom 1 – gas smell or flash flame from cabinet or drawer.
This is mainly an indication for a leak outside the hob (connection area). Check connection and also the installation hoses carefully.

However on LPG use also a leak inside the hob is possible: Than most of leak gas falls down into area below hob. This can be recognized there by smell or it can be ignited there on specific cases (by external ignition source or by sparks in the hob i.e. switch and a expanding of flame from hob interior down to the cabinet.
(On natural gas use and leak inside the hob it is more likely that the gas smell will be recognized above the hob before there is enough gas for ignition in lower region).

Flash flame in cabinet area on LPG use: If there is a flash flame in that area and there is no leakage at connection area it is most probably that a leak which is permanently on gas pressure is the root cause. Leaks which are only active in burner use had to be very big to create enough leak gas below the hob (or there is a small and quite tightened volume to be filed up, as an drawer).

Symptom 2 – gas smell or flame at knob area
This is mainly an indication for an leakage inside hob. On natural gas use however the leak could be also at connection area (gas rises from below into hob), but than smell should be also to recognize below hob.

Try to find out whether gas smell or flame is recognized permanently or only in burner use. With this information the potential area of leak can be reduced.

To get a permanent flame at knobs the leak has to be quite big.

Symptom 3 – enlarged and yellowish burner flame
On this construction of hobs this is no sign for leakage. More likely are problems with wrong nozzle, burner spillage, wrong placed burner parts or wrong pressure.

4.8.8. Specific cases because of installation or pressure

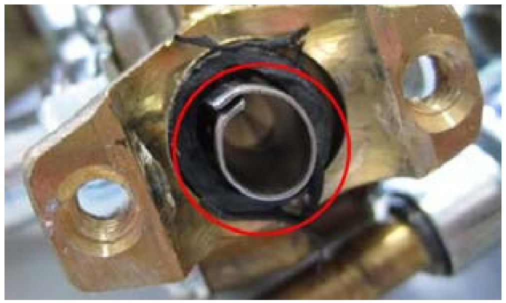
There are known some specific constellations and external influences which can create leakages on our appliances. It is important to know about to avoid repeated damages and wrong invoicing. Sometimes there are clear hints for the external reasons for leakages, which can be used for finding the reason and address the invoice.

4.8.9. Installation faults leading to leakages

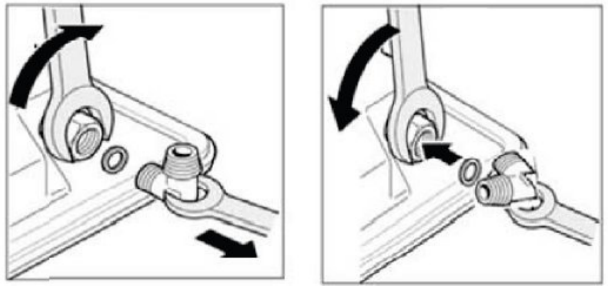
4.8.9.1. Leakage at gas tap connection to manifold on 60 R hobs

If there is detected a leakage at the gas tap connection to manifold on a quite fresh installed appliance and on a specific hob type called 60 R (autarkic hob with all knobs on the right side) the reason is very likely an installation fault. Than in many case the leakage does not appear on a solely gas tap, but on more taps simultaneously.

Explanation. On this hob type the manifold is just a straight tube. It is basically fixed in its position by the connection screws of gas taps through the hob base. If there is a higher torsion momentum to this manifold the fixation gets damaged. Typically the bushing on connection area gets deformed or falls into the manifold (this bushing is inside the silicon seal and has to ensure the right position of this seal). Sometimes the leakage occurs not at once but later in use, when the forces by operating the gas tap move the silicon seal because of the deformed or missed bushing.

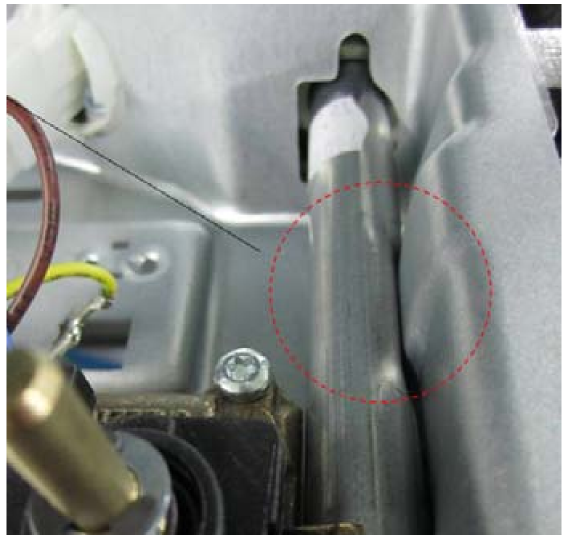


Torsion to manifold can occur at installation procedure, when there is tried turn the elbow without unscrewing the nut or when the nut is tightened again to the elbow without counter -keeping it with a second tool. This is also explained in installation manual with below graphics:



The internal fixation of manifold depends on the hob model. On some models manifold is only kept by the fixation screws of the gas taps, than any torsion force has the potential danger to damage a gas tap fixation.

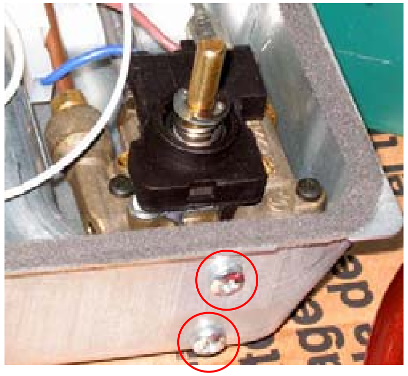
On other construction the manifold has a flattened area supported by the hob base sheet, which makes it able to take some force. Since production FD 9206 there is an improved stabilisation of manifold.



Whenever the older construction is more sensible to torsion damages by installation faults it is always an installation fault and no fault of appliance.

4.8.9.2. Leakage at gas tap connection – loosened fixation screw

On many of our gas hob constructions the gas taps are fixed to the manifold by screws which are screwed from the outer side of hob base to the gas tap, so realizing tight connection of gas taps to manifold as well as fixation of manifold.



There are some cases known where external persons have unscrewed or loosened on or more of this screws, mostly when they tried to find access to hob interior. Since FD88xx on most of this hobs are used specific screws (torx head with central pin) and a warning label (covering the screw heads) to prevent this actions.

4.8.10. **Leakages because of overpressure**

Gas taps used in our appliances are designed to work at a maximum using pressure of 50mbar. They are proved to withstand a higher test pressure of 150mbar (see tightness test). However if the gas taps are exposed to pressure exceeding considerably this 150mbar they are likely to get some leakages.

There are several constellation which can bring this kind of critical pressure to the gas taps. If there are some characteristic signs of gas tap damages it is important to look at the environment and history to find out whether one of this circumstances could have been the reason for the damage.

Symptoms and some possible reasons of enlarged pressure please find on next pages. Also please find there some advices how to handle this cases.

4.8.10.1. To high testing pressure to appliance

On some occasions the gas installation in a house does not only get an tightness test (test pressure used about 100 -150mbar) but also an so called load test to installation. On this test there are used higher pressure values of about 1 to 1,5bar. To avoid damages on appliances these has to be disconnected or the gas supply has to be shut off at the valve before the appliance.

If this disconnecting work was not executed the high test pressure can load to appliance and lead to damages (see below). This damages are likely to happen on new or new changed installations – investigate the history.

4.8.10.2. To high pressure because of installation fault with regulator

There are known cases – especially on LPG installation - where there is or was installed a regulator which gave to high pressure to appliance. In some countries there are used adjustable regulators with a high outlet pressure variation up to 1 bar.

On other installations there is used a “2 step pressure reduction”, with first step at bottle or gas tank reduces to about 600 – 1000 mbar and only second step works down to the using pressure of 30 -50mbar. Sometimes installer forget to install this second step reduction.

Investigate installation system and history of installation work when finding damages on a recent installed appliance.

4.8.10.3. <u>To high pressure because of a pressure regulator fault</u>

Also the pressure regulator can fail and this can lead to high pressure to appliance. This is more likely on LPG and the pressure is more likely to get into critical ranges. On natural gas use this is only known in very specific cases where the supply system is in a real bad shape. On LPG or bottled gas use it is more likely to happen.

Several reasons can lead to a defect of pressure regulator:

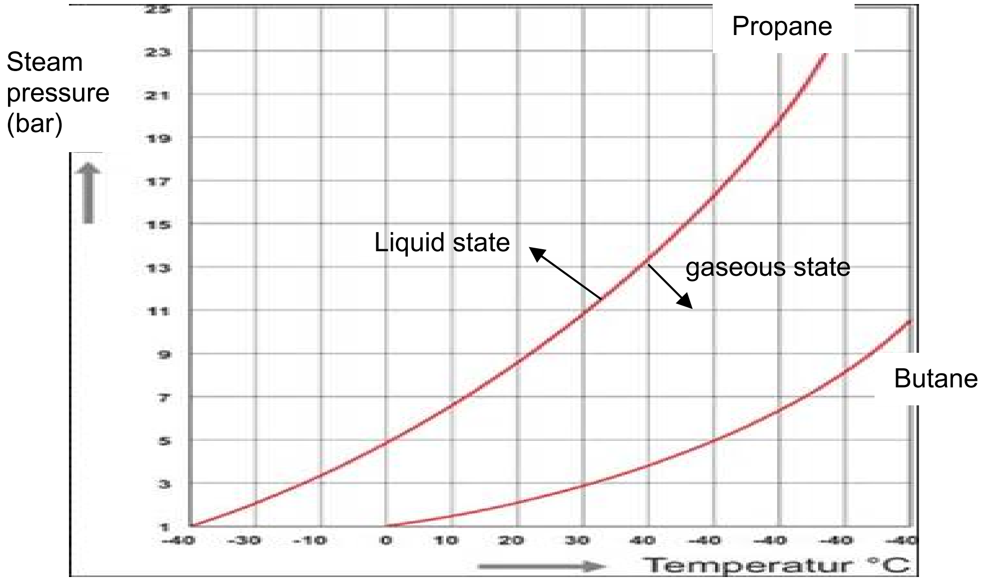
- ► Technical defect on membrane or spring of regulator system
- ► High temperature of LPG bottle which lead to a high pressure in bottle. This pressure can exceed the maximum inlet pressure of the regulator (i.e. the pressure that can be reached in gas bottle on temperature of 50 °C is 16bar on Propane, and 6 bar on Butane). Than regulator fails and can give full bottle pressure to appliance, values depending on kind of gas, temperature and remaining reducing effect of regulator. When temperature of gas bottle drops the regulator may work again correctly, so that the high pressure is no longer obvious.
- ► Misuse of gas bottle, .i.e. if bottle is turned or brought into a laying position, gas in liquid state will flow into the regulator. This gas can pass regulator and evaporate in tubing or appliance. Thus high and unregulated pressure can arrive there, value is depending from the temperature in this area. This use (with gas in its liquid state coming into regulator) can also stop the regulator function and destroy the regulator system. See more detailed in Background information to “turned bottle problem”.

Symptoms of enlarged pressure please find overleaf.

4.8.10.4. <u>Background information to LPG and “turned bottle problem”.</u>

In gas bottles there is always gas in its liquid and gaseous state simultaneously and the gaseous state is above the liquid. If gas is taken out from gaseous area it is filled up immediately by evaporation of liquid. The pressure there in gaseous area is depending from temperature and kind of gas respectively gas mix.

Steam pressure curves – evaporation and pressure of propane and butane depending on temperature



For evaporation liquid gas needs energy, which is provided from surrounding via the bottle walls. If temperature is to low evaporation gets reduced or stops completely, and so there will no gas flow to appliance and burners (below 0°C Butane will no longer evaporate on atmospheric pressure, see pressure curve). Because of this on cold conditions users may try to get energy again to appliance by turning the bottle managing that gas in liquid state will leave the bottle. This is a clear misuse and forbidden in use of gas bottles. Consequences may be a heavily enlarged and unstable flame (because of uncontrolled and changing pressure) and also damages on components of gas tap (because of high pressure and temperature changes). This consequences may be not known to users.

4.8.10.5. Symptoms of serious enlarged gas pressure

In most cases of serious enlarged pressure this high pressure will be not present when we arrive at the appliance because it is only a transitory problem and situation is changed already (i.e. a damaged or wrong regulator was exchanged already).

If however the seriously enlarged pressure exists on the appliance the symptoms are quite clear:

Symptoms, if high pressure still is on appliance:

- ▶ loud noise (whistling) of streaming gas when gas taps are in using position
- ▶ burners are difficult or impossible to ignite due the fast gas stream at the burners,
- ▶ obviously enlarged flame (if it was possible to ignite) that lifts away from the burner (so that a safety device will probably not work

Additionally to that symptoms above high pressure applied to an appliance can lead to leakages of the appliance, in detail it can damage the gas tap (other components are not damaged directly by high pressure). It depends from the construction of gas tap and the value of overpressure, where the damage will be located most probable.

Some of the damages described below can be used as indication for an overpressure the appliance had suffered in the past (whenever this overpressure is no longer present).

On gas **taps without safety device** the high pressure will be applied directly to the tapered plug (cone).

On gas **taps with safety device** on most constructions the pressure arrives first at the safety valve, which will be pressed with additional force into closing position. As long as it is closed it is very unlikely that pressure will pass, but it is possible that the seal at the valve plate gets damaged (cut) or sticks on the counterpart and therefore will be detached from its seat on valve when safety valve is opened later on when gas tap is operated. This will lead to a malfunction on further use (safety valve will than no longer close tight).

As soon as the safety valve of appliance will be opened the pressure will also get into the tapered plug area (same as on gas taps without safety or gas taps, where the safety valve is located downstream in the outlet area.).

There can happen following damages and indications:

- ▶ Tapered plug gets lifted from its correct position (leakage to front plate or axle). If the pressure is high enough the grease in cone or at gas tap axle will be thrown out and there is visible grease at the axle or at the switches. (sometimes in further use the tapered plug will find back into its correct position and leakage will be reduced or disappears again).

Upper picture: white grease from tapered plug right picture: black grease from spindle pressed out

- ▶ Small o- ring on axle will be moved from its correct position, than we get leakage at spindle or behind front plate (see gas tap – position 5)
- ▶ In some extreme cases the seal at backbox plate (see picture on pages before) can be moved (sometime also inwards by venturi effect caused by very heavy flow through the leaking area at the cone)

Please find overleaf a summary of symptoms because of overpressure.

4.8.10.6. Summary of symptoms because of overpressure

Overpressure is not present at the moment but left some signs or indications:

a) reports about very high flame, ignition problems, flame holding problems (1)
b) grease escaping at the gas tap spindle, see picture on page before (1)
c) detached or cut seal of magnet valve, see picture below (2)
d) grease pressed out from tapered plug area to front plate, see picture (2)
e) O –ring at spindle pressed out (3), see explanation (point 5)
d) Backbox seal moved in specific gas taps (2)

Remarks:
(1) – visible without disassembly of gas tap
(2) – visible only after some small disassembly work at gas tap
(3) – visible only after some specific disassembly work at gas tap (normally only done in factory for analysis)

Silicon seal at plate of safety valve, could be missed or damaged

4.8.11. Dealing with cases of supposed overpressure

If there is a critical enlarged pressure it is clear that fault is not to blame to the appliance.

As written before sometimes there are indications that appliance has suffered a critical enlarged pressure, but when we are at appliance the pressure is ok.

In order to avoid further problems and critical situations and charge cost (appliances in warranty period) the whole situation and history of problem should be investigated. Some advices

- Check the pressure regulator (right one, adjustable one, new installed?)
- check the gas taps for symptoms of overpressure
- If only some gas taps are leaking: check the others for tightness and damages (do not open the gas tap itself however, only the magnet valve could be inspected or tested). If there is any doubt: exchange all the gas taps or appliance).
- If there is suspect, that there was a transitory malfunction of pressure regulator advice the customer to replace the regulator (preventively)
- Gas taps which are damaged already can be opened for investigating further signs (removing front or back plate). Try to document it with pictures and do not change the situation. If in doubt ask factory for doing the investigation (see below)
- If there are doubts or discussion about the reason for damage: create a FSB and ask with it for help and analysis (include all the information you can get including pictures).
- Advice customer about the right use of gas bottle (do not use it in laying position or turned) and the risks when not doing so.

4.9 Pan support - Trivets

There are various types and design solutions.

Principally the following trivets are used:

- Steel pan support
  (usually enamelled), lighter and limited flexibility (caution, flaking enamel)
- Cast iron pan support
  solid, heavy and rigid, but will break if overloaded, usually with thin enamel layer which does not cover completely the surface roughness

Complaints about the trivets are generally in the area of stable, even support. This may affect both the even support of the pan on the trivet and the even stability of the trivet on the hob.
Due to the high temperature load during enamelling and use certain deviations from the absolutely exact, even shape are unavoidable.

4.9.1.1 <u>Possible complaints about pan supports</u>

A) uneven position of pot or pan (grease is not distributed homogeneous)
possible reasons:

- Hob not aligned
- Hob is skewed and deformed (hobs with steel worktop)
- Pan support is positioned with inclination on hob top
  (because of support area or rubber feet)
- Pan support is not exactly even (at area standing on the hob or at pot standing area , means fingers)

B) pan support wobbles on hob
possible reasons:

- Hob top is deformed and not quite even
- Rubber feet
- Pan support is not exactly even (on area standing on the hob)

C) pots are wobbling on the grid (complaint „shattering pot“ when stirring or on boiling by itself
Possible reasons:

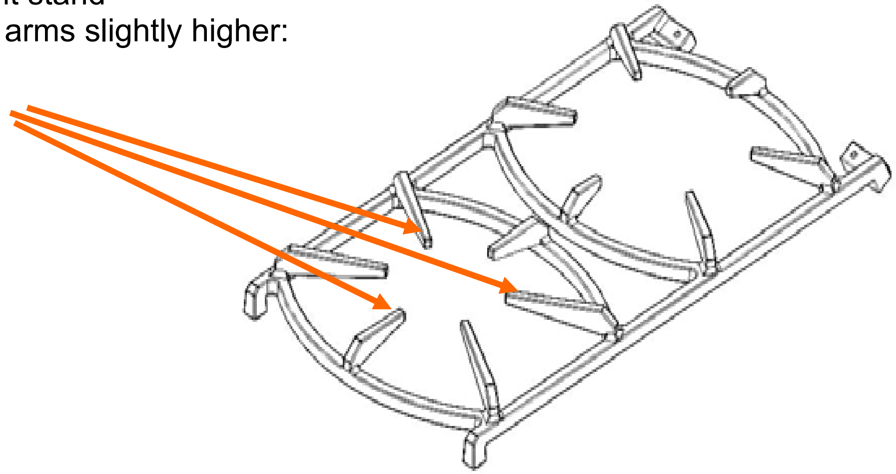
- Pot is not even
- Fingers of pan support (area of pot stand) not at same level

Complaints regarding pan supports are most frequent with the phenomenon C, „pots are wobbling on the pan supports”, customer demands a stable homogeneous stand of the pots.
Caused by the high temperature on manufacturing process (enamelling) as well as on use there is unavoidable some deviation /distorting from exact levelled state. This is possible on stable stand of pan support on hob (B) as well as on stable stand of pot on pan support. (C) .Allowed tolerance see next pages..

Pot stand area, pan support fingers
There are 2 principles:

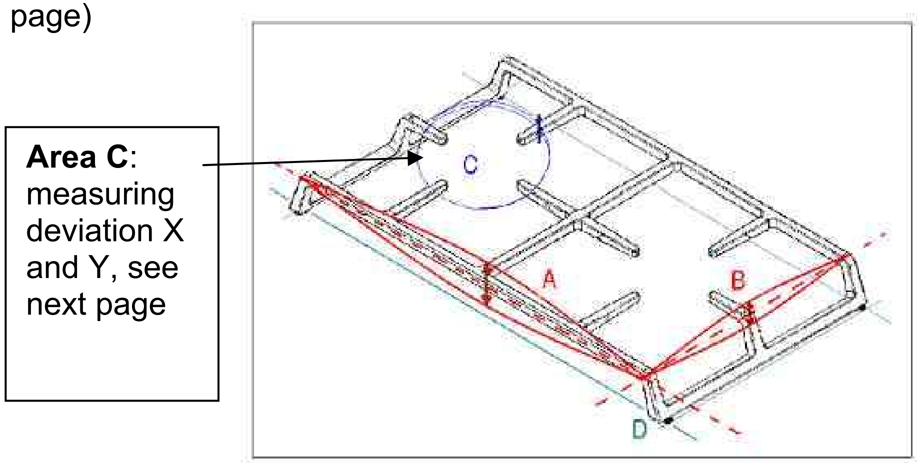
- **3- Point stand-**:
  The three-legged stand provides the pan with a stable support. Usually the 3-point support features pan support areas with 6 arms, three of which are purposely slightly higher and represent the three-legged stand, and the lower arms which function only to prevent the pan from tipping over.
  Although the pan is stable even during a more intensive cooking process, “wilfully” tilting the pan over the axis or use of pans with very heavy handle gives the impression that the arms are very uneven.

3- point stand
with 3 arms slightly higher:



Hint:
Unfortunately there is no general rule dot decide whether a pan support with 6 fingers has the concept if three point stand (three fingers on a higher level) or not (all 6 fingers same level as far as the tolerances allow), In case of doubts this has to be cleared individually for each pan support

- **4-point or multi-point support**:
  As unavoidable tolerances occur during production and use, cooking turbulence may cause the pan to tip over (wobbling aor rocking pot).
  In general a deviation in the level of up to 1 mm is accepted.
  As the arms are frequently lowered towards the burner centre to ensure stability, only positions at the same distance from the burner centre may be considered for a comparison of the level. (see next page)



For different kind of pan supports and different production periods there are defined different tolerance values. :

- Steel pan supports freestanding ovens1,5mm
- Steel pan supports gas hobs: 1,0mm
- Cast iron pan supports (current production)   0,8mm
- Cast iron pan supports until production 2005:   1,0mm

The tolerances of BSH products are quite close in general.

4.9.2. Measuring and judging levelness

4.9.2.1. Measuring the deviation on the installation surface D (if the pan support wobbles)

Place pan support (if existent, with attached rubber feet) onto a level base and press lightly on the corners to check the stability. Measure deviation with caliper gauges and check whether the deviation is within the permitted tolerance (0.8 mm for cast iron or 1.0 mm for pan supports made of enameled steel)

4.9.2.2. Measuring the deviation of the finger A, B, C (if the pan wobbles on the pan support

Important!
The following described methods can only be carried out on pan supports with 4 support fingers (otherwise see 6 finger concept - 3 point stand

Method 1: with normalized pan and thickness gauge

This type of measurement is recommended for interventions in which the main claim is the swinging of pans and if the technician has visited the customer previously (so the reference pot can be prepared). With this method, the technician will check if the pan support is in/out of tolerances and he can show to the customer by a visual way the real status of the pan support (with a normalized pan).

Hint: The measurement can be done also with a good leveled pan of customer on first visit (first check levelness of bottom of pan on a leveled surface)

Check as follows:

- ► Place the normalized pan with diameter base of 18 cm (341235) **WELL CENTERED** on the pan support.
- ► Press softly on the pan to force the support with three fingers if there is not an exact flatness between the four support fingers.
- ► Check with the gauge (341572) the thickness of the gap between pan and finger of pan support.

The maximum thickness sheet of the gauge that fits between pan and finger of pan support will determine the maximum swing of the pan. Check if this measure is in/out tolerances on chapter "Tolerance specifications"

Thickness gauge
341572

Normalized pan
341235

Hint: on WOK burners there should be also checked with a pot with diameter 220mm.

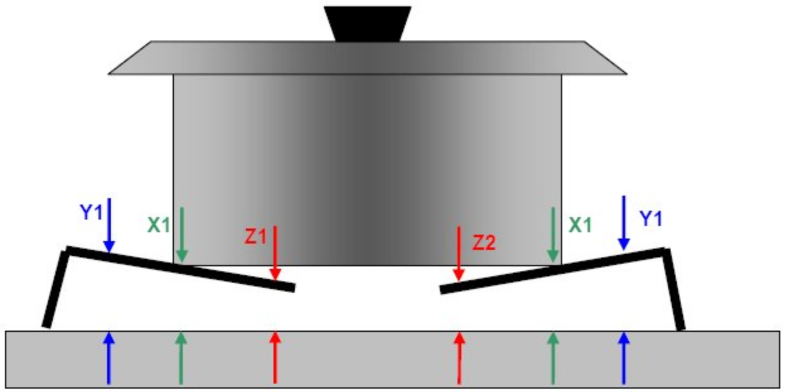
Method 2 (calibre gauge) see next page

Method 2: with caliper gauge

This method is recommended to check by an accurate way the deviations on pan support in its different points of support fingers if no normalized or leveled pan is available, but a caliper gauge..

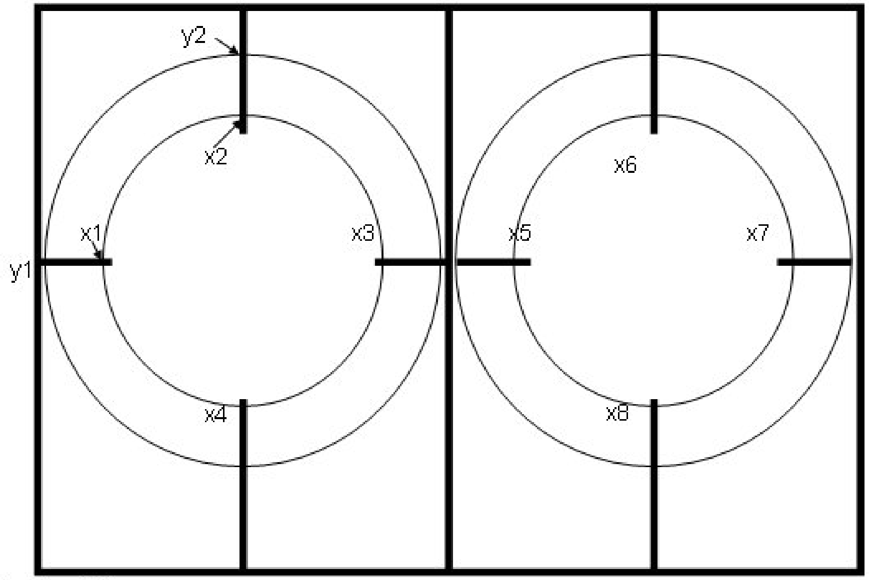
As the fingers on some of the pan supports are not horizontal but frequently lowered towards the burner centre: only positions at the same distance from the burner centre may be considered for a comparison of the level.

Factory and standard defines a certain diameter of 180mm respectively 220mm for WOK burners. It is possible however also to check at other diameters if customer has the problem only there. For other diameters the tolerances are not defined however but it can be used as orientation.



Finger surface level may fall down in direction center, so it is necessary to measure and compare at same distances (diameter) from center:
X = diameter 180mm for standard burners
Y = diameter 220mm for WOK burners
Z = other, individual diameter (only if there is complaint about)

- ▶ Place pan support on a level base.
- ▶ Mark the measuring points with correct and equal horizontal distance to burner center
- ▶ Using a caliper gauge, measure the distance between the base and upper surface of the fingers of the pan supports (see picture next page). Note distance measures of a diameter and compare differences (i.e. between measures of x1- x 4)



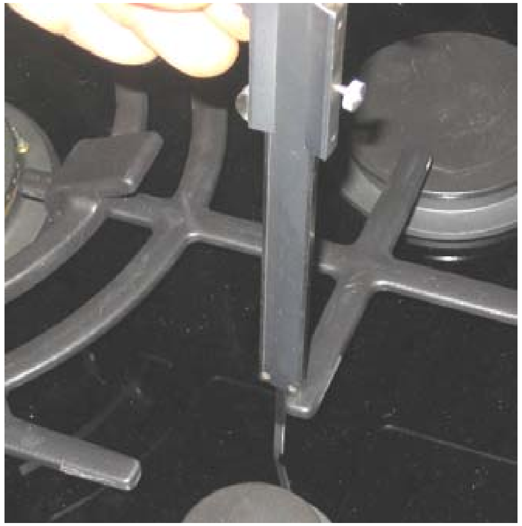
The maximum difference between the heights at the respective diameters (difference e.g. between X1, X2, X3 and X4) must not be greater than 0.8 mm for cast iron pan supports or 1 mm for pan supports made of steel.

Hint: it is recommended to create a small table with the measures.

Measuring distances with caliper gauge:

- ► *Gas hobs with* ***steel hob top:*** Place pan support on a level surface.

- ► *Gas hobs with* ***glass surface****:* Measure directly on the glass plate.



4.9.3. Subsequent need for action

- ► **If the measurements are within the specified tolerance,** the appliance is not defective. In this case present the evidence to the customer and explain as follows:
  - Wobbling of pot maybe caused by pot unevenness,
  - Wobbling of pot maybe caused by position of the pan (centered, not centered?),
  - Tolerances are unavoidable at this parts
  - BSH has very narrow tolerance limits,
  - Distortion of fingers is unavoidable due to extreme temperature load.
- ► **If the measurements are outside the specified tolerance,** pan support is faulty, exchange it against spare part-(if more are faulty: refer complaint to the factory by means of FSB).

Hint: Sometimes customer do not accept the tolerances and expect a "perfect" pan support. In specific cases this requirement can be solved by specific selected pan supports, but this needs a lot of work and specific handling in factory. Please also use FSB to give information about this situation (documentation of measurement and hint, that parts are inside tolerances, but not accepted by customer).

5 FAULT DESCRIPTIONS- FAULT DIAGNOSIS

5.1. List of fault symptoms, diagnosis and remedy hints

This is a linked list with cross-references to the applicable fault information in the various chapters.

Burners, combustion behaviour, flame aspect

- Flame burns yellow or too soft
- Flame hisses and lifts off
- Flame backfires (melted burner parts)
- Flame makes hissing or "blobb" noise and gets reduced
- Flame breaks away on one side
- Flame goes out
- Flame asymmetrical
- Boil start complaints:
- Flame size control does not function correctly Control characteristics.

Gas leakages- gas odour

- General information to leakages and smell of gas
- Flash flames because of leakage
- Gas smell / gas odour
- Leak detected by electronic detector (snooper)
- Pressure drop on gauge of pressure regulator
- Leakages at gas supply connection
- Leakages at gas tap
- Possible symptoms of gas leakages
- Installation faults leading to gas leak at appliance
- Gas leaks because of overpressure
- Leakage test with air pressure + pressure gauge

Ignition problems

- Burner does not ignite – no spark
- Burner does not ignite even though there is a spark
- Continuous ignition – sporadic ignition sparks

Function of safety device- thermal release

- Complaint --flame does not hold--
- Complaint, takes too long until flame holds, Requirements of the thermal release

Pan support, Trivets:

- Pan wobbles or pan support wobbles, see pan supports

Gas oven

- Function of oven controller Test small flame / flame aspect
- Function of oven controller Measurement / Settings:

Hob top made from glass:

- Cracks breakage on ceramic hobs – Judgement / Root causes
- Breakage /explosion of hob top from tempered glass Judgement / Root causes

6 TESTING AND AUXILIARY TOOLS

6.1.1 Leak tester part number

Leak tester

(case with pump, pressure gauge and small parts)	Part no. 34 0034
Replacement test stopper ½” (foam rubber)	Part no. 05 9155
Replacement test stopper ¾” (foam rubber)	Part no. 60 0084
Adapter connection socket for ¾” pipe	Part no. 34 1023
Adapter connection ½” for ¾” pipe straight	Part no. 34 1024
Adapter connection for liquid gas hose R⅜ and R¾ on left for ¾” pipe	Part no. 34 1051
Stamp for closing injector nozzles	in preparation
Adapter for nozzle (bended tube)	Part no. 342045
Dummy nozzles (closed)	self production

6.1.1.1 Spare parts for leak tester: (partly Afriso numbers!)

Pressure gauge:	Part no. 34 0978
Foot pump:	Part no. 34 0979
Foot pump seal:	Part no. 34 0980
Pump hose:	Part no. 34 0981
Non-return valve complete:	Part no. 34 0982
Wooden case (empty):	Part no. 34 0983
Sealing connection of pump hose	Part no 34 2000

Following parts available from Afriso- Euro-Index

Lindenstr.20, 74363 Güglingen 07135 1020 http://www.afriso.de/shop/

	Order no.:
Knurled screw ½”	37314
Knurled screw ¾”	37304
Seals	39215

6.1.2 Special tools / opening gas appliances:

Usually these parts are also documented in the spare-part lists

Open wrench SW 24 / 27 gas connection ½“	Ident-Nr. 34 1201
Free-standing cookers FBH up to FD7301	Part no. 34 0002
Hob wrench FBH cooker hob from FD7401	Part no. 15 9923
Installation lever for ceramic gas hobs (cooker hobs and hobs with integrated control panel).	Part no. 16 9093

also very suitable for Gaggenau WOK VG230 / VG330 and N2222N0 (GK-Domino ´94-´99, screw fittings for burner head)

Repair aid (support strips for Domino ceramic hobs from FD 7905)	Part no. 35 9286
Installation lever for ceramic hob with integrated control panel from FD8105 (angled spatula)	Part no. 48 3196
Locking and unlocking lever (knob) for cooker hob combinatons from 8406:	Part no. 18 9414
Inbus hexagonal No 10 (WOK Inner burner)	Part-Nr. 34 1200
Inbus hexagonal No 7 3/8” (WOK Inner burnerKG354)	Part-Nr. 34 1199

6.1.3 Part number for oven repairs:

Robax special glass pane	Part no. 34 0043
Test needle (1.5 mm ∅), small flame test	Part no. 01 5459
Allen wrench 2.5 mm, oven controller adjustment	Standard tool

6.1.4. Cleaners (specific helpfull on gas appliances)

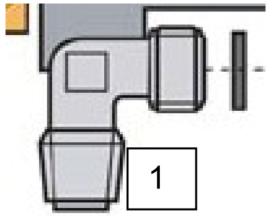
Stainless steel Cleaner for removing tempering colours	Part no. . 46 4524
Metal polish Monidur	Part no. 31 0065
Stainless steel coil “Spontex Spirinett” (enamelled burner parts, oven)	Part no.. 46 9946

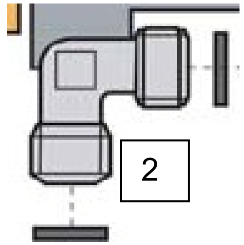
More overleaf!

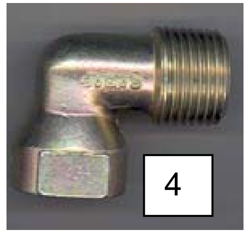
6.1.5 Other part numbers

Sealing (burner seals) and screw set ceran hobs	Part no. 64 2319
Screw set for steel hobs (Sabaf – Defendi)	Part no. 417788
Leak search Foam :(liquid for spraying or brushing)	Part no. 34 0055
Brush for attaching the foam	Part no.17 3682
Leak search Foam: (Alltech spray)	Part no. 31 0613
Tightening filament Loctite (gas connection thread)	Part no. 31 0789
Condensation mirror	Part no. 34 0035
Tap plug grease Staburags N32	Part no. 31 0354
“Screw loosener“ (Lubra metallic penetrating oil) **(Warning: Do not use on gas tap, attacks tap plug grease!)**	Part no. 31 0373
Socket wrench A/F 5.5 for nozzle (EGA burner)	Part no. 26 9605
Socket wrench A/F 7 (Düsen Sabaf, Defendi)	Part no .341794
Loop (for recognizing nozzle No)	Part no. 341892
Thickness gauge (judgement pan supports)	Part no. 341572
Installation set for built-in cookers FBH	Part no. 03 1612
Ignition cable 40 cm	Part no. 02 1853
Ignition cable 120 cm (oven)	Part no. 02 9975
Insulating sleeve for ignition cable	Part no. 02 1935
Stainless steel countersunk screw (FBH hob top for built-in hobs < FD74xx)	Part no. 15 1703
Silicone adhesive Omnivisc (for gluing in rubber feet of pan support)	Part no. 31 0589
Coffee support 3 Arms	Part no. 42 3529
Coffee support 4 Arms	Part no. 18 4200
Lixsteel stainless steel cleaner:	Part no. 46 0739
Monidur metal polish	Part no. 31 0065
Hose for pressure test	Part no. 61 8950
Flow pressure electr. Testo 505-p1 0560.5051	Part. Nr. 34 1097
½ inch intermediate piece with nipple for pressure test (thread for gas connection female - male)	Ident-Nr.:34 1052

6.1.6 Adapter connection for gas installation







Connection set for liquid gas:
½ inch to 8 mm steel pipe with 90° elbow,
for D; A for cutting-ring connection). Part no. 04 7785

Adapter connection ½ inch ISO 228 – ISO7
internal – external (conical), straight Part no. 18 1018

Adapter connection ½ inch to 10 mm corrugated pipe
(½” internal thread – liquid gas corrugated pipe)
Not for DE / AT!! straight Part no. 16 9828

Adapter connection ½ inch – 12 mm copper pipe
(½” internal thread – copper pipe spigot) Not for DE / AT!!
straight Part no. 03 8313

½ inch bracket external ISO228 (parallel)-
external ISO7 (conical) **(1)** Part no.:15 6095

½ inch bracket external- external ISO228
(parallel, FR. ES) **(2)** Part no.:15 6094

½ inch bracket internal- external ISO7 (conical)
(both sides can be used only for seal in the thread
ISO7), only for older appliances FD< 80xx **(3)** Part no.:15 2760

½ inch bracket internal- external ISO7 (conical)
(internal thread for seal with flat packing
ISO228, external thread for seal on the
thread ISO7 **(4)** Part no.:17 3018

½ inch bracket internal- external ISO228 (parallel)
both sides
(not necessary as it can be connected directly) Part no.: no

Flat packing for ISO 228 connection
(“paper” seal over pipe end) Part no.:03 4308

½ inch piece with nipple for pressure measurement
Part no.:34 1052