Operating instructions

Heating and special torches GRIFLAM®

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Table of contents

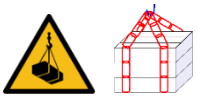
1 Content

1.1 Foreword

These operating instructions are intended to enable the proper and safe use of the GRIFLAM® heating and special torches. Observance of these operating instructions helps to avoid dangers and to increase the reliability and service life of the torches. The operating instructions must be available at hand for everyone who works with the torch and must be read before putting the torch into operation.
The German version of these operating instructions is the original.

1.2 Transport

1.2.1 Notes on transport

Danger	**Falling parts**
	When transporting heating and special torches GRIFLAM® the following must be observed: Only use transport and slinging equipment approved for the weight. Take weather conditions into account. Moving under suspended loads is prohibited. Slings secure on heat and special torches Fix GRIFLAM® so that it is not possible for the heating and special torches GRIFLAM® to fall out.

The heating and special torches GRIFLAM® have to be checked for possible transport damages and if necessary a complaint has to be made immediately. Damaged work equipment must never be used or applied.

1.2.2 Notes on storage

A storage or intermediate storage of the heating and special torches GRIFLAM® must be carried out in a room - protected from dust and humidity - at temperatures between +5°C and +35°C to avoid damages.

1.3 Personal protective equipment

Note	**Personal protective equipment**
	Wear suitable PPE, especially protective shoes and hand protection. Use suitable safety glasses when handling gases or liquids under pressure or without pressure.

1.4 Required expertise and training of the user

GRIFLAM® heating and special torches and systems requiring supervision may only be operated independently by persons who are 18 years of age or older, physically fit and have the necessary expertise or have been instructed by a competent person. Furthermore, regular instruction is recommended, but at least once a year.

2 Description of the torches by operation, mixing principle and design

The GRIFLAM® heating and special torches can be distinguished according to their type of operation, their mixing principle or their design.

2.1 Type differentiation according to operation

2.1.1 Manual operation

Manually operated are torches where all switch-on, ignition and switch-off processes as well as the control of the torch capacity are performed or initiated manually. The only self-acting process that can be considered is switching off the torches by activating safety devices.

The second possible application for heat torches is their use as machine torches. The torch is permanently connected to a machine or device. The heat torch can work semi-automatically or automatically.

2.1.2 Semi-automated

Torches are semi-automated if they are operated with self-acting ignition and, if applicable, flame monitoring devices and control units and if each ignition process (torch start-up) is initiated manually. Shut-down can be initiated manually. No automatic re-ignition takes place after a torch shutdown. The torch capacity is controlled automatically or manually during operation.

2.1.3 Automated

Torches are automated if they are operated with self-acting ignition, flame monitoring, control and regulation devices. Flame ignition, flame monitoring and torch on/off switching are controlled without operating personnel depending on the value of the controlled variable.
Gas volume control systems additionally allow programmable or temperature-controlled volume control of fuel gas and oxygen or compressed air. Programmable quantity values guarantee reproducible work processes.

2.2 Type differentiation according to the mixing principle

2.2.1 Bunsen mixing principle

Heat torches that work according to the Bunsen mixing principle are also known as intake air torches. They are fed exclusively with fuel gas and the torch's mixing device also draws in atmospheric combustion air. When the fuel gas flows through the pressure nozzle in the intake air injector, it creates a negative pressure compared to the ambient air pressure. Atmospheric ambient air is drawn in through openings in the intake air injector at the mixing point and mixed with the fuel gas. The fuel gas/air mixture is fed to the torch nozzles through a mixing tube. The intake air injector can also form a unit with the torch nozzle. In this case, only fuel gas is fed to the heat nozzles via distribution pipes. Most pilot torches operate on the intake air principle.

2.2.2 Injector torches

The injector (mixing device) consists of a pressure nozzle and a mixing nozzle. The pressure nozzle is located in the mixing nozzle. Oxygen or compressed air flows through the pressure nozzle. As it flows out into the mixing nozzle, a negative pressure is created which sucks in the fuel gas. Oxygen or compressed air mixes with fuel gas in the further course of the mixing nozzle. The mixture is fed through the mixing tube to the torch head (torch nozzle) where it exits and burns.

Danger	**Fire and explosion hazard**
	Mixed uses are not permitted. Only heat torches may be used in conjunction with handles or machine shafts from the same manufacturer and of the same type. Failure to do so may result in fire or explosion hazard.

The gas mixing or nozzle mixing nozzles represent a special design. Instead of a fuel gas/oxygen mixture, fuel gas and oxygen are supplied separately to these heat nozzles. Only inside the nozzle is oxygen and fuel gas mixed by a number of small, integrated injectors using the vacuum mixing principle.

2.2.3 Torch with special Eco-Ven injector

The injector (the mixing device) consists of a pressure nozzle and a mixing nozzle. The pressure nozzle is located in the mixing nozzle. Compressed air flows through the pressure nozzle. As it flows out into the mixing nozzle, a negative pressure is created which sucks in the fuel gas. Compressed air now mixes with fuel gas in the further course of the mixing nozzle. A second pressure nozzle sucks in an additional 75% of the air volume required for combustion from the surrounding atmosphere according to the same principle. The mixture is fed through the mixing tube to the torch head (torch nozzle) where it exits and burns.

The Eco-Ven injector is used exclusively for heat torches of the fuel gas/compressed air/intake air mixture types and is not suitable for oxygen supply!

2.3 Distinction according to the type of construction

Heat torches are geometrically adapted to the application. Common shapes are heat inserts with one nozzle (torch head), in-line torches, forked torches and closed and hinged ring torches. Hardening torches represent a special form. They are manufactured in row torch form or adapted to the workpiece geometry (e.g. for tooth flank hardening). In addition to the flame outlet, they often have a quench water outlet, whereby the quench water also serves as cooling water for the torch head.

3 Safety Instructions

3.1 General risks

Danger	**Fire and explosion hazard**
	Flammable gases or oxidising substances are used. In case of misuse or technical defect, these can lead to an ignitable atmosphere and thus to fires or explosions. Certain gases are heavier than air and spread on the ground, creating a risk of suffocation. Do not allow fuel gas or fuel gas-oxygen or fuel gas/compressed air mixtures to flow out of the torch without ignition. Do not store highly flammable substances in the immediate working environment.

Danger	**Fire hazard**
	Risk of fire by placing the hot heat and pilot torch on flammable surfaces. Do not place heat and pilot torches on flammable surfaces when hot.

Danger	**Risk of injury and damage**
	Torches from Messer Cutting Systems comply with the requirements of DIN EN ISO 5172 mutatis mutandis and are manufactured and tested in accordance with the rules of technology. No changes or conversions may be made to the torches without the manufacturer's approval. Incorrect handling and use can cause hazards for the operator and other persons as well as damage to the torch and the plant.

Danger	**Risk of suffocation**
	Depending on the size and design of the torch, large quantities of ambient air are required to operate the torches. To avoid the risk of suffocation, it is therefore important to ensure a sufficient supply of fresh air. It is also true that harmful exhaust gases can be produced, which can also contribute to the risk of suffocation. If torches are operated without exhaust gas discharge, adequate ventilation of the workplaces must be ensured. If a heating system is connected to a chimney system, a safety device (flow monitor) is required which switches off the torches or switches over to another chimney in the event of a malfunction of the chimney duct.

All instructions marked with the safety signs warn of possible dangers and must be followed. Furthermore, the legal provisions and regulations always apply additionally.

3.2 Intended use

Heat torches may only be used to heat metals or other materials within the specified performance range and with the specified gas pressures.

Only gases for which the torch is marked may be used. For gas labelling see section Labelling. In addition, the gas supply must be adequately dimensioned with regard to the gas consumption indicated for the torch.

The fuel gas used in each case is mixed with oxygen, compressed air or air at the torch inlet (injector torch) or with oxygen at the torch outlet (external mixed torch).
Torches which are marked for oxygen must not be used for air and vice versa.
Gas labelling see section Labelling

The distance between the torch and the workpiece must be maintained in such a way that optimum heat utilisation is guaranteed. Please note that too small a distance can cause melting on the workpiece surface and the closure of torch bores, e.g. by jumping off scale parts. This creates the danger of flashback in the torch.

For torches with water cooling, care must be taken to ensure that the cooling water flow is always guaranteed. This must be ensured by using a flow monitor or visible outlet. In the cooling water circuit, the return flow must always be monitored. The cooling water to be used should be of drinking water quality.

Furthermore, proper use includes observing all safety instructions in this operating manual, complying with legal requirements, carrying out the necessary tests and inspections, and observing markings, data sheets and the like.

3.3 Use not in accordance with regulations

In principle, any use that does not meet the criteria of intended use is considered improper use.

In particular, operation with values deviating from the specified pressures, gas quantities, gas types or temperatures is also considered improper use.

The torches must not be used for the use of gases in the liquid phase.

The torches must not be used for transferring gases or for blow-off operations.

The operation of stationary torches must not be performed without constant supervision by a trained specialist.
Exception: Automatically operating systems with monitoring elements for flame, cooling water, gas pressures, possibly temperature with automatic switch-off.

In case of doubt about the possible applications of the torch, the manufacturer should be consulted.

Any use not in accordance with the intended purpose is expressly prohibited!

3.4 Applicable guidelines and regulations

Please observe the respective national laws and guidelines (for Germany listed below):

2014/68/EU Pressure Equipment Directive
2014/35/ EU Low Voltage Directive

DGUV

Rule 100-500 Chap.2.26Welding , cutting and allied processes
Rule 100-500 Chap.2.31Working on gas pipes
Regulation 100-500 chap.2.33Operating installations for handling gases

Standards

DIN EN 125	Flame control devices for gas appliances - Thermoelectric flame arresters
DIN EN 60204-1	Safety of machinery - Electrical equipment of machines
DIN EN ISO 12100Safety of	machinery
DIN EN 730-1Safety devices	with integrated flame arrester
DIN EN ISO 5175-1Safety devices	with integrated flame arrester
DIN EN ISO 9012	Gas welding machines- manual torches for sucked in air
DIN EN ISO 3821Rubber hoses	
DIN EN 560hose connections	
DIN EN 1256	Hose connections
DIN EN ISO 5172Gas welding equipment	
DIN/CEN/TR 13259	Handheld special torches and machine torches for industrial processes for flame heating, flame brazing and related processes
DIN EN ISO 9090Gas tightness	
DIN EN ISO 9539Materials	
DIN ISO 746-2Industrial	thermoprocessing equipment Part 2: Safety requirements for combustion plants and fuel handling systems

Laws

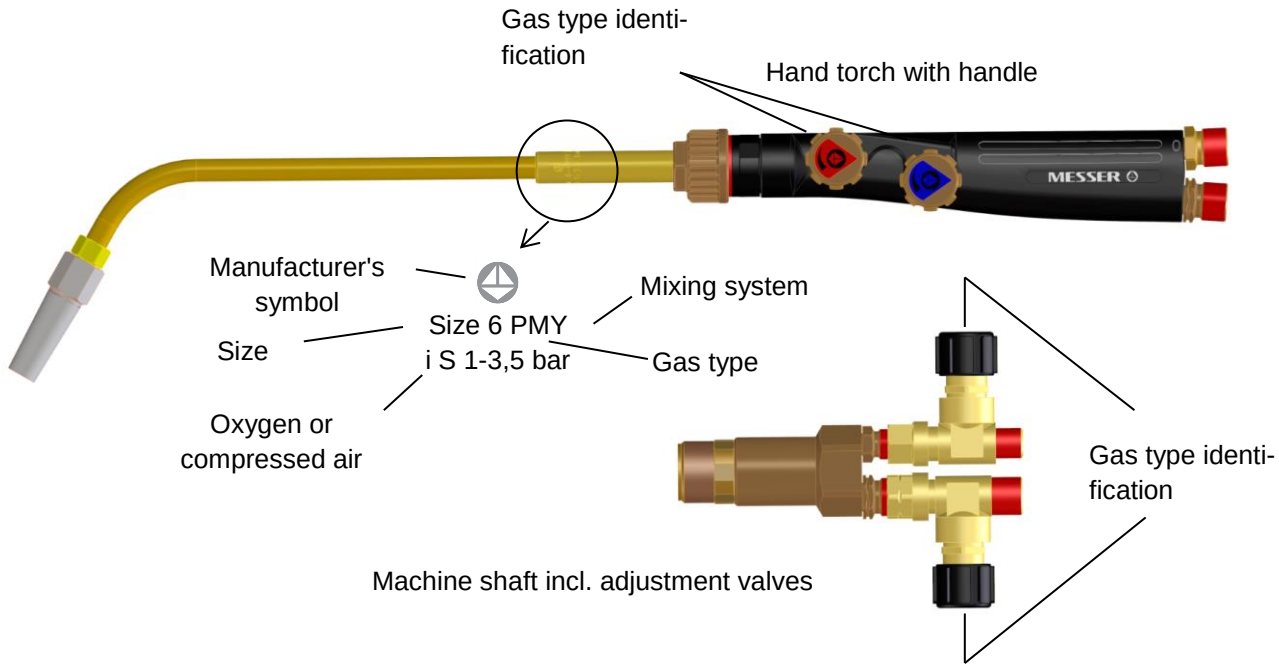
ProdSG Product Safety Act
BetrSichV Industrial Safety Regulation

Technical rules

TRBS	Technical Rules for Operational Safety
DVS 0221 data sheet Recommendations	for risk assessment

3.5 Labelling

3.5.1 Exemplary design of hand torch with handle or machine shaft



3.5.2 Type of gas and marking according to DIN EN ISO 5172

D = compressed air	Black
O = oxygen	Blue
A = Acetylene	Yellow
P = propane, butane, LPG (liquid gas)	Orange
M = methane (natural gas)	Rot
Y = MPS (Methyl acetylene propandiene-	Red mixtures and other fuel gas mixtures, e.g. MAPP)
E = Ethylene, Grieson	Red
H = hydrogen	Red

3.5.3 Mixing systems

i = mixing system with suction effect (suction torch)
i = gas-return-proof mixture with suction effect (suction torch)
I = mixture without suction effect (pressure torch)
I I = gas-return-proof mixture without suction effect (pressure torch)

4 Additional torch equipment (possible options)

Depending on the selected torch type and type of automation, the following ignition and monitoring devices can be used.

4.1 Ignition devices

With the following ignition devices, in addition to the classic bow-type manual igniter version, heat torches can be ignited.

4.1.1 Pilot flame with air intake (fuse)

The ignition fuse is an external torch for manual ignition of the main torch. It is connected to a separate fuel gas supply line and operates according to the Bunsen mixing principle.

4.1.2 Electrically ignited pilot flame with air intake (pilot torch)

Device to be mounted on the torch (pilot torch) with separate gas supply, ignition electrode and ignition transformer.

4.1.3 Electrically directly ignited main flame

Ignition electrode mounted or integrated on the torch, electrically wired with ignition transformer. The ignition electrode projects into the gas flow of the main torch and ignites the gas mixture when the ignition spark is triggered. Only possible with fuel gas/compressed air mixture or intake air torches.

4.2 Ignition devices with flame monitoring

4.2.1 Ignition device with ionisation electrode

Only suitable for torches that are operated with a fuel gas/compressed air or fuel gas/air mixture and their maximum flame temperatures.

Variant 1: The main torch is ignited via an ignition electrode and then the main flame is monitored via the ionisation electrode. This is combined with a flame monitor or automatic torch control unit, integrated in a control cabinet. In the event of a torch malfunction (flame goes out), the solenoid valves of the gas supply panel close and thus stop the gas supply.

Variant 2: The main torch is ignited by an external pilot torch with a permanent flame and then the flame of the pilot torch is monitored via the ionisation electrode. This is combined with a flame monitor or automatic gas torch control, integrated in a control cabinet. In the event of a torch malfunction (pilot torch flame goes out), the solenoid valves of the gas supply panel close and thus stop the gas supply. In the event of a main torch fault (flame goes out), on the other hand, the monitored pilot torch re-ignites the flame and no gas flows out unhindered.

!! No monitoring function with main torch switch-off in case of flashback in the main torch!

4.2.2 ignition device and separate use of a UV probe

Depending on the system concept, and especially if a fuel gas/oxygen mixture is used at the main torch use of a UV probe may be necessary. The main torch is ignited by an external pilot torch and then the main flame is monitored via the UV probe. This is combined with a flame monitor or automatic gas torch control, integrated in a control cabinet. In the event of a torch malfunction (flame goes out), the solenoid valves of the gas supply panel close and thus stop the gas supply. This also applies in the event of a flame flashback in the main torch.

4.3 Thermoelectric flame monitoring

In thermoelectric flame monitoring, a thermocouple projects into the flame of the main torch. This is connected to a switching valve as a safety device. If the flame of the main torch goes out, the temperature at the thermocouple drops, which then causes the switching valve to close. The flow of fuel gas is thus interrupted and must be manually unlocked again. This type of flame monitoring is practically only used for torches with Bunsen mixing principle. Under no circumstances is it permitted to use it with acetylene or with a combination of fuel gas with oxygen.

4.4 Temperature monitoring of the workpiece via pyrometer

Non-contact measuring method with temperature display with or without timer, electromagnetic valves for switching off or restarting the torch to control the workpiece temperature. To use this function, the torch control unit in the control cabinet must be equipped and programmed accordingly.

4.5 Cooling water monitoring

Flow monitor and/or temperature monitor with pulse generator to switch off the torch by means of electromagnetic valves. In the cooling water circuit, flow monitors must always be installed in the return line. To use this function, the torch control unit in the switch cabinet must be equipped and programmed accordingly.

4.6 Gas pressure monitoring

In certain applications, the inflow pressures of the gases can be monitored by pressure switches. If the minimum or maximum required pressures are exceeded, the gas supply is interrupted by closing the solenoid valves. After the pressures are correct again, a lockout must be released and the torch must be re-ignited. To use this function, the torch control unit in the control cabinet must be equipped and programmed accordingly.

4.7 Gas warning system

Depending on the application, external monitoring of the ambient air for uncontrolled gas leakage may be necessary. The use of a gas warning system is recommended for this purpose, which must be explicitly adapted to the gases used and the room to be monitored. In the event of uncontrolled gas leakage, for example, a corresponding alarm is triggered. To use this function, the torch control unit in the control cabinet must be equipped and programmed accordingly.

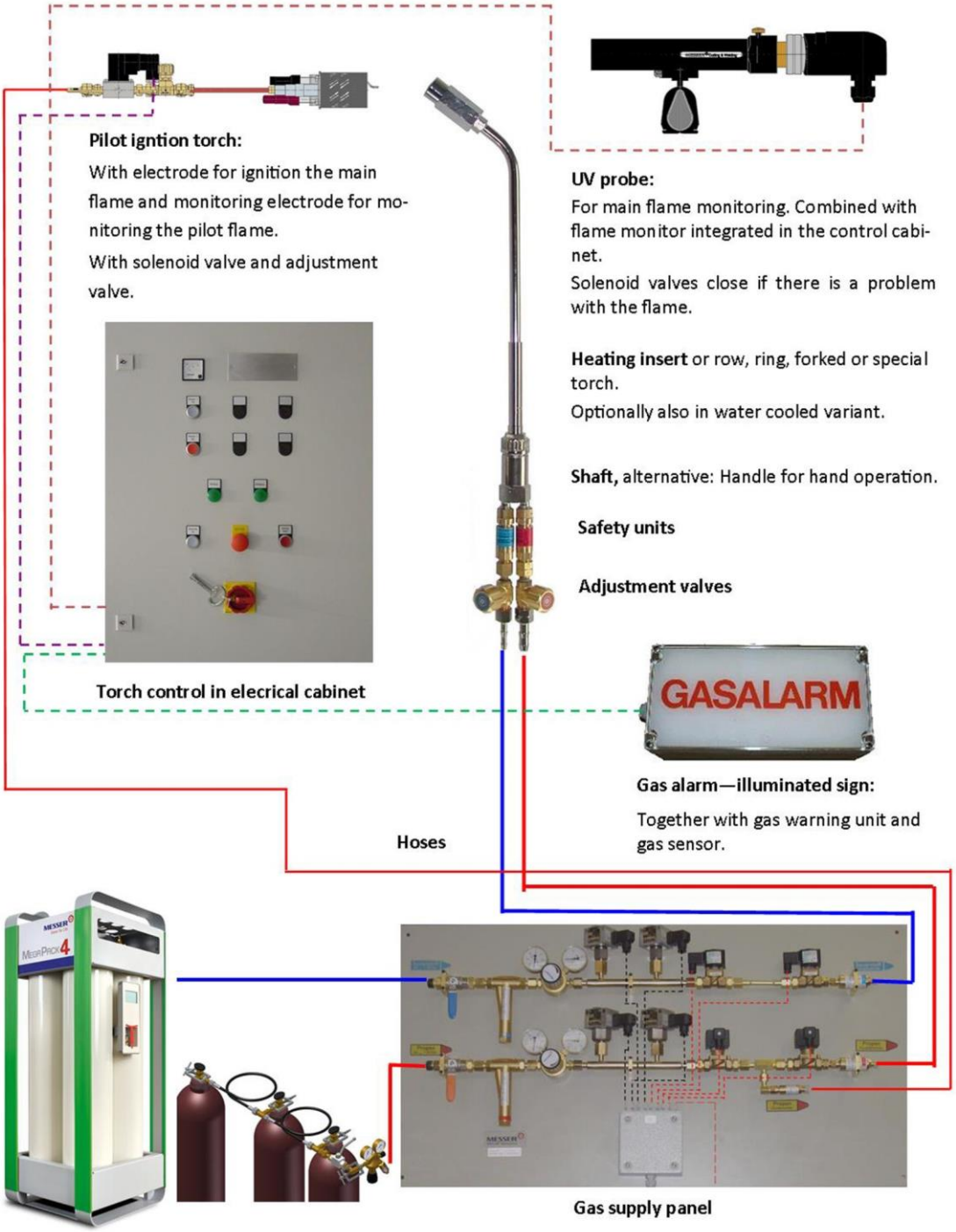
4.8 Schematic structure of an automated heating system (without temperature monitoring)

Version:

- Single parts for automated heating system on the following pages.
- Automated heating units will be offered complete from Messer GRIFLAM.

Application:

- Automated operation of heating torches with ignition and monitoring functions.



5 Commissioning, assembly, decommissioning

5.1 Preparations for commissioning

Danger	**Fire and explosion hazard**
	Always keep all parts coming into contact with oxygen free of oil and grease! Otherwise there is a risk of explosion!

Danger	**Fire and explosion hazard**
	Flammable gases or oxidising substances are used. In case of misuse or technical defect, these can lead to an ignitable atmosphere and thus to fires or explosions. Some gases are heavier than air and spread on the ground, creating a risk of suffocation. Perform a leak test before the first commissioning. To do this, open and observe the water and gas supply. Use approved test sprays.

Danger	**Uncontrolled movements**
	Danger from escaping media at high pressure, hoses being knocked around, parts being whirled up. For this reason, cables and hoses must be laid free of stress and vibration, without kinking or crushing points. Do not damage hoses and cables. Do not lay hoses on sharp edges without protection. Fix the cables and components in accordance with the relevant regulations. All hoses must meet the requirements of DIN EN ISO 3821. The specified operating pressures at the torch inlet must be observed and maintained.

Danger	**Fire and explosion hazard**
	Hoses that are exposed to higher thermal loads, e.g. on stationary heat torches with high thermal output, must be equipped with a heat protection layer.

Danger	**Fire and explosion hazard**
	Due to vibrations during transport, it cannot be excluded that connections or gas and air-carrying pipes have become loose and have become leaky. All threaded connections must therefore be checked for leaks before commissioning and retightened if necessary.

Danger	**Fire and explosion hazard**
	Fire and explosion hazard during commissioning in case of gas leakage and formation of an explosive atmosphere due to non-ignition as a result of an incorrectly adjusted torch. Keep the ignition process short and allow for an appropriate cooling phase between two ignitions. Set ignition times appropriately in relation to hose lengths.

Danger	**Burns caused by hot surfaces**
	The heating and pilot torch heats up very strongly during operation and retains this high temperature for a long time after shutdown. During and after operation, therefore, a safety distance from the heating and pilot torch must be maintained.

Danger	**Hazards due to radiation**
	Eye injuries are possible during operation due to the generation of infrared light. Do not look directly into the flame during operation, wear protective goggles if necessary.

Before installation, it must be checked whether the gas supply is sufficiently dimensioned, in particular whether the required gas quantities and gas pressures are achieved.
The gas tapping points must be equipped with safety devices according to DIN EN ISO 5175-1 and DIN EN ISO 5175-2.

5.2 Assembly

Note	**Personal protective equipment**
	Wear suitable PPE, especially protective shoes and hand protection. Use suitable safety glasses when handling gases or liquids under pressure or without pressure.

If a machine is used: Move the machine into a safe position, disconnect it from the power supply and secure it against being switched on again. Machine parts that move when not in use or that can fall down during work must be secured.

The following applies to all applications: Switch off the supply of auxiliary materials (water, gases, etc.) safely and secure against being switched on again.

For torches with cooling water connection, the water connections must also be checked:

- Thread undamaged and dry?
- Seals undamaged and not brittle?

Then install the torch. For torches with injector principle, the "suction test" must be performed, see section "Notes on operation and maintenance". Afterwards the torch must be connected gas-tight to the handle or machine shaft by tightening the union nut. Make sure that the seals and sealing surfaces are in perfect condition. When using a machine shaft, suitable adjustment valves must also be fitted to the shaft. All hoses used must comply with DIN EN ISO 3821.

The oxygen or compressed air connections must be fixed by tightening (clockwise) the nuts.

The fuel gas connections are to be fixed by tightening (left turning) the nuts.

The water connections must be fixed by tightening (clockwise) the nuts.

In the case of a system with ignition device the following applies additionally: All electrical connections of the ignition system may only be connected when the ignition is switched off.

If possible, ignition cable pliers should be used. If this is not available, the assembly should always be carried out by pulling or pushing the plug. If the cable itself is pulled, it can be damaged or torn off.

When laying the cables, make sure that they are not bent and do not come into contact with hot parts.

Ignition cables and monitoring cables must always be laid separately. Laying them together within one cable shaft is not permitted and can lead to malfunctions.

The ignition cable between ignition electrode and ignition transformer should be max. 5 m long. If the control cabinet is placed further than 5m from the torch, it is recommended to install the ignition transformer in a separate terminal box instead of the control cabinet and to mount it near the torch.

The pilot torch must be earthed on the housing at the designated point.

For successful heating with a result that is as constant as possible, the torch must be installed or guided in such a way that the distance between the torch and the workpiece is kept as constant as possible. With machine-guided torches, additional care must be taken to avoid collisions with the workpiece or fixture. The safe operation of a torch at a constant heat output is only guaranteed if the secondary flame is provided with sufficient air for complete combustion. If the torch is operated in areas of the component with restricted air access, forced ventilation must be provided if necessary.

Danger	**Risk of suffocation**
	Depending on the capacity of the torches, large quantities of ambient air are required to operate the torches. In order to avoid the risk of suffocation, it is therefore important to ensure a sufficient supply of fresh air. It is also true that harmful exhaust gases can be produced, which can also contribute to the risk of suffocation. If torches are operated without exhaust gas discharge, adequate ventilation of the workplaces must be ensured. If a heating system is connected to a chimney system, a safety device (flow monitor) is required which switches off the torches or switches over to another chimney in the event of a malfunction of the chimney duct.

5.3 Commissioning

All points under Preparations for commissioning and installation are fulfilled, all shut-off devices are closed and all installed components as well as the gas supply are in a perfect technical condition and in compliance with the relevant safety regulations.

Note	**Personal protective equipment**
	Wear suitable PPE, especially protective shoes and hand protection. Use suitable safety glasses when handling gases or liquids under pressure or without pressure.

It must be ensured that the required gas pressures or gas quantities are present at the torch inlet before the gas mixture is ignited. For torches with cooling water, it must be checked whether the cooling water flow is guaranteed. Cooling water must always be switched on first.

5.3.1 Commissioning for torches with Bunsen mixing principle

Keep the fuel gas adjustment valve closed at first. Slowly open the bottle valve or the extraction valve (distribution line). Set the operating pressure at the pressure regulator according to the information on the torch or the table. The required fuel gas pressure must be upstream of the safety device and should be constant and at least equal to the required operating pressure.

1. Open the fuel gas adjustment valve at the torch inlet about 3/4.
2. Open the shut-off ball valve at the torch inlet completely.
3. Immediately ignite escaping fuel gas with a torch lighter or pilot flame. If the pilot flame is permanently installed (integrated), it must be ignited beforehand.
4. Adjust the flame according to the application using the adjustment valve and the air control.
5. After the flame has stabilised, adjust the operating pressure at the tapping point or pressure regulator if necessary.

5.3.2 Commissioning for torches with Bunsen mixing principle and thermoelectric flame monitoring

Keep the fuel gas adjustment valve closed at first. Slowly open the bottle valve or the extraction valve (distribution line). Set the operating pressure at the pressure regulator according to the information on the torch or the table. The required fuel gas pressure must be upstream of the safety device and should be constant and at least equal to the required operating pressure.

1. Open the fuel gas adjustment valve at the torch inlet about 3/4.
2. Open the shut-off ball valve at the torch inlet completely.
3. Press and hold the push button of the thermoelectric flame monitor.
4. Immediately ignite escaping fuel gas with a torch lighter or pilot flame. If the pilot flame is permanently installed (integrated), it must be ignited beforehand.
5. The push-button of the thermoelectric flame control safety valve must remain pressed until the thermocouple has been heated for about 10-15 seconds. After that the button can be released. The safety valve remains open due to the torch flame on the thermocouple. The valve closes automatically if the flame goes out or the connecting line is interrupted.
6. Adjust the flame pattern according to the application by means of the adjustment valve and the air control.
7. After the flame has stabilised, adjust the operating pressure at the tapping point or pressure regulator if necessary.

5.3.3 Commissioning for torch with injector

Keep the fuel gas adjustment valve and the compressed air or oxygen adjustment valve closed at first. Slowly open the bottle valves or extraction valves (distribution line). Set the operating pressures at the pressure regulator as specified on the torch or according to the table. Required pressures must be upstream of the safety devices and should be constant and at least equal to the required operating pressure.

1. Open the compressed air or oxygen adjustment valve about 1/3.
2. Open the fuel gas adjustment valve at the torch inlet about 3/4.
3. Immediately ignite the escaping fuel gas mixture with a torch lighter or pilot flame. If the pilot flame is permanently installed (integrated), it must be ignited beforehand.
4. Adjust the flame pattern according to the application using the adjustment valves.
5. After the flame has stabilised, adjust the operating pressures at the tapping points or pressure regulators if necessary.

5.3.4 Commissioning for torch with special injector Eco-Ven

Keep the fuel gas adjustment valve and compressed air adjustment valve closed at first. Slowly open the bottle valves or extraction valves (distribution line). Set the operating pressures at the pressure regulator as specified on the torch or according to the table. Required pressures must be applied upstream of the safety devices and should be constant and at least equal to the required operating pressure.

1. Open the compressed air adjustment valve about 1/3.
2. Open the fuel gas adjustment valve at the torch inlet about 3/4.
3. Fully open the adjustment valve for intake air.
4. Immediately ignite the escaping fuel gas mixture with a torch lighter or pilot flame. If the pilot flame is permanently installed (integrated), it must be ignited beforehand.
5. Adjust the flame pattern according to the application using the adjustment valves.
6. After the flame has stabilised, adjust the operating pressures at the tapping points or pressure regulators if necessary.

5.3.5 Commissioning for torches in automated plants

In automated or semi-automated systems, initiate torch start via buttons on the control cabinet. Before doing so, open the adjustment valve as with a manually ignited torch. Solenoid valves open automatically. Torch is ignited by pilot torch or directly electrically. If the torch does not ignite, the flame monitoring system switches off the gas supply (depending on the system, fuel gas and/or oxygen, compressed air) via the solenoid valves. After any malfunction has been rectified, the switch cabinet must be unlocked via push-buttons before the next start attempt. After the start has been completed, regulate the desired flame output at the setting valves. The required operating pressures for oxygen or compressed air and fuel gas, as well as cooling water if necessary, can be monitored in automated systems. If the set minimum or maximum pressures are exceeded, the system switches to fault mode at torch start and closes the gas supply.

5.4 Decommissioning

5.4.1 Decommissioning for torches with Bunsen mixing principle

Close the fuel gas adjustment valve or ball valve at the torch inlet. If there are longer breaks, additionally close the bottle or tapping valves or ball valves on the distribution line. Open the fuel gas adjustment valve or ball valve to relieve the system of fuel gas pressure. Then release the pressure regulator by unscrewing the adjusting screw. Close the pressure regulator outlet valve and fuel gas adjustment valve or ball valve. The optional use of a thermoelectric flame monitor has no influence on this.

5.4.2 Decommissioning for torch with injector

When switching off the torch, proceed in the reverse order to lighting. First close the fuel gas adjustment valve on the handle or machine shaft and wait until the flame has extinguished. Then close the oxygen or compressed air adjustment valve. For longer breaks, additionally close the bottle or extraction valves or ball valves on the distributor line. Release the pressure from the system by opening the setting valves. Then release the pressure regulator by unscrewing the adjusting screw. Close the pressure regulator outlet valves and the setting valves.

5.4.3 Decommissioning for torches with special injector Eco-Ven

When switching off the torch, proceed in the reverse order to lighting. First close the fuel gas adjustment valve on the handle or machine shaft and wait until the flame has extinguished. Then close the compressed air adjustment valve and then the adjustment valve for intake air. For longer breaks, additionally close the bottle or extraction valves or ball valves on the distributor line. The system must be relieved of pressure by opening the setting valves. Then release the pressure regulator by unscrewing the adjusting screw. Close the pressure regulator outlet valves and the setting valves.

5.4.4 Decommissioning for torches in automatic plants

For automatic systems press the stop button. Solenoid valves for fuel gas and oxygen or compressed air close with a time delay. In case of longer breaks, additionally close the bottle valves or the tapping valves or ball valves on the distribution line. The system must be relieved of pressure by opening the setting valves. Then release the pressure regulator by unscrewing the adjusting screw. Close the pressure regulator outlet valve and the setting valves.

5.5 Disassembly

Danger	**Burns caused by hot surfaces**
	The heating and pilot torch heats up very strongly during operation and retains this high temperature for a long time after shutdown. After operation, cool-down times (temperatures <64 °C, see also DIN EN ISO 13732-1) must be observed. Warm gloves must be worn.

Note	**Personal protective equipment**
	Wear suitable PPE, especially protective shoes and hand protection. Use suitable safety glasses when handling gases or liquids under pressure or without pressure.

Removal is in the reverse order to installation.

Danger	**Danger from residual energy**
	Fluids can still be under pressure in pipes due to unblocked feeds, residual pressures or faulty components. Therefore, do not hold the hoses in the direction of the body after loosening them.

If a machine is used: Move the machine into a safe position, disconnect it from the power supply and secure it against being switched on again. Machine parts that move when not in use or that can fall down during work must be secured.

The following applies to all applications: Switch off the supply of auxiliary materials (water, gases, etc.) safely and secure against being switched on again.

For torches with cooling water connection applies additionally:

The water connections can be loosened by turning the nuts counterclockwise.

Danger	**Danger from residual energy**
	Fluids can still be under pressure in pipes due to unblocked feeds, residual pressures or faulty components. Therefore, do not hold the hoses in the direction of the body after loosening them.

The torch gas connection can be released by turning the nuts clockwise.
The oxygen or compressed air gas connection must be loosened by turning the nuts counterclockwise.

In the case of a system with ignition device the following applies additionally: All electrical connections of the ignition system must only be disconnected when the ignition is switched off.

Ideally an ignition cable pliers should be used. If this is not available, the disassembly should always be done by pulling or pushing the plug. If the cable itself is pulled, it can be damaged or torn off.

Make sure that the plug is always pulled straight away from the ignition electrode, otherwise the ceramic may be damaged.

6 Instructions for operation and maintenance

6.1 Faults

The causes of faults can be many and varied, which is why this chapter can only give a rough outline of possible faults. It expressly makes no claim to completeness. A prerequisite for fault-free operation is that commissioning has been carried out correctly. The media supply must be ensured with the specified gas pressures and flow rates.

6.1.1 Flame change

Characteristic: Acoustic or optical features (colour, size) of the flame have changed.
Cause: Incorrect flame setting and/or gas pressures
Remedy: readjust the flame. In case of repeated occurrence, check the gas pressures or check the gas supply.

6.1.2 Torch bang

Characteristic: Flame blows off, possibly with continuous crackling.
Cause: The torch nozzles touch the material surface. Dirty or damaged outlet holes of the heating nozzles. Lack of fuel gas.
Remedy: Check the nozzle bores: Check for unhindered gas escape and clean with a suitable nozzle cleaner (Caution: Do not use twist drills. Nozzle bore must not be widened). If necessary, replace heat nozzles.
Increase the distance of the torch to the workpiece.
If necessary readjust the fuel gas pressure (check upstream fittings).

6.1.3 Torch backfire

Feature: Extinguishing the flame with a whistling sound. Flame penetrates into the torch and continues to burn in the area of the mixing point.
Cause: The torch nozzles touch the material surface. Dirty or damaged outlet holes of the heating nozzles. Lack of fuel gas. Overheating. Leakage in the mixing tube
Remedy: Close the fuel gas and oxygen valve immediately.
Exception: Hardening torches, in this case close the oxygen valve first to prevent a flame cutting effect.
In automatic mode with direct monitoring of the main flame, the solenoid valves for the gas supply close automatically when the flame goes out. (Not with monitoring by pilot torch flame).
Check torch clearance, replace damaged heat nozzles.
Clean dirty outlet holes of the heating nozzle with a suitable nozzle cleaning drill.
Readjust the fuel gas pressure, check the upstream fittings if necessary.
Check the tightness of the union nut between the handle or machine shaft and the injector, and all screw connections between the injector and the torch head.
After the flame in the torch has extinguished, carefully re-open the oxygen valve to cool the inside of the torch.
With water-cooled torches, let the cooling water continue to run!

Be careful when recommissioning. Observe the corresponding chapter 6.2.

6.1.4 Heat accumulation

Feature: Torch temperature rises
Cause: Heat accumulation
Remedy: If the torch is water-cooled, check the water outlet temperature and increase the flow rate if necessary (water pressure). Reduce
heat build-up and reflection of the incident flame on the nozzle or torch head by increasing the distance between the torch and the workpiece.

6.1.5 Damage to the torch

Characteristic: E.g. leakage of screw connections on torches and nozzles, damage due to torch backfire, meltdown at the mixing point, blocked injector nozzle, etc.
Cause: Various possibilities outside the intended operating mode
Remedy: Do not put the torch into operation and have it repaired by a competent person in an authorised repair shop.

6.2 Recommissioning after a fault

6.2.1 Cleaning of torch and nozzles

Clean the torch and nozzles before putting them back into operation. Use suitable nozzle cleaners for cleaning the nozzles, if necessary also use a brass wire brush. Attention: Nozzle bores must not be widened / deformed.
The cleaning may only be carried out by qualified personnel.

6.2.2 Suction test (for injector torches)

To do this, unscrew the fuel gas hose from the handle or machine shaft or, in the case of handles with non-detachable nozzles, pull off, open the oxygen and fuel gas valves, oxygen flows out of the torch nozzle. Hold fingertip at fuel gas inlet socket of the grip or machine shaft. If the suction effect is good, the fingertip is sucked in. If no suction effect is detected, the torch must not be put into operation and must be checked or repaired in an authorised workshop.

6.2.3 Recommissioning after torch backfire

In addition to the remedial measures described above, it must be ensured that the torch has cooled down when it is restarted.

6.3 Maintenance

Danger	Maintenance work must be carried out exclusively by competent persons who, through their professional training, professional experience and timely professional activity, have the necessary expertise to inspect the work equipment. (Germany TRBS 1203)

GRIFLAM® heat and special torches must always be handled with care and protected from damage and soiling. This applies especially but not exclusively to threads and sealing surfaces.
Cleaning of the torch head must be carried out carefully and re-boring of the nozzle holes is not permitted. Mechanical cleaning may only be carried out by competent persons.

The GRIFLAM® heat and special torches have to be visually inspected regularly for impurities and damages.

- Contamination must be removed
- If damages are found, the heat and special torch GRIFLAM® must be taken out of operation.

6.3.1 Handling oxygen

Danger	**Fire and explosion hazard**
	Always keep all parts coming into contact with oxygen free of oil and grease! Otherwise there is a risk of explosion!

6.3.2 Seals

Torches may only be used with perfect seals and sealing surfaces.

Damaged seals must be replaced immediately. Damaged sealing surfaces must be reworked or replaced.

6.3.3 Valves

Glandless valves cannot be tightened. In case of leakage replace sealing ring or replace complete valve. If the valve leaks, clean or repair the valve seat and valve cone.

6.3.4 Leak test

Safety devices must be tested at least once a year for leak tightness, gas leakage resistance and flow rate. All gas-carrying parts (torches, fittings, hoses, pipes and connections) must be checked for leaks and damage at least twice a year. Leaks must be eliminated before further operation.

7 Repair

Danger	Repairs may only be carried out by repair workshops authorised by the manufacturer and only by competent persons.

Only the use of original spare parts will ensure proper function and safety. In the event of unauthorised repairs or changes to the original condition by the user or third parties without the approval of the manufacturer, liability for the consequences arising therefrom is cancelled.

After each conversion, a leakage test of the system must be carried out.

After the repair the torch must be completely checked (DIN EN ISO 5172). For special torches this standard has to be applied analogously.

8 Scrapping and disposal

The GRIFLAM® heat and special torches are mainly made of reusable materials and can therefore be disposed of by handing them over to a scrap metal recycler. The local official regulations have to be followed.