GOLDSCHMIDT
Smart Rail Solutions

AUTOGENOUS DEVICES

OPERATING INSTRUCTIONS

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1. General Information

1.1 About these operating instructions

The purpose of these operating instructions is to enable safe use of the autogenous torches and heating trays for the intended purpose and, moreover, to prevent risks, reduce downtimes and increase the reliability and service life of the autogenous devices through compliance with the information contained.

These operating instructions include all the information required for use as intended by trained personnel. Among other things, they contain information about commissioning, operation, maintenance and disposal of autogenous devices. For further information or in cases of doubt, please contact the manufacturer.

Please note the following points:

- The operating instructions form part of the autogenous torches.
- They must be available to the user at all times.
- These operating instructions do not replace the work instruction for the processes in question.
- The information in these operating instructions is binding in nature.
- Everyone who uses the autogenous torches presented in these operating instructions must have read and fully understood the entirety of these operating instructions before use.
- Follow the instructions, prohibitions and commands in the operating instructions at all times.
- Pay attention to all the safety information.

1.2 Supplementary documents

Special work instructions are available for the different applications of the autogenous torches described in these operating instructions in connection with the execution or preparation of a Thermit® weld or with other procedures. The work instruction for the particular Thermit® welding process includes important information on execution of the welding process and must be observed when using the autogenous torches.

1.3 Liability

The user is responsible for failure to comply with the operating instructions. The warranty does not cover damage to the autogenous torches presented in these operating instructions or to accessories or disruptions to business where said damage or disruption is the result of failure to comply with the operating instructions or misuse by the user. Unauthorised conversion or modification of the autogenous torches or accessories are not permitted and invalidate the warranty.

1.4 Copyright

2. Safety

2.1 Explanation of symbols

SYMBOL	DESCRIPTION
	Warning: risk of injury
	General note for helpful tips and additional information

2.2 Safety instructions

This chapter contains all the information relating to safety. Read all safety information thoroughly before use and follow it carefully when using the device.

(1) The use of autogenous torches and handing fuel gases and oxygen requires specialist knowledge and compliance with these operating instructions. Operating personnel should receive training and safety instruction.
(2) Before starting up, take note of possible dangers at the workplace, e.g. of fire risk due to highly flammable solids, gases or liquids. When heating, care must be taken that the resulting heat dissipates or rises upwards. It is recommended to cool the heat conducting material.
(3) A mixture of fuel gas and oxygen or fuel gas and air must not be allowed to escape from the torch **unignited**.
(4) All autogenous torches meet the requirements of EN ISO 5172 and have been manufactured and tested in accordance with the latest technical standards. No modifications or repairs to the torches may be carried out without the approval of the manufacturer.
(5) Improper use or use for anything other than the intended purpose can lead to risks for the operator and others and may cause damage to the torch and the system.
(6) The operator has a duty to provide sufficient personal protective equipment (PPE) for the operating personnel.
(7) The accident prevention regulations of the relevant insurer are binding for the execution of all work.
(8) It is not permitted to use the presented products in combination with competitor products.

The following standards apply to the autogenous torches and associated equipment:

- EN ISO 5172:2006 + A1:2012 + A2:2015 Gas welding equipment - Blowpipes for gas welding, heating and cutting - Specifications and tests
- EN ISO 3821:2019 Gas welding equipment - Rubber hoses for welding, cutting and allied processes
- EN 560:2018 Gas welding equipment - Hose connections for equipment for welding, cutting and allied processes
- EN 561:2002 Gas welding equipment - Quick-action coupling with shut-off valves for welding, cutting and allied processes
- EN ISO 5175-1:2017 Gas welding equipment - Safety devices - Part 1: Incorporating a flame (flashback) arrestor
- EN ISO 5175-2:2017 Gas welding equipment - Safety devices - Part 2: Not incorporating a flame (flashback) arrestor
- EN 16436-1:2014 + A3:2020 Rubber and plastics hoses, tubing and assemblies for use with propane and butane and their mixture in the vapour phase

3. Product description and use characteristics

3.1 Structure and description of the autogenous torches

3.1.1 Types

An assembled, ready-to-use autogenous torch consists of a handle HESA type SL/56 or a needle valve and the corresponding torch insert. The torch insert is selected according to the application/purpose and connected to the respective handle using the terminal nut to give an operational autogenous torch. The various torch inserts are ready for use only after the individual cutting or heating nozzle or gouging tip has been installed.

3.1.2 Mixing systems

All the autogenous torches mentioned have the mixing system “injector mixer with suction action”.

3.1.3 Propane/air mixture torch

Rail foot heater and in-line torches are operated without oxygen and therefore have a needle valve instead of a handle. Start-up: The needle valve is to be opened. The fuel/air mixture must be ignited immediately with a suitable igniter. If an thermal detector system is installed, it must be actuated until the gas supply to the flame is maintained automatically. The needle valve must be closed for shutdown.

3.2 Proper use

3.2.1 Autogenous torches

The autogenous torches may only be used for the intended autogenous procedure.

3.2.2 Applications of the torch inserts

HESA cutting torch insert

Disconnecting rails and creating a defined weld gap in accordance with the Thermit® welding process.

HESA preheating torch insert

Preheating rails and drying the casting system as a whole before performing a Thermit® weld as per the work instruction for the respective welding process.

HESA straightening torch insert

Heat straightening of steel sheets and setting hot spots when straightening rails.

HESA flame gouger

Various flame gouging activities.

3.2.3 Fuel gases

There are a range of torch inserts for the various types of fuel gas for different applications. (For details see section 12 Operating data)

POSSIBLE FUEL GASES	MARKING
Acetylene	A
Propane	P

Only those fuel gases which are marked on the respective torch insert may be used.

The autogenous torches may only be used for the procedure for which the respective torch insert is provided.

4. Connections and attachments

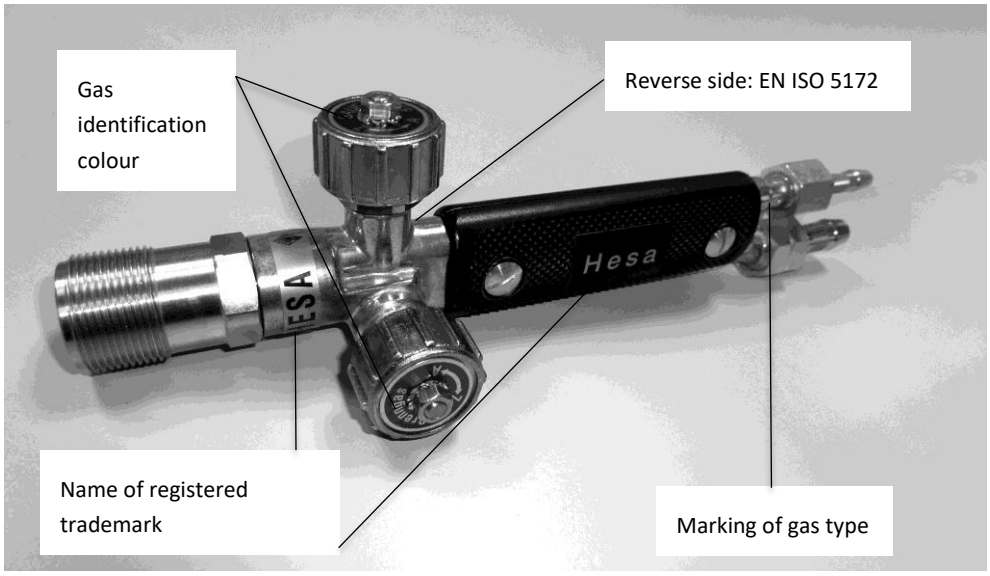
Before commissioning, the autogenous torch must be connected to a suitable supply of oxygen and gas. This is detailed in EN 560. All connecting parts must be checked for gas-tightness before each use. The actual commissioning of the torch, with ignition, may only take place if the system is gas-tight.

5. Marking

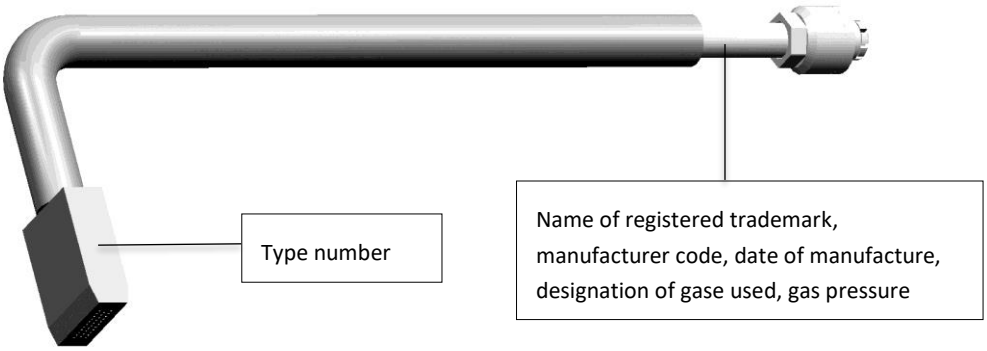
5.1 Explanation of the markings

TYPE OF GAS	DESIGNATION CODE	IDENTIFICATION COLOUR
Oxygen	O	blue green (USA)
Fuel gas	F	red

5.2 Handle HESA type SL/56

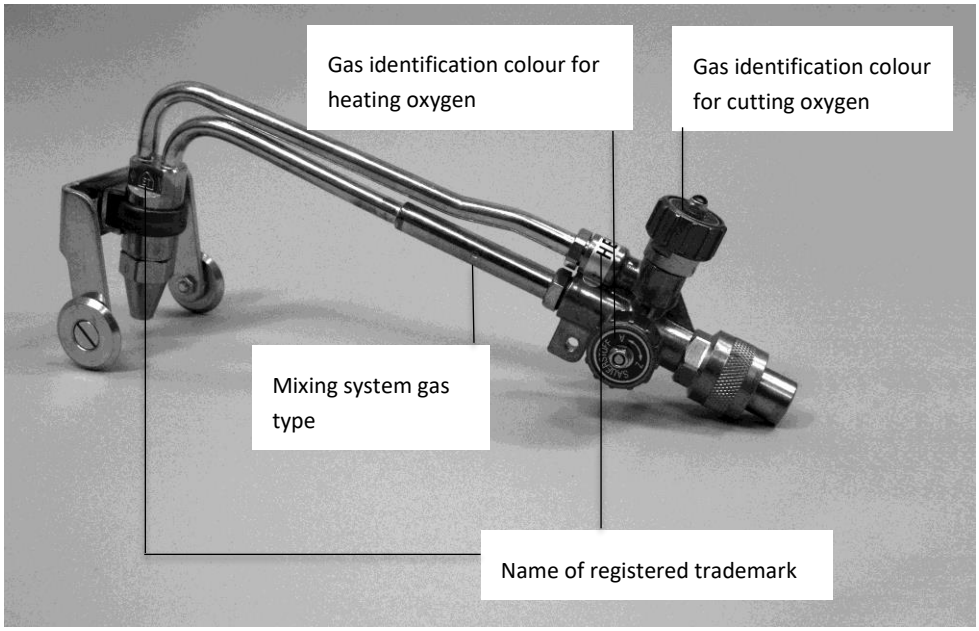


5.3 Preheating torch insert and heat straightening torch insert



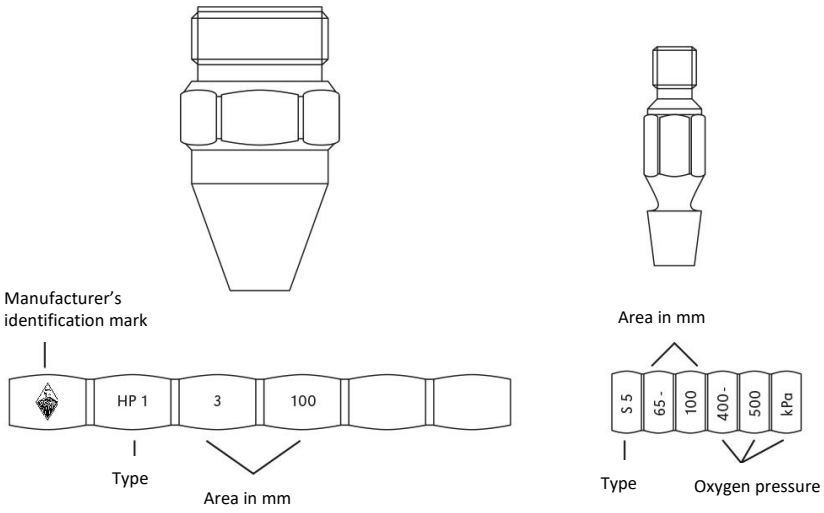
5.4 Cutting torch insert

The cutting torch insert shown here is just an example.



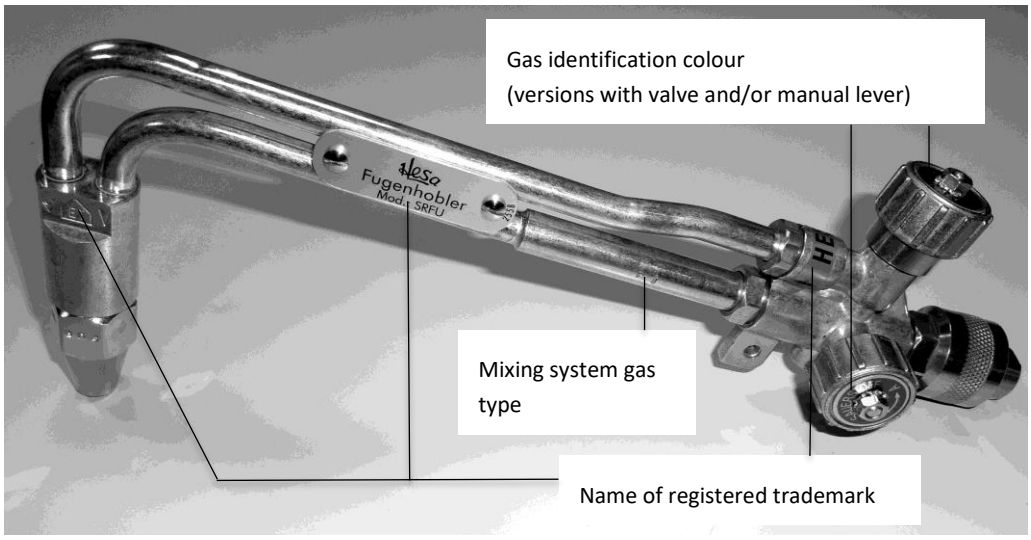
5.5 Marking to EN ISO 5172

Example: Cutting and heating nozzle for low-pressure torch.

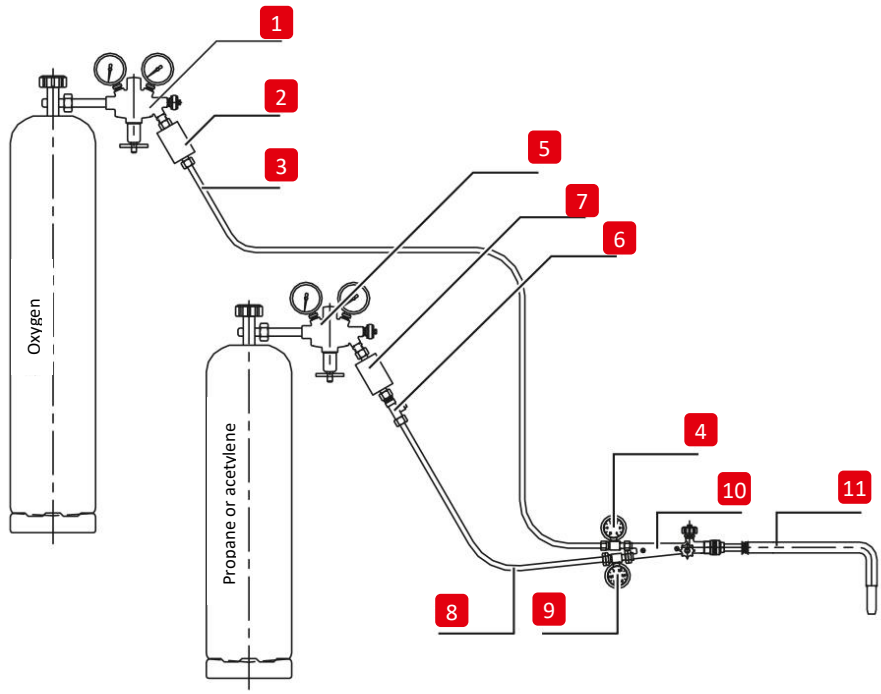


5.6 Flame gouger

The flame gouging insert shown here is just an example.



6. Overview structural diagram of autogenous technology



(1) Pressure regulator for oxygen type HESA 70

(2) Flashback arrestor for oxygen (note national regulations)

(3) Oxygen hose

(4) Check gauge for oxygen (optional)

(5) Pressure regulator for fuel gas used, type HESA 70 (propane or acetylene; for acetylene, connector opposite to that shown in picture)

(6) Pressure drop shut-off device or double-walled gas leakage shut-off device (propane only)

(7) Flashback arrestor for fuel gas used (propane or acetylene)

(8) Fuel gas hose (for either propane or acetylene)

(9) Check gauge for fuel gas (optional)

(10) Handle HESA type SL/56

(11) Autogenous torch insert

7. Commissioning

7.1 Preparations

(1) Check that all threaded connections and seals are clean and undamaged.

Ensure that all parts coming into contact with oxygen are free of oil and grease! **Danger of explosion!**

(2) The hoses (**(3)** and **(8)**) should be connected to the torch inlet (**(10)**) and/or to the pressure regulator outlet (**(1)** or **(5)**) and/or to the tapping-off point safeguard (**(2)** or **(7)**) in accordance with EN ISO 3821. Only hoses and union nuts to EN 560 should be used.

The connection threads are country-specific.

When using hose couplings, these must comply with EN 561!

(3) When abstraction off fuel gas, the use of safeguards in accordance with EN ISO 5175-1 and EN ISO 5175-2 is compulsory. We recommend also doing this to safeguard the oxygen tapping-off point.

(4) The appropriate torch insert (**(11)**) for the handle HESA type SL/56 (**(10)**) should be selected in accordance with the work to be carried out, e.g. heating, straightening, flame cutting or preheating, as per the Thermit® welding process.
When installing the torch insert on the handle, ensure the parts and seals are clean and undamaged. The terminal nut on the torch insert (**(11)**) should be tightened by hand. If necessary, spanner can be used.

7.2 Preheating, straightening

7.2.1 Setting the operating pressures

The oxygen and fuel gas valves on the handle HESA type SL/56 (**(10)**) should initially be kept closed. The cylinder valves should be opened slowly; the adjusting screws on the pressure regulators (**(1)** and **(5)**) must be loose. Now, you need to set the operating pressures at the pressure regulators (**(1)** and **(5)**) by screwing in the respective adjusting screw until the operating pressure stated in the work instruction is reached or until the specifications on the torch inserts are reached. The operating pressures should be adjusted as necessary while the flame is burning.

7.2.2 Igniting and setting the torch flame

First, fully open the oxygen regulating valve on the handle HESA type SL/56 (**(10)**), then partially open the fuel gas regulating valve on the handle HESA type SL/56 (**(10)**). Ignite the outflowing gas mixture **immediately**. After ignition, adjust the operating pressures using the adjusting screws on the pressure regulators if necessary. The neutral flame required for welding works is set using the fuel gas valve only. First, set a surplus of fuel gas. Then restrict the flow of fuel gas until a very long, clearly delineated flame cone is achieved.

7.3 Flame cutting/flame gouging

7.3.1 Start sequence

The respective nozzle should selected according to the work to be carried out and screwed into the torch head of the cutting torch insert (**(11)**) until it is gas-tight. Only use clean and undamaged HESA nozzles! Ensure the sealing surfaces on the nozzles and on the torch head are in perfect condition. If appropriate, fasten a guide carriage to the torch head, adjusting the distance between the nozzle and the workpiece surface in the process.

7.3.2 Setting the operating pressures

The oxygen and fuel gas valves on the handle (**(10)**) or on the cutting torch insert (**(11)**) should initially be kept closed. The cylinder valves should be opened slowly; the adjusting screws on the pressure regulators (**(1)** and **(5)**) must be loose. Now, you need to set the operating pressures at the pressure regulators (**(1)** and **(5)**) by screwing in the respective adjusting screw until the required operating pressure is reached or until the specifications on the torch inserts are reached. The operating pressures should be adjusted as necessary while the flame is burning.

7.3.3 Igniting and setting the torch flame

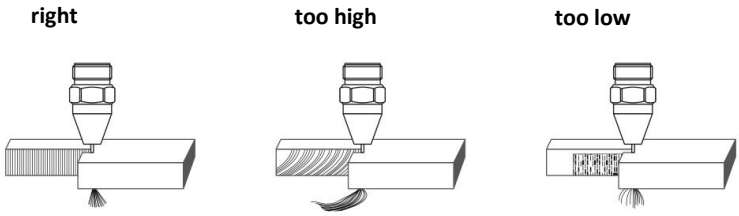
First, fully open the oxygen regulating valve on the handle (**(10)**), then fully open the heating oxygen valve on the cutting torch insert (**(11)**) before finally partially opening the fuel gas regulating valve on the handle (**(10)**). The outflowing gas mixture must be ignited **immediately**! A neutral flame should be set by adjusting the heating oxygen valve (**(11)**) and using the fuel gas regulating valve (**(10)**) (as for welding flame). Now fully open the cutting oxygen valve; adjust the oxygen pressure if necessary. Set the flame to neutral once more. Then close the cutting oxygen valve again.

7.3.4 Special characteristic of flame cutting

Move the torch into position for the initial cut and use the heating flame to locally heat the workpiece to the ignition temperature, roughly bright red.

Do not melt the material causing it to burn or run off!

The cutting oxygen valve is then opened outside the position of the initial cut and the torch is moved in the cutting direction. You can tell if the cutting speed is correct based on the slag stream, horizontal sparking, the cutting noise and square cutting edges.



7.3.5 Special characteristic of flame gouging

For preheating, the gouging tip is inclined at an angle of 60° to 70° to the workpiece surface. The starting point is heated to ignition temperature using the heating flame. As soon as the surface starts to melt, the gouging tip is moved to an angle of 15° to 30° to the workpiece surface; at the same time, the oxygen valve for the gouging tip is slowly opened so that the jet of oxygen hits the heated surface in the direction of working. The forward movement must begin at the same time, and the flow of slag that forms must be driven evenly ahead of the gouging tip, with the edge of the gouging tip being positioned on the workpiece to be gouged or on the edge of the previously gouged joint piece. The joint width and depth can be influenced by the position of the gouging tip relative to the workpiece and by the acceleration or deceleration of the movement. Repeated gouging to a greater depth is needed if defects have formed.

8. Close down and disassembly

Closing down the autogenous torch uses the reverse sequence to that for ignition: first close the fuel gas regulating valve on the handle HESA type SL/56 (**(10)**), then close the oxygen regulating valve.

For the cutting torch and flame gouger, first close the cutting oxygen valve (**(11)**), then the fuel gas regulating valve, and finally close the oxygen regulating valve on the handle (**(10)**) and on cutting torch insert (**(11)**).

For longer interruptions to the work, all cylinder valves and tapping-point valves must also be closed. In this case, all pressure regulators and hoses should be relieved of pressure by opening the regulating valves on the handle HESA type SL/56 (**(10)**) and the cutting oxygen valve. The pressure regulators should then be relaxed by unscrewing the adjusting screws.

9. Notes for operation and maintenance

9.1 Maintenance

9.1.1 Cleaning the torches and nozzles

To make sure that functionality and safety are not impaired, the devices should be handled with care and protected from mechanical damage and contamination. Cutting and other nozzles should be kept clean, and should be cleaned where necessary using suitable nozzle cleaners and possibly also using a brass wire brush.

Do not enlarge the nozzle holes!

9.2 Fault

9.2.1 Damage to the torch

If the fittings and nozzles are not leak-tight, or in the case of damage caused by sustained torch backfire, melting at the mixing point, blocked injectors etc., take the torch out of service and do not operate it. Repairs must only be carried out by authorised repair workshops.

9.2.2 Torch backfire

This indicates a reduction in the outflow speed, e.g. caused by contamination of the nozzles owing to immersion in the weld pool or melt pool or caused by operator error. The flame enters the torch and goes out with a bang. Reignite the torch!

9.2.3 Sustained backfire

In this case, the flame penetrates further into the torch and continues to burn in the region of the mixing chamber. This makes a banging, whistling noise. In this case **immediately** close **both** regulating valves, for oxygen and fuel gas, on the handle HESA type SL/56 (**(10)**) **quickly and simultaneously**. In the case of sustained backfire, autogenous torches that have become hot should be cooled in water with flowing oxygen (with the oxygen valve open).

9.2.4 Flashback

Blowback of the flame into the torch and into the hoses and equipment connected upstream of the torch.

9.2.5 Gas backflow

Flow of the gas that is under higher pressure back into the hose of the gas that is under lower pressure. This can lead to flashback.

9.3 Suction test

The suction test should be carried out each time the torch is commissioned.

Close the outlet valve on the pressure regulator (**(5)**) for fuel gas. Now unscrew the fuel gas hose (**(8)**) on the handle HESA type SL/56 (**(10)**). Next open the oxygen regulating valve and the fuel gas regulating valve. Oxygen now flows out of the torch nozzle. Hold your fingertip on the fuel gas connection port on the handle HESA type SL/56 (**(10)**). In the case of suction action, the fingertip will be noticeably drawn in. If no suction action is established, the torch insert must not be operated and must be checked/repaired in an authorised workshop.

10. Service and repair

10.1 Repair workshop

Repairs may only be carried out by specialists in authorised repair workshops.

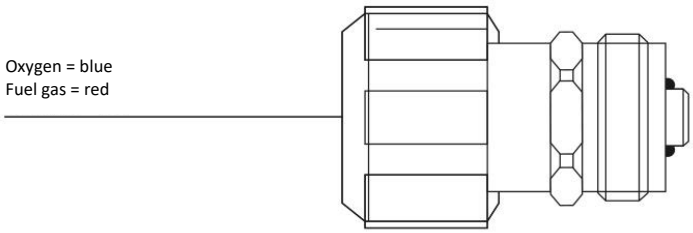
10.2 Spare parts

Only original spare parts guarantee flawless function and safety. It is not permitted to use HESA products in combination with competitor products. Lists of spare parts can be requested as needed.

10.3 Monoblock valves

The monoblock valves fitted are of identical design and require no maintenance. Damaged or leaky valves must be replaced. To do this, the valves should be unscrewed while in the open state. After cleaning the sealing surfaces, screw in a new monoblock valve with O-ring in place and tighten firmly (torque approx. 40 Nm).

i Important: Insert the correct label for gas marking in the recess in the handwheel!



10.4 Inspection

Following repair, the torch must be inspected thoroughly (see EN ISO 5172).

11. Disposal/recycling

This chapter contains all information necessary for the proper disposal of all components of the autogenous torches.

⚠ You must ensure that the autogenous torches and their components are disposed of in an environmentally responsible manner.

At the end of the service life of the autogenous torches, the operator must ensure that each component is disposed of in accordance with the regulations in force at that time.

12. Operating data

12.1 Oxygen and propane consumption of the ET autogenous torch

TORCH TYPE	FLOW RATE						PRESSURE				NOTE
	OXYGEN = O		PROPANE = P				in bar		in kPA		
	l/h	l/min	l/h	l/min	kg/h	kg/min	O	P	O	P	
55-502	13,200	220	4,000	67	7.84	0.131	5.0	1.5	500	150	
55-502	9,900	166	3,000	50	5.88	0.098	4.0	1.5	400	150	
55-502	9,000	160	2,777	46	5.35	0.089	3.5	1.5	350	150	
55-502	8,400	140	2,545	42	4.99	0.083	3.0	1.5	300	150	
55-502	6,300	105	1,909	32	3.74	0.063	2.5	1.5	250	150	
65-504	7,000	117	2,333	39	4.572	0.076	4.5	1.0	450	100	
85-160	7,000	117	2,333	39	4.572	0.076	4.5	1.0	450	100	
85-507	7,000	117	2,333	39	4.572	0.076	4.5	1.0	450	100	
95-502	7,000	117	2,333	39	4.572	0.076	4.5	1.0	450	100	
95-506	7,000	117	2,333	39	4.572	0.076	4.5	1.0	450	100	
551-503	7,800	130	2,295	39	4.5	0.075	4.5	1.0	450	100	
551-525	7,800	130	2,295	39	4.5	0.075	4.5	1.0	450	100	
551-526	1,700	195	3,315	56	6.5	0.109	2.5	1.5	250	150	
551-526	19,900	332	5,610	94	11.0	0.184	5.0	1.5	500	150	
551-537	18,000	300	6,000	100	11.76	0.196	5.0	1.5	500	150	
560-043	-	-	1,160	19	2.25	0.038	-	1.5	-	150	Propane only
560-051	-	-	2,000	34	4.0	0.067	-	1.5	-	150	Propane only
580-709	14,000	233	4,667	78	9.147	0.152	5.0	1.5	500	150	
30-560	2,880	48	960	16	1.882	0.031	5.0	1.5	500	150	Cutting oxygen: 8,000 l/h
30-560	1,920	32	640	10.7	1.245	0.021	4.5	1.0	450	100	Cutting oxygen: 6,880 l/h
551-517	7,700	129	2,346	39.1	4.6	0.077	5.0	1.5	500	150	
30-565	2,809	46.8	557	9.29	1.092	0.018	6.0	1.5	600	150	
30-565	1,709	28.5	383	6.38	0.75	0.013	3.0	1.5	300	150	

12.2 Oxygen and acetylene consumption of the ET autogenous torch

TORCH TYPE	FLOW RATE				PRESSURE				NOTE
	OXYGEN = O		ACETYLENE = A		in bar		in kPA		
	l/h	l/min	l/h	l/min	O	A	O	A	
30-550	5,040	84	3,330	56	4.5	1.0	450	100	
30-561	Preheating flame				4.5	1.5	450	150	Cutting oxygen: 5,600 l/h
	1,400	23	680	11.33					
551-513	3,400	57	2,750	46	4.5	1.0	450	100	
551-551	3,400	57	2,750	46	4.5	1.0	450	100	
551-523	2,880	48	2,580	43	4.5	1.0	450	100	