

OPERATING INSTRUCTIONS OZAT[®] OZONE GENERATOR TYPE CF-5



No reserve all rights in this document and in the information contained therein in the USA. Reproduction or use of this document without express authority is strictly prohibited. Copyright © 2000



INSTRUCTION:

THESE OPERATING INSTRUCTIONS CONTAIN IMPORTANT SAFETY INSTRUCTIONS. THEY MUST BE CAREFULLY READ BY BOTH THE OWNER AND THE USER BEFORE COMMISSIONING.

Supplier: Ozonia North America
 491 Edward H. Ross Drive
 Elmwood Park, NJ 07407
 Tel (201) 794-3100
 Fax (201) 794-3358

	Date / Visa	Rev.	Date / Visa	Derived from:	HTE 600 056	Rev.	Index
Prepared	19.09.95 / Mz	A	12.08.96/Mz	Replaces:		Rev.	
Reviewed	22.09.95 / Za		13.08.96/Za	Page	of	Languages	No
Approved	22.09.95 / St		12.08.96/St	1	72	-	HTE 600 102

CAPTIONS

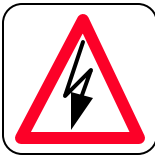
The following is a description of the symbols and pictograms which are used in these operating instructions:



ATTENTION:
PROHIBITED ACTIONS AND PROCEDURES.



WARNING/INSTRUCTION:
WARNING OF DANGER. GENERAL WARNING THAT SPECIAL ATTENTION SHOULD BE PAID. IMPORTANT INSTRUCTION, THAT MUST BE FOLLOWED.



WARNING:
VOLTAGE OR HIGH VOLTAGE: DANGEROUS FOR PERSONS OR HOUSEHOLD PETS. THE VALID REGULATIONS AND ACCIDENT PREVENTION MEASURES MUST BE STRICTLY ADHERED TO.



WARNING:
DANGEROUS SITUATION. SERIOUS INJURY OR DEATH CAN RESULT. THE PRODUCT OR ITS SURROUNDINGS CAN BE DAMAGED.



INFORMATION:
INFORMATION AND INSTRUCTIONS THAT MUST ALSO BE FOLLOWED.



IMPORTANT:
MEASURES RECOMMENDED BY OZONIA .

No responsible rights in this document are in the information contained in this document. Reproduction or use in translation without express authority is strictly prohibited. ©2007 OZONIA



PROHIBITION:
NO SMOKING OR NAKED FLAMES.

List of contents

1. General	7
2. Product description	8
2.1 Technical data	9
2.1.1 Nominal data of the OZAT Ozone Generator CF5	9
2.1.2 Cabinet dimensions	9
2.1.3 Operational data	10
2.2 Connections, Fixation	10
2.2.1 Electrical data	10
2.2.2 Mechanical connections	12
2.2.3 Dimensional diagram, connection and fixation possibilities	13
3. Safety measures and regulations	14
3.1 Gaseous oxygen	14
3.1.1 Oxygen monitoring	15
3.2 Ozone	15
3.2.1 Recommended protective measures and precautions	16
3.3 Electricity	17
3.3.1 Working on live equipment	17
3.4 Mechanical dangers	17
3.4.1 Periodical maintenance	17
3.5 First aid	18
3.5.1 First aid after exposure to ozone	18
3.6 Breathing apparatus	18
4. Construction and function	19
4.1 Scope of delivery and interface	19
4.1.1 Ozonia delivery	19
4.1.2 Delivery limitations	19
4.2 Area monitoring for ozone	20
5. Construction of the OZAT Ozone Generator	21
5.1 Mechanical part	24
5.2 Electrical part	26
6. Operational and display elements, operational modes	27
6.1 Selection of the control location and the set values	30
6.2 Ozone production	30
6.3 Signalisation and monitoring	31
6.3.1 Local	31
6.3.2 Remote	32
6.4 Acknowledging the fault signal	32
6.5 Valve regulation	33
6.5.1 Gas valves	33
6.5.2 Cooling water valve	33
6.6 Functional sequence	33
6.6.1 Switch-on procedure	33
6.6.2 Switch-off procedure	34
6.7 EMERGENCY STOP circuit	34
6.8 Switch-off following a fault (alarm)	35
6.9 Acknowledging alarm	35

No reserve all rights in this document are in the information contained in this document. Reproduction or use of this document without express authority is strictly prohibited.

7. Commissioning

7.1 Setting up and installation	36
7.1.1 Setting up	36
7.1.2 Ambient conditions	36
7.1.3 Installation of the equipment and the piping	36
7.1.4 External connections	37
7.1.5 Protection of lines	37
7.1.6 Electrical installation	37
7.2 Commissioning	37
7.2.1 Checking the installation	37
7.2.2 Further checks	38
7.2.3 Tightness check of the gaslines	38
7.2.4 Checking the cooling water circuit	38
7.2.5 Purging the system to dry it out	39
7.2.6 Commissioning the operational mode "LOCAL"	40
7.2.7 Commissioning in the operational mode "REMOTE"	41

8. Operation 42

8.1.1 Operation and setting of the equipment	43
8.1.2 EMERGENCY STOP	44
8.1.3 Alarm signals	44
8.1.4 Switching of for long periods	44
8.1.5 Operational maintenance	45

9. Maintenance 46

9.1 Periodical tightness check	46
9.2 Periodical check of the area ozone monitoring devices	46
9.3 Periodical check of the breathing apparatus	46
9.4 Re-calibration of the oxygen monitoring device	46
9.5 Replacing the signal lamps	48
9.6 Terminal check	48
9.7 Replacing the filter mats	48

10. Overhauling 49

10.1 Replacement of defective fittings, lines or ozone generator modules	49
10.1.1 Purging the systems before overhaul work	50
10.1.2 Discharging the ozone generator module	50
10.2 Setting the operational pressure	51
10.3 Correcting faults	52
10.3.1 Tripping as a result of a leak	52
10.3.2 Temperature monitor TSH201	52
10.3.3 Cooling water flow low	53
10.3.4 Cubicle temperature high	53
10.3.5 Converter temperature high	53
10.3.6 Ozone generator short circuit monitor	53
10.3.7 Inverter short circuit	54
10.3.8 Inverter short circuit monitor	54
10.3.9 Replacing the oxygen sensor	55

11. Taking out of operation, storage 56

11.1 Shutdown of the equipment	56
11.2 Dismantling the equipment and the connecting pipelines.	56

No reserve all rights in this document and in the information contained therein in the past, present and future. All rights reserved.

12. Packaging, transport		
13. Disposal		58
14. Spare parts list		59
14.1 Electrical material		59
14.2 Mechanical material		60
14.3 Other materials		61
15. Appendix "Gas flow diagram"		62
16. Appendix "Setting curves for OZAT CF5"		63
17. Appendix "P&I diagram"		64
18. Appendix "Electrical connection circuit"		66
19. Appendix "EMP cable fittings"		67
20. Appendix "Layout of the oxygen warning device"		68
21. Appendix "Serto installation instructions"		69
22. Appendix "Discharging the ozone generator module"		71
23. Appendix "Standards, regulations and guidelines"		72

We reserve all rights in this document and in the information contained therein. Reproduction, use, copying, distribution or other processing without express written permission is strictly prohibited.
 Copyright © 2000

1. General

Please ensure that the operating instructions are carefully read by all relevant persons before installation and before putting into operation, to ensure the safe use of the OZAT Ozone Generator (from here on also referred to as the equipment). The Operating instructions contain all important information for the operation and maintenance of the equipment.

The Operating instructions are an integral part of the equipment supply.

Before putting into operation, all the conditions necessary for safe operation of the equipment must be fulfilled. Please refer to Chapter 3 "Safety measures and regulations".

The installation, commissioning and maintenance of the equipment should only be carried out by qualified personnel.

The equipment should only be operated by authorised personnel who have been trained accordingly.

No modifications may be made to the equipment without consulting Ozonia, as this could effect the safety. Ozonia shall not be held responsible for damage resulting from unapproved modifications.

**INSTRUCTION:**

The Operating instructions are to be kept where they will be accessible to operating and maintenance personnel.

2. Product description

The OZAT Ozone Generator is designed to generate an oxygen ozone gas mixture suitable for use in all types of processes, for example:

- Treatment of drinking water
- Swimming pool water
- Treatment of water
- Aquaculture
- Disinfection
- Oxidation processes in the chemical industry

The **owner and/or user** is **responsible** for the implementation of the ozone in the process and for the corresponding safety measures.

**ATTENTION:**

Bringing people or household animals into contact with, or exposing them to gases containing ozone can endanger their lives. Gas containing ozone shall not be released in an uncontrolled manner, neither in a closed space nor to atmosphere.



PROHIBITION:

The equipment contains oxygen; the relevant safety and security measures must also be complied with (see Page 14).

2.1 Technical data

2.1.1 Nominal data of the OZAT Ozone Generator CF5

Nominal production	xxx gr O ₃ /h	2)
Nominal ozone concentration	6 wt%	1)
Adjust. range of the ozone production	5...100 %	
Oxygen requirement (98 % O ₂ , 2 % N ₂)	xxxx kg/h	1)
Cooling media requirement	xxxx m ³ /h	1)
Electrical power requirement	11.9 kW	1)
Temperature of cooling media	12 °C (inlet)	1)

1) for nominal production

2) For different ozone concentrations, the ozone production can be taken from the Appendix "Setting curves for OZAT CF5" on Page 63.



INFORMATION:

The OZAT Ozone Generator requires a running-in time of about 200 hours from the first commissioning before it reaches nominal performance. After 24 hours of operation, about 90 % of the nominal performance will be reached.

2.1.2 Cabinet dimensions

Width:	1900 mm
Depth:	900 mm
Height (with rubber feet):	2000 mm
Weight:	800 kg

2.1.3 Operational data

Gas used:	Oxygen
Quality:	min. 90 wt% Oxygen
Nitrogen:	min. 200 ppm
Dew point:	-60 °C or lower at 1 bar abs.
Hydrocarbons:	<15 ppm
Contamination; Particle size:	≤1 µm
Inlet pressure:	2.5...5 bar g
Outlet pressure:	max. 0.7 bar g
Temperature:	5...40 °C
Operational pressure:	1 bar g
Gas flow, adjustable:	X...XXX m ³ /h
Gas flow display scale:	0...100% (Appendix "Gas flow diagram", Page 62)
Ozone concentration, adjustable:	3...ca.13 wt% (Appendix "Setting curves for OZAT CF5", Page 63)

Cooling medium:	Water
Quality:	6...8 pH-value (drinking water)
Chloride content:	max. 50 mg/l
Inlet temperature:	2...30 °C
Operational pressure:	2...6 bar g
Cooling media flow:	XXX m ³ /h

Environmental conditions:	
Ambient temperature:	5...40 °C for Operation (24 h-average value = 35 °C) -25...+55 °C for Transport and storage (70 °C total max. 24 h)
Installation height	<1000 above sea level.
Air humidity:	≤65 % annual average 85 % for 60 continuous days a year 75 % occasionally
Condensation:	avoid
Protection class:	IP 42 for installation in a dust-free, dry environment
Vibration/Shock:	Installation in a vibration-free environment
Heat dissipation:	about 1100 W released to the environment
Cooling air rate	about 900 m ³ /h for cooling the electrical part

2.2 Connections, Fixation

2.2.1 Electrical data

No response all rights in this document are in the information contained in this document. Reproduction, use or disclosure in their own or other ways without express authority is strictly prohibited. © 2007/08/08 OZONIA



INFORMATION:

The connection to the mains is made direct to the interference suppression filter (3L/PE). The line fuse must be sufficient to meet the local regulations and our requirements.

Mains connection to the interference suppression filter 10E1:

Maximum wire size: 4x10 mm² (3 phase with earth)

Mains switch 10Q1:

Nominal current setting: 40 A

Nominal switching power to EN60898: 16 kA (at 400VAC)

Mains voltage: 400 VAC (three phase) -10...+6 %, with earth wire

Current: 20 A

Power consumption: 14 kVA (at nominal power)

Frequency: 48...63 Hz

Electrical power meter indication: about 0.8 kW (basic power) to
about 12 kW (nominal power)

Control location for commands and set values: LOCAL or REMOTE

Control signals, messages from or to the master controller (as in Appendix "Electrical connection circuit", Page 66).

Connections with multi-core cables (as in Appendix "EMP cable fittings", Page 67) wired to screwed terminals.

1 external set-value signal: 4...20 mA (Δ 0...100 %)

internal resistance: 75 Ω

max. permissible current: 25 mA

max. permissible common mode volt.: ≤ 30 V

5 external control input: potential free contact (for 24 VDC, 5...10 mA)

- Supply ON/OFF
- Reset
- Gas valves OPEN
- Cooling water valve OPEN
- Enable REMOTE

1 EMERGENCY STOP input: potential free contact (for 24 VDC, 50mA)

VAC, 4 A) 7 signals to master controller: potential free contact (for max. 250

- Control location REMOTE
- Set-value REMOTE
- Supply READY (i.e., Mains voltage available)
- Supply ON
- Collective alarm
- Gas valves OPEN
- Cooling water valve OPEN

Voltages in the equipment:

in the intermediate circuit (12C1...12C2)	~550	VDC
at the Ozone Generator (13E1):	~3.5	kV, 3 kHz

2.2.2 Mechanical connections

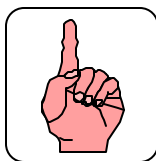
Oxygen connection: Flange DN 25 PN 16

Ozone gas connection: Flange DN 25 PN 16

Cooling medium in/out: outside thread R1"

Pressure relief valve (vent): Tube fitting Ø10
(oxygen and ozone gas)

Condensate drain: 1" Threaded union

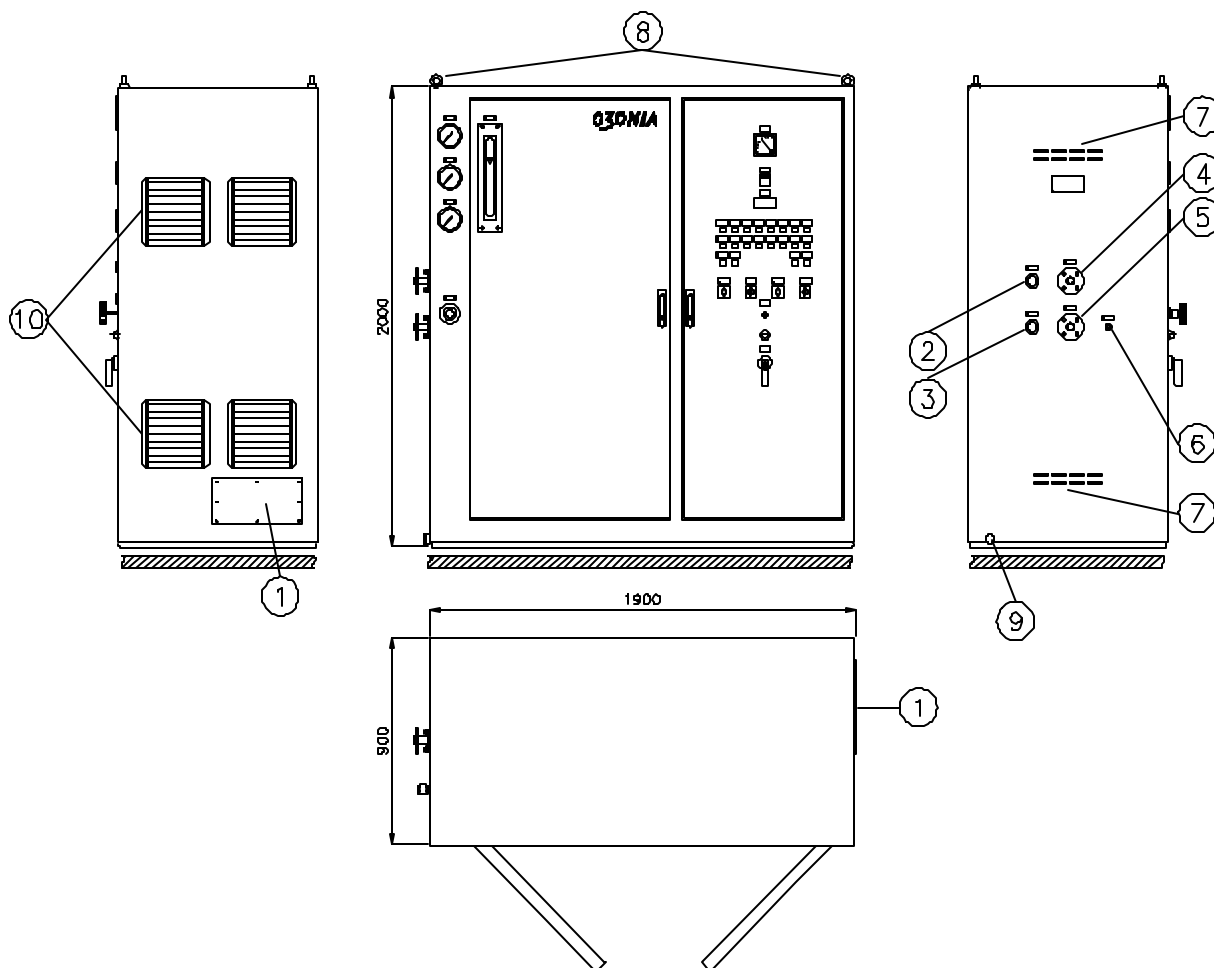


IMPORTANT:
Material recommended for the external connections.

Water:	Plastic (PVC, PE, PA)
Ozone:	Fluorised plastics (PTFE) Stainless steel (e.g. ,1.4571, 1.4435)
Oxygen:	Fluorised plastics(PTFE) Stainless steel (e.g., 1.4571, 1.4435) Copper

No reserve all rights in this document are in the information con-
 sidered in this document. Reproduction or use of this document in
 without express authority is strictly prohibited.
 Copyright © 2000

2.2.3 Dimensional diagram, connection and fixation possibilities



Captions:

- 1 Gland plate for mains cable, controle cable, external operating panel and signals
- 2 Cooling media outlet
- 3 Cooling media inlet
- 4 Ozone gas outlet
- 5 Oxygen inlet
- 6 Pressure relief valve outlet
- 7 Air vents
- 8 Lifting eyes \varnothing 30 mm
- 9 Condensate drain
- 10 Ventilation openings

No reserve all rights in this document are in the information contained in this document. Reproduction or use in translation without express authority is strictly prohibited.

3. Safety measures and regulations

The equipment must only be installed, put into operation and maintained by trained specialists. The owner and/or user must ensure that the operating personnel have been suitably instructed.

The equipment represents to the state of the art. It has been subjected to a hazard analysis. Based on this analysis, corresponding precautionary measures regarding the safety of persons and domestic animals have been made. Nevertheless, it is still possible that **danger could arise** as a result of incorrect use, bad maintenance, material changes and so on. These dangers are associated with:

- gaseous oxygen
- ozone
- electricity
- mechanical dangers

3.1 Gaseous oxygen

Characteristics:

- colourless, odourless. tasteless
- heavier than air (concentration in channels, etc.)
- supports and accelerates burning (particularly in concentrations in air >25 % Vol./ normal concentration 21 % Vol.)

The oxygen concentration can increase, in insufficiently ventilated areas and even reach dangerous levels as a result of leaks in the equipment internal or external piping, or by opening of systems containing oxygen. High oxygen concentrations will result in a significantly increased **fire risk**.



PROHIBITION:

- Naked flames are particularly dangerous
- therefore smoking is forbidden
 - no welding work
 - etc.



ATTENTION:

- Oil and grease are very dangerous
- no oil or grease soiled clothing
 - keep oxygen equipment free of oil and grease.



ATTENTION:

- Sparks are dangerous (switching sequences, grinding, unsuitable tools, etc.)

Comprehensive information can be requested from oxygen suppliers or can be obtained from the publications of the specialist bodies (e.g.: IGC document, issued by the "European Industrial Gases Association, Brussels; can also be obtained from Ozonia). See also Appendix "Standards, regulations and guidelines", Page 72.

No reserve all rights in this document and in the information contained therein. Reproduction or use in translation without express authority is strictly prohibited. Copyright © 2000

3.1.1 Oxygen monitoring

In the OZAT Ozone Generator there is a built-in oxygen monitor, which switches off the equipment if the concentration rises above 24,5 % by Vol. This monitor is, however, **only** effective at higher concentrations **within the equipment**.



WARNING:

If the oxygen monitoring unit has switched off the equipment due to high oxygen concentrations, or shows increased values, the room ventilation should be switched on and a breathing apparatus put on before opening the equipment. Ozone can also escape with the oxygen.



IMPORTANT:

The owner and/or user is responsible for compliance with local regulations. A list is given in Appendix "Standards, regulations and guidelines", Page 72.

3.2 Ozone

In the OZAT Ozone Generator, a part of the oxygen (feed gas) is converted into ozone.

Characteristics:

- Ozone is toxic and corrosive
- Ozone accelerates burning
- Ozone is heavier than air and oxygen (concentrations build up at ground level, in channels etc.)
- Ozone has an acrid odour
- Ozone is unstable

Ozone can be detected by humans as low as 0,003...0,02 ppm (Vol.) (odour threshold).



IMPORTANT:

The owner and/or user is responsible for compliance with the regulations regarding the use of ozone. Comprehensive information regarding ozone can be found in the publications of various specialist bodies. A listing is given in Appendix "Standards, regulations and guidelines", Page 72.

The following are some of the more important points regarding the handling of ozone:



WARNING:

Modern Ozone Generators can produce ozone concentrations up to 15 wt% and higher. Relatively small quantities of ozone at high concentrations lie well above the lethal level. This is why even small leaks can produce dangerous concentrations of ozone in the surroundings of the ozone installation. For this reason, ozone warning devices must be installed in these areas.

Summary of the effects of ozone at various concentrations:

Ozone concentration in inhaled air in ml/m ³	Effects
ca. 0,02	Average odour awareness threshold in pure air.
0,1	TWA-value (Time Weighted Average) ¹⁾ Concentration for an 8 hour working day and a weekly working time of 40 hours. Irritation symptoms possible in nose and mucous membranes of the throat.
ca. 0,5	Deadening of the sense of smell after about 5 minutes exposure time.
ca. 1	Strong coughing spasms, tiredness
> 10	Longer periods of exposure can be lethal.
> 5000	Death within a few minutes

Source: ZH 1/474 (Appendix 23, Page 72)

¹⁾ Please check , as local regulations and guidelines can differ!

3.2.1 Recommended protective measures and precautions

- Observation of the regulations by the owner and/or user
- Compliance with local, national or international regulations
- Access restrictions to the “Ozone Rooms”
 - ◊ Access only for trained personnel
- Training of the authorised personnel regarding
 - ◊ Safety regulations
 - ◊ Particular dangers associated with the handling of ozone
 - ◊ Procedures in case of failures and accidents
- Identification of areas into which ozone could escape, with appropriate warning signs.
- Provision of efficient ventilation systems and well-marked escape routes in areas with ozone installations.
- In order to be able to safely switch off the equipment in cases of danger, an emergency switch that disconnects the electrical supply to the equipment should be provided in a location that can be easily reached at any time.
- Areas in to which ozone can escape must be monitored with ozone warning devices (according to Chapter 4.2 “Area monitoring for ozone”, Page 20).
- Have suitable breathing apparatus available on-site. Put on the breathing apparatus before entering areas into which ozone has escaped or is suspected to have escaped.



WARNING:

Even after the OZAT Ozone Generator has been switched off, ozone-generating installations still contain ozone gas. Therefore, before opening equipment or piping, flush the equipment thoroughly until no ozone can be detected.

No response all rights in this document are in the information contained in this document. Reproduced or used in publications without express authority is strictly prohibited. © 2007/10/12 02:00

3.3 Electricity

The equipment can **only** be open if the mains switch is switched off.



WARNING:

As the smoothing capacitors can still hold dangerous voltages up to 3 minutes after switch off, the capacitor covers should only be removed after this time. To be absolutely certain check the line voltage with a suitable measurement instrument. Covers on the power inlet side of the mains switch should only be removed if the supply to the equipment has been shut off.



WARNING:

Before starting work on the ozone generator modules these must be made safe by individually discharging the connections to the module (as in Chapter 10.1.1 “Discharging the ozone generator module”).

3.3.1 Working on live equipment

Working on live equipment is **forbidden**.

3.4 Mechanical dangers

Piping to and from the equipment must be laid so that they cannot be damaged. If it is not possible to lay the lines safely, they must be covered. The lines must not be exposed to any vibrations

3.4.1 Periodical maintenance

In order to maintain the highest possible safety, the equipment should be periodically checked according to the instructions in Chapter 9 “Maintenance”.

No response all rights in this document are in the information con-
 tained in this document. Reproduction or use in translation in their own
 without express authority is strictly forbidden.
 Copyright © 2000

3.5 First aid

**IMPORTANT:**

The owner and/or user must ensure that the necessary conditions for First Aid measures are met according to local regulations. If applicable, the recommendations or guidelines of the accident prevention offices are also to be observed.

3.5.1 First aid after exposure to ozone

Following exposure to ozone, the following first aid measures must be immediately carried out:

- Bring the victim into the fresh air
- Call emergency services, stating ozone exposure
- Give medical oxygen
- Keep victim absolutely quiet
- Check pulse, breathing, consciousness
- If victim becomes unconscious, place in the prone position
- If breathing stops, apply artificial respiration

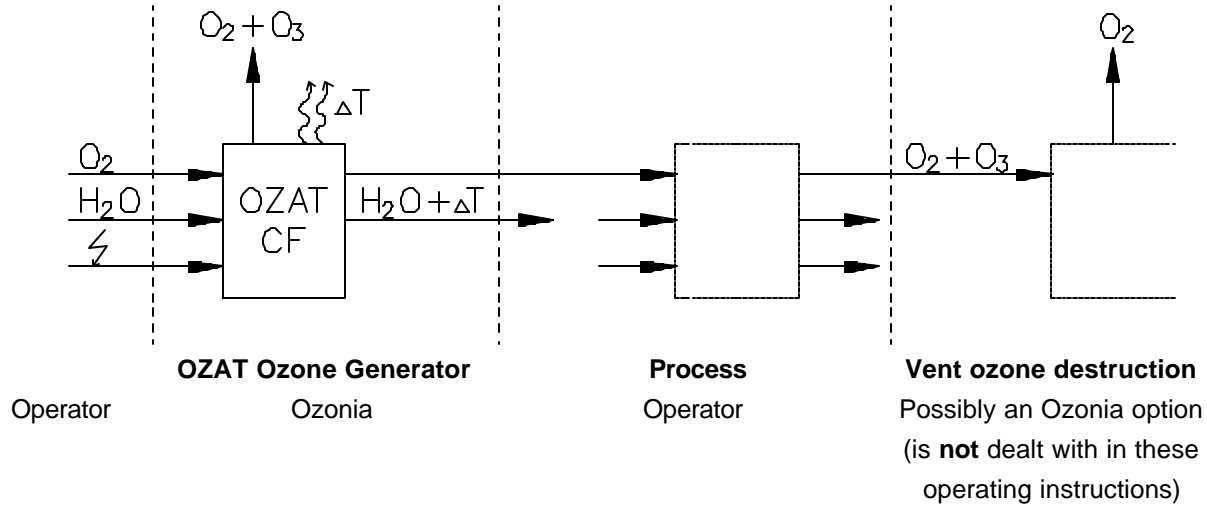
Source: ZH 1/474 (Appendix 23, Page 72)

3.6 Breathing apparatus

The operator must provide breathing apparatus suitable for use with ozone for every person who will be working on the OZAT Ozone Generator or in an installation containing ozone. The breathing apparatus can be obtained directly from suitable suppliers or their representative (e.g., the Dräger company, Lübeck, Germany).

4. Construction and function

4.1 Scope of delivery and interface



4.1.1 Ozonia delivery

- OZAT Ozone Generator CF with operating instructions
- Possibly spare parts according to Ozonia recommendations
- Possible options (e.g. vent ozone destructor)
- On request:
 - ◊ Training
 - ◊ Servicing

4.1.2 Delivery limitations

The operator will supply:

- Oxygen gas)
- Cooling water |
- Electrical energy > Specification according to operational data on Page 10
- Control signals |
- Emergency stop)

The equipment will produce:

- Oxygen gas containing ozone as given in the operational data
- Supplied quantity of water as given in the operational data (outlet temperature max. 5 °C above inlet temperature)

No reserve all rights in this document are in the information contained in this document. Reproduction or use in full or in part without express written permission is strictly prohibited. © 2009 Ozonia

Released into the environment:

- Heat loss through convection
- Oxygen containing ozone when the input pressure is too high or there is a leak.
- Heat loss through forced ventilation
- Signals and collective alarm

The owner and/or user must supply or install:

- Adequate room ventilation
- Area monitoring in all areas in which oxygen or ozone can escape.

4.2 Area monitoring for ozone

Depending upon local conditions, it might be necessary that **several** monitoring units be provided (basically one in every area in which ozone can appear). Air currents should also be taken into consideration here. In very large rooms several monitoring units should be installed.

Area monitors can be tripped by the following:

1. an ozone leak in the operators plant.
2. an ozone leak in the ozone generator (OZAT).

When an ozone alarm has been given all personnel must be evacuated from the contaminated area. The room containing ozone should only be entered when wearing a suitable breathing apparatus. Before opening an OZAT unit a check should be made at the cabinet's lower ventilation opening to see if the unit contains a dangerous ozone concentration. If this is the case, the doors may be opened to facilitate a quicker dissipation of the ozone gas (breathing apparatus to be worn).



INFORMATION:

Ozonia recommends 1 ozone warning device per 50 m² floor area. A detection unit is to be installed within 1 metre of the lower ventilation opening (see page 13).



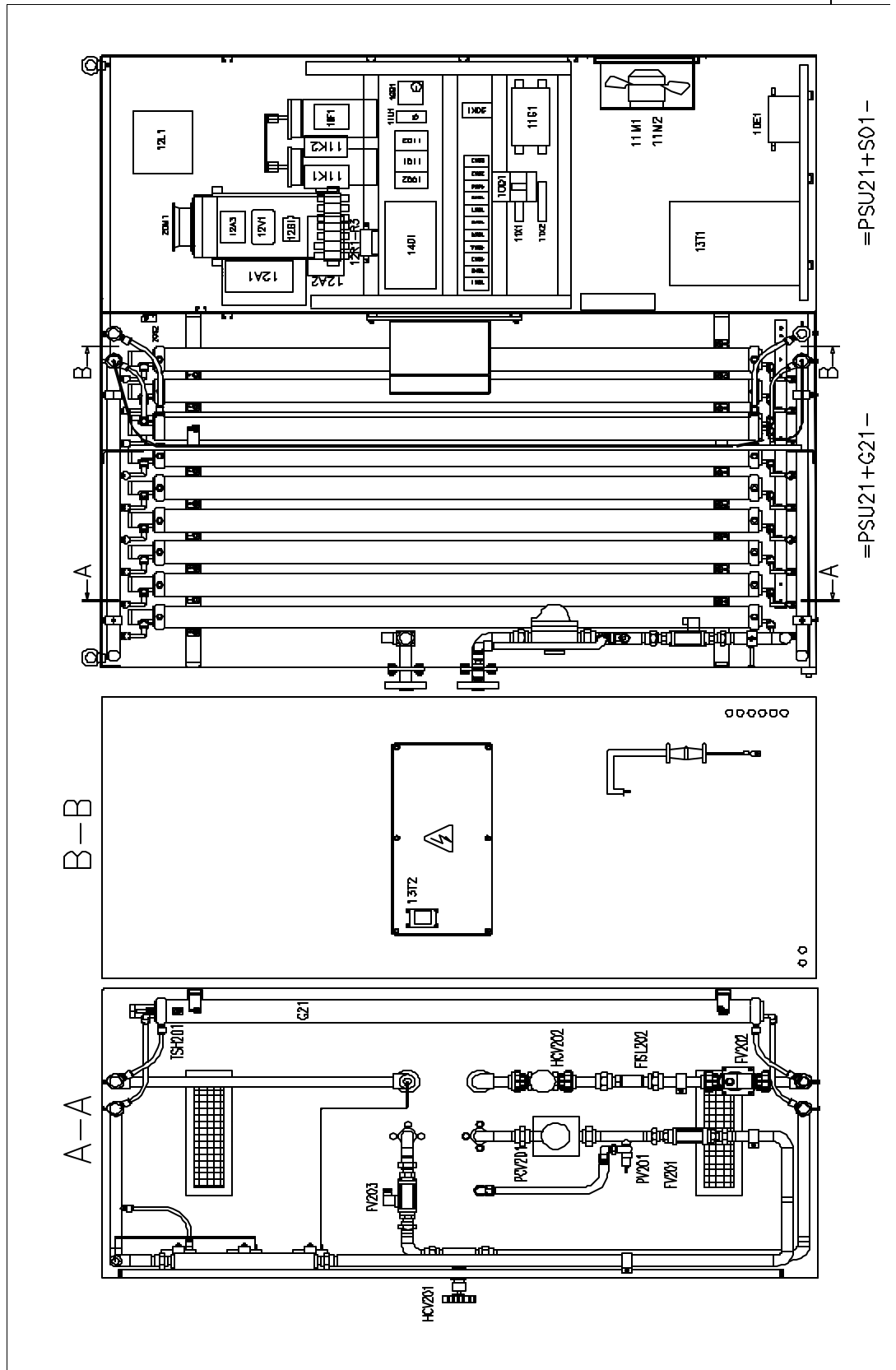
WARNING:

If the area monitors give a warning or fail, the oxygen supply and the electrical supply must be immediately and automatically disconnected. Simultaneously, the warning must initiate an optical and acoustic alarm, so that personnel in the respective rooms are warned. As long as the area monitors indicate a high ozone concentration, the rooms are only to be entered when wearing suitable breathing apparatus.

5. Construction of the OZAT Ozone Generator

No reserve all rights in this document and in the information contained therein. Reproduction, use, copying, distribution, or any other form of communication without express written permission is strictly prohibited.

All rights reserved in this document and in the information contained therein. Reproduction or use in translation without express authority is strictly prohibited.
Copyright © 2001



=PSU21+S01-
=PSU21+G21-

Mechanical captions:

Electrical captions:

	PCV201	Pressure control valve	10E1	Interference suppressor
		filter		
PV201		Pressure relief valve	10Q1	Mains switch (can be operated externally)
FV201		Gas valve	10F1	Converter fuses
FV202		Cooling water valve	10Q2	Circuit breaker
FV203		Ozone gas valve	11Q1/2	Circuit breakers (11Q1 monitoring)
TSH201		Temperature sensor	11G1	Auxiliary supply unit (voltage 24 VDC)
FISL202		Cooling media flow meter	11K1/2	Converter-/Inrushcontactor
		with switch low	11U1	Voltage control relay
G21		Ozone generator	11M1/2	Cubicle fans
HCV201		Hand operated control gas valve	11X1/2	Auxiliary voltage distribution
HCV202		Hand operated control cooling media	12L1	DC current coke
		valve	12G1	Rectifier module
			12C1...2	Smoothing capacitors
(see Appendix "P&I diagram", Page 64)			12V1	Inverter power electronics
			12A3	Inverter monitor
			12A1	Inverter electronics
			12A2	Measurement electronics
			12R1...3	Inrush resistors
			13T1	High voltage transformer
			13T2	High voltage potential transformer
			14D1	Programmable controller
			16B1	Cubicle temperature sensor
			19K1...9	Auxiliary relay
			20K1...3	Auxiliary relay
			20M1	Converter fan
			20S2	Door switch

The equipment is separated into a mechanical / process-technical part (left) and an electrical part (right).

No reserve all rights in this document are in the information con-
 tained in this document. Reproduction, use, copy or disclosure in form, print or
 digital or any other way is strictly prohibited.
 © 2007/08/08 OZONIA

5.1 Mechanical part

The most important mechanical parts are:

- Ozone generator G21:
 - ◇ In the Ozone Generator, a part of the oxygen of the gas used is converted into ozone. Each Ozone Generator models has the following connections:
 - Cooling media (inlet and outlet)
 - Feed gas (inlet and outlet)
 - Electrical supply (high voltage bushing and earthed module tube)
- The Ozone Generator unit can consist of one or more ozone generator modules.
- TSH201 Temperature monitoring of the ozone generator:
 - ◇ The ozone generator is provided with a temperature monitoring system which will produce a signal to switch off the electrical supply if an excessive rise in temperature (limit value 45 °C) as a result of lack of cooling media occurs. The unit can be switched on when the temperature drops to 30 °C.

The cooling water circuit is equipped with the following fittings:

- Isolation and regulating valve HCV202 (in the equipment):
 - ◇ To regulate and turn off the cooling water.
- Flow meter with minimum contact FISL201 (in the equipment):
 - ◇ To indicate the cooling water flow set with the regulation valve HCV202. A minimum flow contact is fitted which will give an alarm when the flow is too low.
- Solenoid valve FV202 (in the equipment):
 - ◇ To automatically turn the cooling water flow off an on. Can be manually bypassed for setting purposes.
- Temperature indicator TI202 (equipment front):
 - ◇ To indicate the cooling water outlet temperature.
- Drain valve DV202 (equipment front):
 - ◇ To drain the cooling water circuit. Fitted with a 20mm hose connector.



INFORMATION:

When draining an OZAT's cooling circuit which is connected to a closed cooling water system, an opening device must be forseen at the highest point.

The installed gas line is equipped with the following devices:

- Pressure control valve PCV201 (in the equipment):
 - ◇ To reduce the input pressure to the optimal operational pressure (factory set)
- Pressure relief valve PV201 (in the equipment):
 - ◇ Used to protect the internal system against undesirable overpressures. The reduction of the overpressure takes place via a line to atmosphere, connected to vent union. The gas flow to atmosphere should not be restricted in any way, that is, no valves, instruments or anything similar should be built into the line. The minimum diameter must correspond to the union thread, then the length of the line must not exceed 10 metres. For longer distances, the diameter of the line must be increased accordingly.



WARNING:

Because ozone as well as oxygen can be released when the pressure relive valve operates, the outlet location must be a safe distance from paths or streets, so that there is no danger for persons or household animals.

- Solenoid valve FV201/203 (in the equipment):
 - ◇ For automatically switching on and off the gas flow. It has a manually operated override for purging procedures and maintenance work when the equipment is not in service.
- Gas pressure gauge PI201 (equipment front):
 - ◇ For monitoring the operational pressure.
- Gas flow meter FI201 (equipment front):
 - ◇ The gas flow is indicated on the flow meter. The effective gas flow can be calculated using the Appendix "Gas flow diagram" on Page 62.
- Temperature monitoring TI203 (equipment front):
 - ◇ For monitoring the inlet gas temperature of the ozone generator.
- Hand operated control valve HCV201 (equipment front):
 - ◇ For setting the gas flow.

- Oxygen monitoring:

- ◇ To monitor the oxygen concentration in the interior of the equipment. The monitoring consists of a sensor (in the left-hand part) and an evaluation device (OZAT CHECK MK I) on the front door of the electrical part. The oxygen monitor reacts to concentrations >24,5 % by Vol. and switches the equipment off automatically.
- ◇ The evaluation unit has the following displays (light diodes, from left to right):

Colour	Symbol	Concentration % Vol.	Meaning
• yellow	⇓	19,5	Re-calibrate (see under Maintenance)
• green	•	20,5	normal O ₂ -Concentration
• yellow		21,5	high O ₂ -Concentration
• yellow	▬	22,5	high O ₂ -Concentration
• yellow	■	23,5	high O ₂ -Concentration
• red	■	24,5	Alarm (Switch off)
• green	ON	-	Auxilliary voltage on

5.2 Electrical part

The electrical part is completely separated from the mechanical / process technical part by an internal partition, so that the electrical components are effectively protected from any possible leakages of cooling media. The layout of the individual components with captions can be seen on page 19/20.

The power electronics are used to supply the ozone generator G21 with midium-frequency AC voltage. The high voltage transformer 13T1 steps-up the output voltage from the power electronics to the voltage required by the ozone generator modul.

The most important components and their functions are:

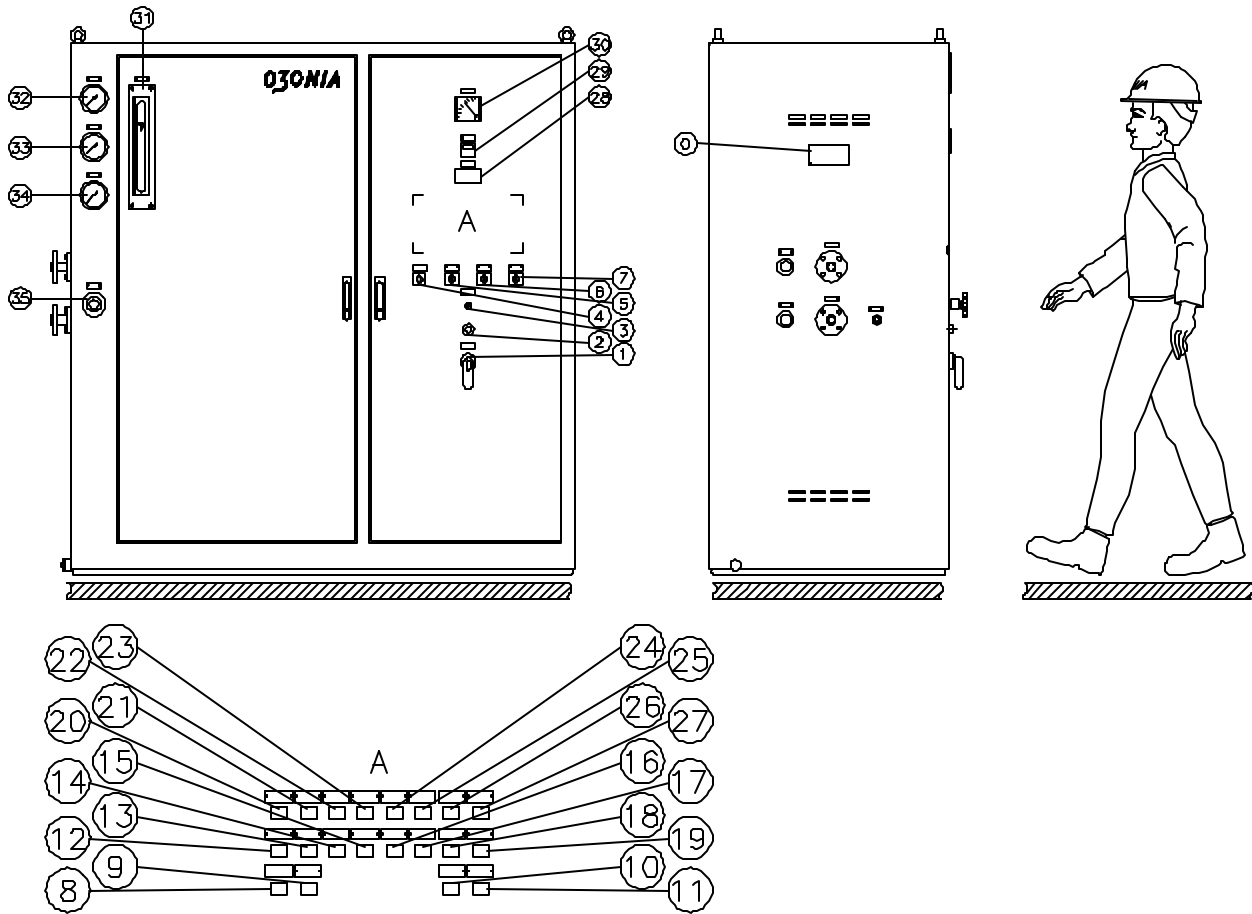
- Mains switch 10Q1 for switching on the equipment.
- Auxiliary voltage supply 11G1 for the control voltage.
- Voltage control relay 11U1 for mains voltage control.
- Capacitors 12C1...12C2.
- Inverter 12V1 consisting of two power transistors for the generation of a midium-frequency AC voltage for the ozone generator modul.
- High voltage transformer 13T1 to step-up of the output voltage from the inverter to the voltage required by the ozone generator module.
- Inverter monitor 12A3 for generation of the gate pulse for the power transistors.
- Inverter electronics 12A1 for the regulation of the inverter's real power.
- Measurement electronics 12A2 for registering the inverter's real power.
- Programmable Logic Controller 14D1 for the control and monitoring of the equipment.
- High voltage potential transformer 13T2 for monitoring the voltage of the ozone generator module.
- Cubicle temperature sensor 16B1 for monitoring the internal temperature (45°C)

No respove all rights in this document are in the information con-
 tained in this document. Reproduction or use in publications
 without express authority is strictly prohibited.
 © 2001/02/03 OZONIA

6. Operational and display elements, operational

No reserve all rights in this document and in the information contained therein. Reproduction, use or disclosure in their own or other persons' business without express written consent is strictly prohibited.

modes



Legende:

0	Rating plate with CE-identification
1	10Q1 Main switch
2	20S1 EMERGENCY STOP
3	12R4 Potentiometer 0...100 %: "SETPOINT" local set value
4	17S5 Selector switch: "CONTROL LOCAL/REMOTE"
5	17S7 Selector switch: "GAS VALVES AUTO/OPEN"
6	17S8 Selector switch: "COOLING WATER VALVE AUTO/OPEN"
7	17S6 Selector switch: "SETPOINT LOCAL/REMOTE"
8	17S2 Push button, white: "POWER SUPPLY OFF"
9	17S1 Push button, white: "POWER SUPPLY ON"
10	17S4 Push button, white: "LAMP TEST"
11	17S3 Push button, white: "RESET"
12	23H1 Signal lamp, red: "OXYGEN CONCENTRATION HIGH"
13	23H2 Signal lamp, red: "OZONE GENERATOR TEMPERATURE HIGH"
14	23H3 Signal lamp, red: "CUBICLE TEMPERATURE HIGH"
15	23H4 Signal lamp, red: "CONVERTER TEMPERATURE HIGH"

No reserve all rights in this document and in the information contained therein. Reproduction or use in translation without express authority is strictly prohibited. © 2001 OZONIA

	16	23H5	Signal lamp, red: "INVERTER SHORT CIRCUIT"
17	23H6		Signal lamp, red: "OZONE GENERATOR SHORT CIRCUIT"
18	23H7		Signal lamp, yellow: "COLLING WATER FLOW LOW"
19	23H8		Signal lamp, yellow: "CIRCUIT BREAKERS TRIPPED"
20	22H1		Signal lamp, green: "POWER SUPPLY READY"
21	22H2		Signal lamp, green: "POWER SUPPLY ON"
22	22H3		Signal lamp, green: "POWER SUPPLY OFF"
23	22H4		Signal lamp, green: "GAS VALVES OPEN"
24	22H5		Signal lamp, green: "COOLING WATER VALVE OPEN"
25			Blind cover
26			Blind cover
27			Blind cover
28	21B1		Evaluation unit OZAT CHECK MK I
29	20P1		Service hour counter
30	12P1		Electrical real power display
31	FI201		Gas flow meter
32	PI201		Gas pressure gauge
33	TI203		Gas temperature indicator
34	TI202		Cooling media temperature indicator
35	HCV201		Hand operated control valve

The equipment is switched on and off "LOCAL" or "REMOTE". In addition, the selection of the electrical real power, an influencing value for the ozone production is possible directly from the front side under "LOCAL" or from "REMOTE". The gas flow, however, can only be influenced from the equipment.

6.1 Selection of the control location and the set values

Four combinations are possible:

Selector switch	Control command Equipment ON/OFF		Performance Pre-set value		Gas flow Setting
	LOCAL	REMOTE	LOCAL	REMOTE	LOCAL ¹⁾
Combination 1	X		X		X
Combination 2		X		X	X
Combination 3	X			X	X
Combination 4		X	X		X

¹⁾ No selection possibility, only "LOCAL"

6.2 Ozone production

The ozone production is dependent on the gas flow and the electrical real power supplied. In addition, the temperature of the cooling media has a certain effect. The combined effect of the individual values can be seen in the production diagram on Page 63. (see also Chapter 8.1.1 "Operation and setting of the equipment")

The electrical real power is set with the set value potentiometer.

Potentiometer setting	Remote signal	Power W
left limit	4 mA	Basic power (minimum O ₃ production)
right limit	20 mA	Nominal power (maximum O ₃ production)

Gas flow setting (hand control valve HCV201):

The scale value for the desired gas flow is to be ascertained from the gas flow diagram on Page 62. The gas flow is altered using the valve until the corresponding scale value is reached on the gas flow meter FI201.

No response all rights in this document are in the information con-
 sidered in this document. Reproduction or use in this document is
 without express authority is strictly prohibited.
 © 2001/02/03 OZONIA

6.3 Signalisation and monitoring

6.3.1 Local

The following operating modes are displayed:

- "POWER SUPPLY READY"
- "POWER SUPPLY ON"
- "POWER SUPPLY OFF"
- "GAS VALVES OPEN"
- "COOLING WATER VALVE OPEN"
- "OXYGEN HIGH" CONCENTRATION
- "OZONE GENERATOR TEMPERATURE HIGH"
- "CUBICLE TEMPERATURE HIGH"
- "CONVERTER TEMPERATURE HIGH"
- "INVERTER SHORT CIRCUIT"
- "OZONE GENERATOR SHORT CIRCUIT"
- "COOLING WATER FLOW LOW"
- "CIRCUIT BREAKERS TRIPPED"

"POWER SUPPLY READY" means that the main switch is on, the mains voltage is within tolerance, the equipment is able to operate (contact "REMOTE ENABLE" closed) and that the converter fuses are in order. The equipment is ready to be switched on. During the switching on sequence the signal "POWER SUPPLY READY" will go off. The equipment will switch off by under or over voltage.

"POWER SUPPLY ON" is illuminated when the electrical supply for the ozone generator is switched on and ozone is being produced. The signal lamp will blink during the switching on sequence.

"POWER SUPPLY OFF" is illuminated when the electrical supply for the ozone generator is switched off. The signal lamp will blink during the switching sequence.

"GAS VALVES OPEN" means that both valves are open. The signal lamp will blink during the opening sequence.

"COOLING WATER VALVE OPEN" means that cooling water can flow.

"OXYGEN CONCENTRATION HIGH" is illuminated when the oxygen concentration is higher than 24.5% .

"OZONE GENERATOR TEMPERATURE HIGH" is illuminated when the ozone generator temperature is higher than 45°C.

"CUBICLE TEMPERATURE HIGH" means that the cubicle inside temperature is above 45°C.

"CONVERTER TEMPERATURE HIGH" is illuminated when the converter's heater sink temperature exceeds 80 °C.

“INVERTER SHORT CIRCUIT” is illuminated when the IGBT monitoring signals an inverter fault.

“OZONE GENERATOR SHORT CIRCUIT” means that an ozone module has failed.

“COOLING WATER FLOW LOW” is illuminated when the minimum set cooling water flow has been reached.

“CIRCUIT BREAKERS TRIPPED” means that the automatic fuse (11Q1) for the cubicle fan has tripped.

6.3.2 Remote

The following operating modes are displayed:

- “POWER SUPPLY READY”
- “POWER SUPPLY ON”
- “GAS VALVES OPEN”
- “COOLING WATER VALVE OPEN”
- “CONTROL REMOTE”
- “SET POINT REMOTE”
- “FAILURE”

“CONTROL REMOTE” means that the supply is switched over to remote control.

“SET POINT REMOTE” means that the supply requires a remote set value signal (4-20mA).

“FAILURE” means that the supply is switched off due to one of the following faults:

- Ozone generator temperature too high
- Ozone module short circuit
- Short circuit power electronics
- Oxygen concentration in cubicle too high
- Cubicle inside temperature too high
- Converter heat sink temperature too high

When the fault “Cooling water flow low” or “Circuit breakers tripped” a “Failure” signal will be given but the supply will not be switched off.

The fault “Oxygen cocentration high” is also displayed on the oxygen monitoring unit on the front of the equipment (see also Chapter 3.1.1 “Oxygen monitoring”)

6.4 Acknowledging the fault signal

The blinking fault signal is acknowledged by pressing the “RESET” key on the equipment front or by closing the “RESET” contacts remotely. After acknowledging the fault the lamp will light continuously and remedial action must take place. As soon as the fault has been corrected the lamp will go off and the equipment can be re-started.

6.5 Valve regulation

6.5.1 Gas valves

The gas valves can be (local) either opened in the setting "OPEN" or with the normal sequence in the position "AUTO". By closing the contact "GAS VALVES REMOTE OPEN" remotely, the gas valves will open. The valves will be sequentially opened and closed in all types of service.

6.5.2 Cooling water valve

The cooling water valve can be (local) either opened in the setting "OPEN" or with the normal sequence in the position "ATUO". By closing the contact "COOLING WATER VALVE OPEN" remotely, the cooling water valve will open.

6.6 Functional sequence

Precondition: mains switched on, the mains voltage is within tolerance limits, the converter fuses are okay, both front doors are closed and the EMERGENCY STOP has not been operated, i.e. the "POWER SUPPLY READY" is illuminated.

6.6.1 Switch-on procedure

The switch-on sequence is as follows:

- ON-command "POWER SUPPLY ON" from the equipment (LOCAL) or "SUPPLY ON" contact closed externally (REMOTE)
- Lamp "POWER SUPPLY ON" will blink and the lamp "POWER SUPPLY OFF" will go off
- Lamp "POWER SUPPLY READY" will go off
- Service hour counter ON
- Solenoid valve FV201 will open and the lamp "GAS VALVES OPEN" will blink.
- About 5 seconds later the ozone gas valve FV203 will open and the lamp "GAS VALVES OPEN" will burn continuously
- After a further 3 seconds the cooling water valve FV202 will open and the lamp "COOLING WATER VALVE OPEN" will light
- The converter will be switched on
- The cooling fan will start
- About 2 seconds later the in-rush contactor will be switched on
- Inverter released
- Lamp "POWER SUPPLY ON" will burn continuously
- Power increased from the pre-selected LOCAL or REMOTE value. Power increase within about 20 seconds from the basic power to 100 %.

The whole switching on sequence takes about 20 seconds.

6.6.2 Switch-off procedure

The switch-off procedure is as follows:

- OFF-command "POWER SUPPLY OFF" from the equipment (LOCAL) or "SUPPLY ON" contact opened externally (REMOTE).
- Lamp "POWER SUPPLY ON" will go off
- Lamp "POWER SUPPLY OFF" will blink
- Service hour counter will stop
- Power set value will be blocked
- About 2 seconds later, the inverter will be blocked
- About 4 seconds later the converter will switch off
- Fan will switch off
- About 2 seconds later the in-rush contactor will switch off
- Solenoid valve FV202 closes and lamp "COOLING WATER VALVE OPEN" goes off
- Lamp "POWER SUPPLY READY" illuminates
- About 3 minutes later the ozone gas valve FV201 will close. Due to the delay, the equipment will be purged with the feed gas, and the residual ozone fed to the process
- Gas valve FV203 will close and lamp "GAS VALVES OPEN" will go off
- Lamp "POWER SUPPLY OFF" will light up

6.7 EMERGENCY STOP circuit

When the EMERGENCY STOP switch is operated, the energy supply from the mains will be interrupted at the same time the gas flow stopped. In contrast to a normal operational switch off procedure, there is **no** flushing of the equipment after an emergency stop. Additional terminals have been foreseen which enable external EMERGENCY STOP buttons to be connected to the equipment.



WARNING:

After an emergency stop there is still ozone inside the components (e.g. ozone generator module, piping and, possibly, in the equipment).

6.8 Switch-off following a fault (alarm)

Function of the fault monitoring:

Fault	Release of the monitoring	Switch-off delay following occurrence of a fault	Remarks
Oxygen concentration high	always effective	3 seconds	Gas valves closes immediate, otherwise normal switch-off procedure
Ozone generator module temperature high	always effective	5 seconds	normal switch-off procedure
Cubicle temperature high	always effective	10 seconds	normal switch-off procedure
Converter temperature high	always effective	5 seconds	normal switch-off procedure
Inverter short circuit	with inverter release	not delayed	normal switch-off procedure
Ozone generator short circuit	5 seconds after inverter release	2 seconds	normal switch-off procedure
Cooling water flow low	with cooling water valve release	10 seconds	only indication, no switch off procedure
Circuit breakers tripped	always effective	1 second	only indication, no switch off procedure

6.9 Acknowledging alarm

The blinking alarm signal is acknowledged by pressing the "RESET" key on the equipment front or by closing the "RESET" contacts remotely. After acknowledging the alarm the lamp will light continuously and remedial action must be take place. As soon as the alarm has been corrected the lamp will go off and the equipment can be re-started.

No response all rights in this document are in the information contained in this document. Reproduction or use in this document is strictly prohibited. © 2007/07/07 OZONIA

7. Commissioning

7.1 Setting up and installation

7.1.1 Setting up

The setting up of the equipment and the ozone gas lines should be carried out in such a manner that no water or moisture can enter the equipment. If this cannot be ensured by the lay-out of the line alone, a non return valve and a condensation trap should be provided in the ozone gas line.

7.1.2 Ambient conditions

The installation location must comply with the data given in Chapter 2 "Product description":

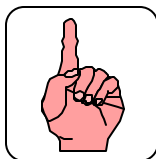
- Temperature
- Altitude
- Humidity
- Protection class
- Vibration

will be complied with.

In addition, it should be ensured that the dissipated heat does not lead to any unacceptable temperature rise in the generator room and that the installation corresponds to the safety regulations for areas into which oxygen or ozone can be present (see also Chapter 3 "Safety measures and regulations").

7.1.3 Installation of the equipment and the piping

During the **complete installation work**, the equipment is to be protected against dirt, dust and foreign bodies (metal swarf, screws, etc.).



IMPORTANT:

All gas lines must be kept free from dust, oil and grease. When installation the unit the correct materials (oxygen- and ozone resistant) must be used for the lines, devices, seals, etc.

7.1.4 External connections

All external line connections for cooling media, oxygen ozone and pressure relief valve should be made, so far Serto connections be used, according to the Serto installation instructions on Page 69. Flange and pipe connections are only to be made in accordance with recognised standards and by qualified personnel.

When mounting the external connections, pay attention to the **marking** on the equipment (feed gas, ozone or cooling media input and output).

7.1.5 Protection of lines

Where there is the danger that the lines can be damaged or ripped away, they must be **protected**.

7.1.6 Electrical installation

The electrical connections must comply with local regulations. If the equipment is fitted with an instrument socket (IEC-standard), a corresponding mains cable with a suitable plug must be used (plug standard see Chapter 2.2.1 "Electrical data").

7.2 Commissioning

Preparation:

- The commissioning personnel authorised by the owner and/or user must read and understand the operating instructions.
- The commissioning personnel must be familiar with the safety measures and regulations, be equipped with the necessary breathing apparatus and must **know** the escape routes.

7.2.1 Checking the installation

Before the electrical feed, the feed gas and the cooling media can be connected, the following must be checked:

- Is the line feed protected?
- Are the lines for
 - ◇ feed gas
 - ◇ ozone
 - ◇ cooling media
 - ◇ pressure reliefconnected to the correct unions on the equipment?

7.2.2 Further checks

The following additional points must be checked before commissioning:

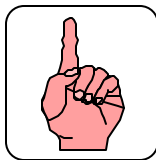
- Is there adequate ventilation for normal operation and in case of malfunction?
- Is the feed gas and the cooling media (quantity, quality and pressure) in accordance with the technical data in Chapter 2 "Product description "
- Have all connections been correctly made?
- Is the owners and/or users process, in which the ozone will be used, ready for the ozone and is the vent ozone destructon operational?

7.2.3 Tightness check of the gaslines

If the above conditions have been fulfilled, a tightness check should be carried out. This is done as follows:

- Set the installation, including feed and return lines, by override the solenoid valves FV201/203 and opened hand regulating valve HCV201 under operational pressure and treat all connections on the gas side with oxygen-resistant leakage spray. Any connections where bubbles form, must be re-made.

As an oxygen-resistant leakage spray, <SNOOP LIQUID LEAK DETECTOR> from <NUPRO COMPANY>, for example, can be used.



IMPORTANT:

The tightness test must be repeated until no further leaks are found.

7.2.4 Checking the cooling water circuit

In order to ensure trouble-free operation, the factory settings should be in case something has moved during transport. The following checking procedure is to be observed:

- Bridge the solenoid valve FV202 manually by latching the hand actuator.
- Slowly open the isolation valve in the inlet pipe. Observe the maximum permissible pressure given in the operational data.
- Check the flow on the flow meter FISL202.
- If the flow is different to the given nominal data, adjust this with the hand operated control valve HCV202 .
- Set the reed switch on the flow meter FISL202 to 25% of the nominal flow value.

Check all connections for leaks. Leaky joints, not to be confused with condensation, are to be remade.

- Reset the manual override on the solenoid valve FV202 again.



WARNING:

When dealing with leaky joints, the connections can only be taken apart when they are not under pressure.

7.2.5 Purging the system to dry it out

Before applying electrical energy to the ozone generator, ensure that there is no moisture in the gas lines. To dry out the system, the gas flow circuit must be purged for at least 12 hours with feed gas (in accordance with the operational data). When doing this, the following sequence should be followed:

- Override the solenoid valves FV201/203 manually by latching the hand actuator
- Slowly open the stop valve in the feed gas line. Keep to the maximum permissible pressure given in the operational data!
- Using the hand regulating valve HCV201 set the gas flow to about 20 % (check using the gas flow meter FI201).
- Check whether the gas pressure gauge PI201 shows 1 bar.
- Purge for at least 12 hours.
- Close the stop devices in the feed line and the hand operated regulating valve.
- Reset the manual override on the solenoid valve FV201/203 again.
- Close the equipment.

The equipment is ready for commissioning.



WARNING:

During commissioning, ozone will be produced. It must be ensured that the ozone produced can be routed to the process and that any surplus ozone will be destroyed.



WARNING:

If a smell of ozone is detected, the mains switch (EMERGENCY STOP) must be immediately switched off, and the area evacuated in accordance with the safety measures.

No response all rights in this document and in the information contained therein in this document are reserved. All rights reserved. © 2008 OZONIA

7.2.6 Commissioning the operational mode “LOCAL”

When the plant is ready to produce ozone, the contact “REMOTE ENABLE” must be closed.

- Turn the power set-value potentiometer to the left stop (limit).
- Set the operational selector switch to “LOCAL”.
- Set the pre-set value to “LOCAL”.
- Set cooling water and gas valves to “AUTO” .
- Switch on the mains supply (voltage on the equipment).
- Switch on the mains switch. The lamp “SUPPLY READY” will light.
- Press button “SUPPLY ON” , the lamp will blink until the switching on sequence has finalised.
- The lamps “SUPPLY OFF” and “SUPPLY READY” will go off.
- The lamp “GAS VALVES OPEN” will blink during the opening phase and then burn continuously.
- Lamp “COOLING WATER VALVE OPEN” will light.
- Real power indicator shows the minimum power.
- Increase the gas flow to maximum with the hand operated control valve HCV201
- Turn the power set-value potentiometer slowly to the right until the stop is reached.
- Real power indicator shows the maximum power.
- Set the power set-value and the gas flow back to minimum.
- Switch off the equipment with the “SUPPLY OFF” push button, the lamp will blink until the switching off sequence is finished. Real power indicator must return back to zero and the lamp “SUPPLY ON” will go off. The lights “SUPPLY OFF” and “SUPPLY READY” will illuminate.

7.2.7 Commissioning in the operational mode “REMOTE”



ATTENTION:

“REMOTE” commissioning can only take place after the “LOCAL” commissioning has been successfully completed.

This part of the commissioning is better carried out by two people, one at the equipment and the other at the “REMOTE” control position, they must be able to communicate with each other. When the plant is ready to produce ozone, the contact “REMOTE ENABLE” must be closed.

- Set the power set value REMOTE to minimum (4 mA).
- Set the operational selector switch to “REMOTE”.
- Set the pre-set-value to “REMOTE”.
- Set cooling water and gas valves to “AUTO” .
- Switch on mains supply.
- Switch on the mains switch.
- The following signals are now present at the REMOTE control position:
 - ◇ CONTROL POSITION REMOTE
 - ◇ SET-VALUE REMOTE
 - ◇ SUPPLY READY
- Release the “SUPPLY ON” command (REMOTE).
 - ◇ Confirmation “SUPPLY ON”
 - ◇ Confirmation “GAS VALVES OPEN”
 - ◇ Confirmation “COOLING WATER VALVE OPEN”
- Real power indicator shows the minimum power.
- Increase the gas flow to maximum with the hand operated control valve HCV201
- Slowly increase the power set-value (from 4 to 20 mA).
- Real power indicator shows the maximum power.
- Set the power set-value and the gas flow back to minimum.
- Remotely switch the equipment off (open contact SUPPLY ON). . Real power indicator must return back to zero.

After completing the commissioning work, close the hand operated control valve HCV201 again.



IMPORTANT:

If the commissioning cannot be carried out, check in Chapter 9 “Maintenance” for possible causes and, if necessary, contact the service personnel.

8. Operation

The equipment may only be operated by persons authorised by the owner and/or user. It is up to the owner and/or user how many persons he authorises to operate the installation, and whether he will additionally instruct further persons with partial functions, e.g., "EMERGENCY STOP".

The owner and/or user must ensure that the persons authorised by him have familiarised themselves with the safety measures and regulations, and that they also comply with them, in addition to having read and **understood** the operating instructions.

No response all rights in this document and in the information contained therein are reserved. Reproduction, use, copying, distribution, sale, or other use without express written permission is strictly prohibited.
Copyright © 2000

8.1.1 Operation and setting of the equipment

The preconditions are:

- The process (plant) is ready to receive ozone
- Power supply switched on
- Mains switch on, "PSU READY" lamp illuminated
- Cooling media turned on
- Gas feed turned on

The equipment can now be switched on or off, either LOCAL or REMOTE (if connected), to the pre-set values for gas flow and electrical real power P_e . The necessary settings are found as follows; for the setting of the equipment the "gas flow diagram" on Page 62 and the setting curves on Page 63 can be used.

Setting the ozone production and concentration:

Example 1

Given: Ozone quantity MO_3 and ozone concentration c

Wanted: Gas flow V_n and real power setting P_e

Procedure:

- Calculation of the gas flow V_n

$$V_n = \frac{100}{\rho} \cdot \frac{MO_3}{c}$$

c = Ozone concentration [wt%]

MO_3 = Ozone production [kg/h]

ρ = Density of the feed gas [kg/m³]
at standard conditions

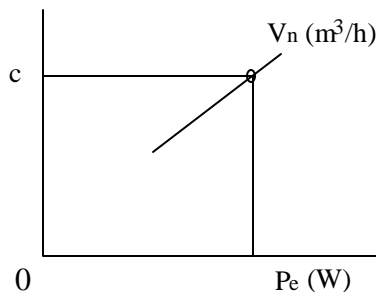
($t_n = 0$ °C, $p_n = 1.013$ bar)

for $c = 10$ wt%, $MO_3 = 1.3$ kg/h and $\rho = 1.429$ kg/m³ (oxygen) it follows:

$$V_n = \frac{100}{1.429} \cdot \frac{1.3}{10} = 9.1 \text{ m}^3 / \text{h}$$

- The required electrical real power is determined from the setting curves on Page 63.

The intersection of the horizontal line of the desired ozone concentration c with the curve of the required feed gas quantity V_n gives the electrical real power P_e .



If there is no suitable curve available for the required oxygen quantity, interpolate between the two curves.

For the above example ($c = 10$ wt%, $MO_3 = 1.3$ kg/h) an electrical real power P_e of about 12 kW results (12 °C cooling media inlet temperature).

- From the gas flow diagram on Page 62, the corresponding scale value for the feed gas quantity can be found (indicated by the gas flow meter).

Example 2

Given: electrical real power P_e and the gas flow V_n

Required: ozone production MO_3 and ozone concentration c

Aid: Setting curves on Page 63

- Find the intersection of the vertical line from the electrical real power with the curve for the gas flow.
- A horizontal line gives the ozone concentration c .
- From c and V_n (gas flow), the ozone production MO_3 can be calculated:

$$MO_3 = \frac{\rho \cdot V_n \cdot c}{100}$$

8.1.2 EMERGENCY STOP

In cases of danger, such as:

- Ozone leakage
- Electrical accident
- Etc.

the emergency stop switch must be switched off. In this way, the electrical energy supply and the feed gas flow will be **immediately** interrupted.

8.1.3 Alarm signals

If an alarm signal occurs, the equipment is switched off. After the fault has been remedied, the alarm signal can be acknowledged by pressing the "RESET" push button, and the equipment is switched on again. If a fault repeatedly appears, the service personnel should be informed.

8.1.4 Switching off for long periods

If the equipment is not to be used for a long period of time, the gas flow should be closed (hand operated control valve HCV201). This will save gas and will avoid water entering the equipment and the ozone generator from the clients process side.

**INFORMATION:**

The ozone generator is sensitive to moisture. For this reason the feed gas must always comply with the specification and the ingress of moisture from the process side must be prevented.

8.1.5 Operational maintenance

The oxygen monitoring device should be periodically checked. If the light-emitting diode (LED) on the far left of the oxygen monitoring device with the symbol "⬇" is illuminated, the equipment must be re-calibrated. The procedure is described in Chapter 9 "Maintenance".

**WARNING:**

No calibration must be carried out if any one of the other light diodes (e.g., increased oxygen concentration) is illuminated, because the oxygen monitoring device will be calibrated to an incorrect value.

No further operational maintenance is required.

9. Maintenance

Maintenance work may only be carried out by personnel who have been trained and authorised for this work by the owner and/or user. The owner and/or user must ensure that the maintenance personnel are familiar with the safety measures and regulations, and that they also comply with them, in addition to having read and understood the operating instructions.

9.1 Periodical tightness check

It is recommended that periodical tightness checks for the complete installation are carried out. To do this, the complete system is pressurized, the inlet and outlet valves are then closed and afterwards the feed pressure of the inlet valve is reduced to zero. The starting pressure (i.e., after about 10 minutes) and the end pressure (after several hours) should be recorded. At the same time the temperature must be measured. If the condition

$$p_{1abs.} \cdot (t_2 + 273) = p_{2abs.} \cdot (t_1 + 273)$$

is established, the system is tight.

If the system is not tight, the procedure described in Chapter 7.2.3 "Tightness check" must be repeated.



INFORMATION:

$p_{1abs.}$ and $p_{2abs.}$ are absolute pressures in bar, i.e., the ambient pressure must be added to the gas pressure gauge (overpressure) PI201.

9.2 Periodical check of the area ozone monitoring devices

The ozone monitoring devices installed by the owner and/or user must be periodically checked. For the time interval between checks and the procedure for the test, consult the supplier's operating instructions.

9.3 Periodical check of the breathing apparatus

Breathing apparatus must be regularly checked in accordance with the supplier's instructions.

9.4 Re-calibration of the oxygen monitoring device



WARNING:

No calibration must be carried out if any one of the other light-emitting diodes (e.g., increased oxygen concentration) is illuminated, as in this case the oxygen monitoring device will be calibrated to an incorrect value.

If the light-emitting diode on the far left of the oxygen monitoring device with the "↓" symbol is illuminated, the equipment must be re-calibrated. The oxygen monitoring device is fitted with a battery which supplies the auxiliary voltage for the calibration procedure. When calibrating, proceed as follows:

- Switch off the mains switch
- Open the front doors

The oxygen sensor is fitted on the inner side of the left-hand front door, and the corresponding evaluation electronics are mounted on the right-hand front door in a housing. On the rear of the electronic housing there is a calibration knob (round hole, on the left next to the connection terminals). By pushing the calibration knob with a screwdriver, the voltage of the built-in battery will be applied, and the equipment will be automatically re-calibrated. If the battery voltage is insufficient, the corresponding LED blinks in the operational state (normally indicated with the symbol "↓"). When the battery is discharged the LEDs will not light. A replacement battery must be immediately installed (type U9VL / Lithium).

Procedure for battery changing:

- Disconnect plug of the evaluation unit (electronic device).
- Unfasten the mechanical locks of the frame on the front of the electronic device with a screwdriver.
- Release the printed board including front plate by slight pushing the plug socket on the rear side of the housing and pull the printed board out.
- Change the battery mounted on the printed board.

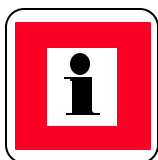
A graphical illustration in the Appendix "Layout of the oxygen warning device" on Page 68 shows the arrangement of the sensor and the evaluation electronics.



WARNING:

When calibrating, the following points must always be observed.

- The left hand front door must be opened in such a way that the oxygen sensor is in air with a normal oxygen concentration. Only when this is the case can the calibration proceed.
- Calibrate the oxygen warning device by pressing the calibration knob for 5 seconds.
- After a further 30 seconds the green LED will be illuminated showing that the measurement instrument is calibrated.
- After a further 30 seconds, the measuring instrument switches itself off.
- Close the front doors.
- Check whether the LED is green:
 - ◇ If yes, the OZAT Ozone Generator can be put back into operation.
 - ◇ If not, the calibration must be repeated to ensure that it has been correctly carried out. If the same result is obtained, the life span of the sensor has expired and it must be replaced. The operational period of the sensor at an O₂-concentration of 20,5 % is 5...7 years.



INFORMATION:

If, as a result of ageing of the sensor, the function of the oxygen monitoring device is suspect, the OZAT Ozone Generator is automatically switched off.

No responsibility for errors in this document and in the information contained therein. Reproduction or use of this document without express authority is strictly prohibited. © 2007/10/17 OZONIA

9.5 Replacing the signal lamps

To ensure a perfect signalisation, defective lamps should be replaced immediately. The lamps can be checked by pressing the "LAMP TEST" button. Signal lamps may only be replaced with the mains switch switched off.

9.6 Terminal check

Once a year all electrical connection screws should be tightened. To do this the supply should be switched off. The covers should only be removed after waiting 3 minutes, as the smoothing capacitors require time to discharge. Before beginning work, the smoothing capacitors 12C1...12C2 and the electrical connections of the ozone generator G21 must be **discharged**. After completing the work, replace all covers.



WARNING:

If the time of 3 minutes between switching off the mains switch 10Q1 and dismantling the capacitor covers is not observed, there is a **danger of electrocution**.



WARNING:

External voltages for the external signalling must be switched off!

9.7 Replacing the filter mats

Depending on the environment where the equipment is installed, the filter mats must be changed at regular intervals.

No response all rights in this document and in the information contained therein reserved. Reproduction or use in translation without express authority is strictly prohibited. © 2007/10/12 02:00

10. Overhauling

Overhaul work must only be carried out by authorised and trained specialists. The owner and/or user must ensure that his maintenance personnel are familiar with the safety measures and regulations, and that they also comply with these, in addition to having read and understood the operating instructions.



WARNING:

If work has to be carried out on the ozone generator or on the high voltage transformer, the high-voltage terminals have to be earthed in accordance with local regulations. If work has to be carried out on the ozone generator or on the gas lines, it must first be ensured that the parts are not under pressure and are free from ozone.

10.1 Replacement of defective fittings, lines or ozone generator modules



ATTENTION:

Before every repair or service work, the complete system must first be purged (see Chapter 10.1.1). The gas pressure is then to be reduced to atmospheric pressure, the cooling media and the mains switch are to be turned off. The ozone generator module must be discharged directly at the high voltage bushing (see Chapter 10.1.1).

Only original replacement parts from Ozonia must be used. After installing the new fitting, ensure that the connections are properly made and, if necessary, carry out a tightness check (see Chapter 9.1 "Periodical tightness check") of the system.

No reserve all rights in this document and in the information contained therein. Reproduction or use in translation without express authorisation is strictly prohibited. © 2007 Ozonia

10.1.1 Purging the systems before overhaul work

Every time that overhaul (repair) or service work has to be carried out on the pipeline guides or the fittings, the residual ozone in the ozone generator and in the lines must be removed out with the feed gas. To purge the system, proceed as follows:

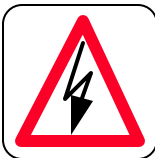
- switch off the equipment.
- Close the shut-off device in the feed gas line.
- After the pressure in the system has dropped (check on the gas pressure gauge PI201), close the hand operated control valve HCV201.
- Open the front doors.
- By-pass the solenoid valves FV201/203 (by latching the hand actuator).
- Open the shut-off device in the feed gas line.
- Set a medium gas flow with the hand control valve HCV201 (observe the gas flow display FI201).
- Set at half of the gas flow quantity.
- Purge for at least 6 hours.
- Close the shut-off device in the feed gas line.
- When the system pressure has been relieved, close the hand operated control valve HCV201. Check on the gas pressure gauge PI201.
- The OZAT Ozone Generator is now ready for any repair or service work that may be necessary. After completing the work, the system tightness must always be checked (see Chapter 9.1 "Periodical tightness check") and be dried out by purging (see Chapter 7.2.5 "Purging the system to dry it out").
- Before putting into operation, the shut-off solenoid valve FV201/203 by-pass must be closed.
- Close the front doors.
- Put the equipment into operation (see Chapter 7.2.6)

**PROHIBITION:**

When the lines are opened, a concentration of oxygen can accumulate in the clothing, with an associated increased fire risk. The corresponding safety measures should therefore be taken. (see Chapter 3 "Safety measures and regulations").

10.1.2 Discharging the ozone generator module

Discharging may only take place when mains switch (10Q1) is switched off. The discharging device is first connected to earth and only then may the discharge rod be introduced into the opening on the upper side of the connector cover to discharge each ozone generator module.

**WARNING:**

The discharging device must only be held by the handle. It is absolutely essential to ensure that there is a metal-to-metal contact with the electrical connection. See the illustration in the Appendix "Discharging the ozone generator module" on Page 71.

10.2 Setting the operational pressure

Changes in the system pressure have a direct effect upon the ozone production. If the factory-adjusted operational pressure has changed, it must be reset.

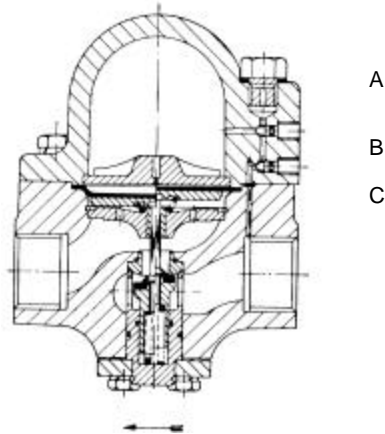


IMPORTANT:

The operational pressure may only be adjusted if it does not correspond with the nominal operational pressure, i.e., if it is more than 1.2 bar at 70 % gas flow or less than 0.8 barg .If the pressure is incorrectly adjusted, the ozone generator and/or the electrical supply may work incorrectly or fail.

The operational pressure is set using the pressure control valve PCV201, which is mounted inside the housing. Proceed as follows:

- Switch off the equipment
- Open the front doors.
- By-pass the shut-off solenoid valves FV201/203 by latching the hand actuator.
- Set an optimal gas flow using the hand operated control valve HCV201 (observe the gas flow meter FI201).
- Set the gas pressure using the pressure control valve PCV201.



- Open needle valve B in order to release any pressure in the dome.
- Close needle valve B.
- Open needle valve C half a turn.
- Carefully open needle valve B and let gas enter the dome. At the same time read the minimum-pressure indicated by the pressure gauge PI201. As soon as the operational pressure is indicated close needle valve B.
- Close needle valve C.
- If the indicated operational pressure is too high, carefully open needle valve B until the ideal operating pressure is reached.
- The dome regulator valve is set and ready for service.
- Before putting into service, the by-pass of the shut-off solenoid valve FV201/203 must be closed.
- Close the front doors.
- Put the equipment into operation (see Chapter 7.2.6).

No reserve all rights in this document are in the information contained in this document. Reproduction or use in translation without express authority is strictly prohibited. © 2001/02/03 OZONIA

10.3 Correcting faults

10.3.1 Tripping as a result of a leak

The opening of the cabinet must take place in a well ventilated room. As ozone can escape together with the oxygen, a **breathing apparatus** for protection against ozone must be worn for safety reasons. The source of the leak can be located by spraying the system using a leakage spray that is approved for use with oxygen and ozone.

If the leakage has been localised and repaired, the cabinet must be thoroughly ventilated so that the concentration of oxygen in the cabinet can again be reduced to the level of the concentration in the ambient air. Before putting into service again, check whether the LED-display of the oxygen warning device is again at green with the cabinet closed.

If the fault has been localised and corrected, the installation can be put into service.

10.3.2 Temperature monitor TSH201

A temperature alarm "high" can have the following causes:

- Cooling media flow interrupted or turned off
- Cooling media inlet temperature too high > 30 °C
- Ambient temperature > 40 °C
- Cooling media flow too low (set-value: as in "Operational data" on Page 10).

If the error has been localised and corrected, the installation can be put into operation.

10.3.3 Cooling water flow low

A signal from a correctly set reed contact can have following causes:

- Cooling water flow too low, for adjustment and control see "Checking the cooling water circuit" 7.2.4.

10.3.4 Cubicle temperature high

When the cubicle temperature monitor continually trips, can have following causes:

- Ambient temperature too high
- Fan is faulty (fault:"CIRCUIT BREAKERS TRIPPED")
- Equipment incorrectly connected to the mains, i.e. phase sequence incorrect (fan running in wrong direction)
- Temperature monitor setting is wrong (nominal setting: 45 °C)

10.3.5 Converter temperature high

This can have following causes:

- Fan faulty
- Short circuit on the power side
- Ambient temperature too high

When there is a short circuit on the power side, the same procedures for "Inverter short circuit" 10.3.7 are to be observed.

10.3.6 Ozone generator short circuit monitor

A tripping as the ozone generator short circuit monitor can be caused by the following:

- Defective high voltage transformer 13T1
- Defective high voltage converter 13T2
- Defective ozone generator G21

The causes mentioned above can be localised as follows when the equipment has been switched off and **discharged** (12C1...12C2 and G21):

- High voltage transformer 13T1
 - ◇ The high voltage transformer must be removed and the HV side connected to a 24 V, 50/60 Hz source. A voltage of $\approx 2,2$ V must be measured on the primary side.
- High voltage converter 13T2
 - ◇ Check by replacing the converter
- Ozone generator G21
 - ◇ In order to find out which ozone module is defect, it is possible to disconnect each individual module. For this purpose, when the supply is switched off, removable links have been foreseen in the high voltage distribution system. After removing one of these links the ozone generator is to be restarted, if the module short circuit system still trips, the generator is to be switched off, the link replaced and another link removed. This procedure is to be repeated until the faulty module is located.



WARNING:

After switching the supply off the ozone generator modules are charged. Before working on them each must be discharged with the earthing device supplied. The discharging device must only be held by the handle. It is absolutely essential to ensure that there is a metal-to-metal contact with the electrical connection. See the illustration in the Appendix "Discharging the ozone generator module" on Page 71.

10.3.7 Inverter short circuit

If the high power circuit breaker (10Q1) has tripped, and cannot be switched on again, there is possibly a defect in the IGBT module (12V1) or in the rectifier (12G1). Both components must be replaced one after the other. If these measures are not successful contact the Ozonia Service department.

10.3.8 Inverter short circuit monitor

If the short-circuit monitor trips repeatedly, the IGBT inverter monitor (12A3) must be replaced. If this does not eliminate the error, then the IGBT module (12V1) must be replaced.

10.3.9 Replacing the oxygen sensor

The Life span of the oxygen sensor (built into the left-hand door) is 5...7 years when working with normal oxygen concentrations in air. If no further re-calibration is possible, the oxygen sensor should be replaced as soon as possible. After replacing the oxygen sensor, a calibration must be carried out as described in Chapter 9.4 "Re-calibration of the oxygen monitoring device". When the calibration has been successfully completed, the equipment can be put into operation.

**ATTENTION:**

The equipment must not be operated with an uncalibrated (non-functional) oxygen sensor.

11. Taking out of operation, storage

There are two possibilities for taking out of service:

- Shutdown of the equipment and permanently disconnecting the feed gas, cooling media and electricity supply.
- Dismantling the equipment and the connecting lines.

11.1 Shutdown of the equipment

Before the definitive shutdown of the equipment, all lines must be thoroughly purged so that all ozone remaining in the equipment and in the feed lines is either fed to the process or to the vent ozone destructor.

If the equipment is on loan, or is to be re-installed at another location, it should only be purged with dry gas (dew point 60 °C or lower) , so that the system will not be damaged.

After purging, the pressure should be lowered to atmospheric pressure, the gas connection lines sealed with **airtight** sealing caps, and the cooling media drained.

11.2 Dismantling the equipment and the connecting pipelines.

Dismantling of the connecting pipelines:



PROHIBITION:

When the lines are dismantled, oxygen can escape. There is therefore an increased risk of fire and uncreased oxygen concentration, particularly in the clothing. It is therefore very important to observe the regulations for the handling of gaseous oxygen. (see also Chapter 3 "Safety measures and regulations")

Dismantling the electrical connections:



WARNING:

Before disconnecting electrical connections, the power feed to the connectors must be switched off and the cable then disconnected. For equipment with plug connections, the connector plug must be pulled out. External power supplies for any external signalling must be switched off.

12. Packaging, transport

When being transported, the equipment must be protected against mechanical damage and tipping, as well as against moisture, direct sunshine and dust.

Measures:

- Seal the equipment in plastic, and provide with silica gel additives as protection against moisture.
- Transport in suitable wooden containers.

13. Disposal

For disposal, proceed as follows:

- Dismount the ozone generator module(s) and return to Ozonia.
- The remaining material, such as:
 - ◇ Electronic printed circuit boards
 - ◇ Power transistors
 - ◇ Silicon rectifiers
 - ◇ Capacitors
 - ◇ Plastics such as PTFE, PE, PVC, Plexiglas (pipelines, conduits, cable channels, electrical components)
 - ◇ Non-ferrous metals such as nickel, brass, copper (fittings, rails, cables)
 - ◇ Stainless materials (heavy metals from alloys)

should be disposed of by the specialists in the owner's company or by special disposal companies.

14. Spare parts list

14.1 Electrical material

1 Interference supp.filter Type: B84143- B36-R Art. No: TE10431	=PSU21+S01-10E1	1 Power circuit breaker Type: S2B160 R40/FFC III Art. No: TE10247	=PSU21+S01-10Q1
1 Fuse holder Type: ST 14 III D Art. No: TE10617	=PSU21+S01-10F1	1 Circuit breaker Type: LP3G6-T Art. No: TE10329	=PSU21+S01-10Q2
1 Circuit breaker Type: LP3G1-T / SDH11 Art. No: TE10321	=PSU21+S01-11Q1	1 Circuit breaker Type: LP3G1,6-T Art. No: TE10317	=PSU21+S01-11Q2
1 Auxiliary supply unit Type: RDRKG10 Art. No: TE10434	=PSU21+S01-11G1	2 Contactor Type: B40-30-11 Art. No: TE10582	=PSU21+S01-11K1/K2
2 Voltage distributor Type: 24VDC Art. No: TE10630	=PSU21+S01-11X1/X2	1 Voltage control relay Type: S 172 156 / 400V Art. No: TE10495	=PSU21+S01-11U1
2 Fan Type: PF6.000/400V Art. No: TE10353	=PSU21+S01-11M1/M2	2 Fan outlet 350g/m ² Type: PFA 6.000 Art. No: TE10025	
3 Resistors Type: GFF 27/90 S 100R/80W Art. No: TE10728	=PSU21+S01-12R1...3	1 Potentiometer Type: 5KΩ/4W Art. No: TE10457	=PSU21+S01-12R4
4 Carbon film resistor 12kΩ/10W/±10%	=PSU21+S01-12R5...8	1 DC choke Type: EDUG Art. No: TE10076	=PSU21+S01-12L1
1 Rectifier Type: SKD60/12 Art. No: TE10145	=PSU21+S01-12G1	2 Capacitors Type: MKP -G 1000/450/C Art. No: TE10202	=PSU21+S01-12C1...2
1 IGBT module Type: SKM 200 GB122D Art. No: TE10157	=PSU21+S01-12V1	1 Inverter electronics Type: TE 500/R2 Art. No: TE10107	=PSU21+S01-12A1
1 IGBT monitor Type: SEM 2 Art. No: TE10162	=PSU21+S01-12A3	1 Measuring electronics Type: TE 501/R5 Art. No: TE10099	=PSU21+S01-12A2
1 Wattmeter Type: RQ96M 0...10V Art. No: TE10701	=PSU21+S01-12P1	1 Mitsubishi PLC Type: FX-48 MR-DS Art. No: TE10628	=PSU21+S01-14D1
1 HV transformer Type: Bauleistung 24kVA Art. No: TE10665	=PSU21+S01-13T1	1 HV transformer Type: Bauleistung 1VA Art. No: TE10659	=PSU21+G21-13T2
1 Cubicle temp. sensor Type: SK3112/24VDC Art. No: TE10548	=PSU21+S01-16B1	1 Temperature sensor Type: KO 560 080 +/-5% Art. No: TE10643	=PSU21+S01-16B2

	3 Illuminated push button =PSU21+S01-17S1/S3/S4	1 Illuminated push button =PSU21+S01-17S2 Type: 722-211.011 Art. No: TE10339		
				Type: 722-212.011 Art. No: TE10338
13	Signal lamps =PSU21+S01-22H1...5 Type: 722-040.001 Art. No: TE10369	-23H1...8	2	Control switch (L/R) =PSU21+S01-17S5/6 Type: CG8 A221-600 FT2/G221 Art. No: TE10515
2	Control switch (A/O) =PSU21+S01-17S7/8 Type: CG8 A221-600 FT2/G221 Art. No: TE10514		1	Auxiliary relay =PSU21+S01-20K1 Type: KC 40E 24VDC Art. No: TE10554
11	Relay 11 pole 3U =PSU21+S01-19K1...9 Type: FINDER 60 6013.9024.0040 Art. No: TE13503		1	Service hour counter =PSU21+S01-16P1 Type: 24V/630.2 Art. No: TE10031
1	Emergency stop =PSU21+S01-20S1 Type: 2 OE Art. No: TE10440		1	Door switch =PSU21+G21-20S2 Type: TPS1 Art. No: TE10516
1	O2 concentration monitor =PSU21+S01-16B1 Type: OZAT CHECK MK I Art. No: 1001153	=PSU21+S21-QSH201	1	Fan =PSU21+S01-20M1 Type: W2G 130-AA-03-01 Art. No: TE10357

14.2 Mechanical material

1	Ozone generator module =PSU21+G21-G21 Type: ZM 170-3 A Art. No: 1001559	=PSU21+G21-13E1...	1	Temperature monitor =PSU21+G21-TSH201 Type: KO 220 045+/-03 Art. No: 1001107	=PSU21+G21-15B1..
2	Solenoid valve =PSU21+G21-FV201/203 Type: CD 1010 Art. No: 1001294	=PSU21+G21-21Y1/Y2	1	O2-Sensor =PSU21+G21-QE201 Type: KE-25 Art. No: 1001118	=PSU21+G21-21B2
1	Gas pressure display =PSU21+G21-PI201 Type: PM 02.02 Art. No: 1001289		1	Control valve =PSU21+G21-HCV201 Type: 316-G HR Art. No: 1001291	
1	Gas flow display =PSU21+G21-FI201 Type: 10A1197A Art. No: 1001508		1	Pressure control valve =PSU21+G21-PCV201 Type: C1 811/10/1 Art. No: 1001293	
1	Pressure relief valve =PSU21+G21-PV201 Type: HV 6512L4B NI Art. No: 1001105		1	Temperature display =PSU21+G21-TI203 Type: TM 73.03 Art. No: 1001290	
1	Temperature display =PSU21+G21-TI202 Type: TM 73.03 Art. No: 1001395		1	Flow display with reed.. =PSU21+G21-FISL202 Type: VKP-80-Rg Art. No: 1001297	=PSU21+G21-15B13
1	Control valve =PSU21+G21-HCV202 Type: 5144 1" Art. No: 1001296		1	Solenoid valve =PSU21+G21-FV202 Type: CD 1020 Art. No: 1001507	=PSU21+G21-21Y3

No reserve all rights in this document are in the information con-
 sidered in this document. Reproduction or use of this document
 without express authority is strictly prohibited.
 © 2001/02/03 OZONIA

14.3 Other materials

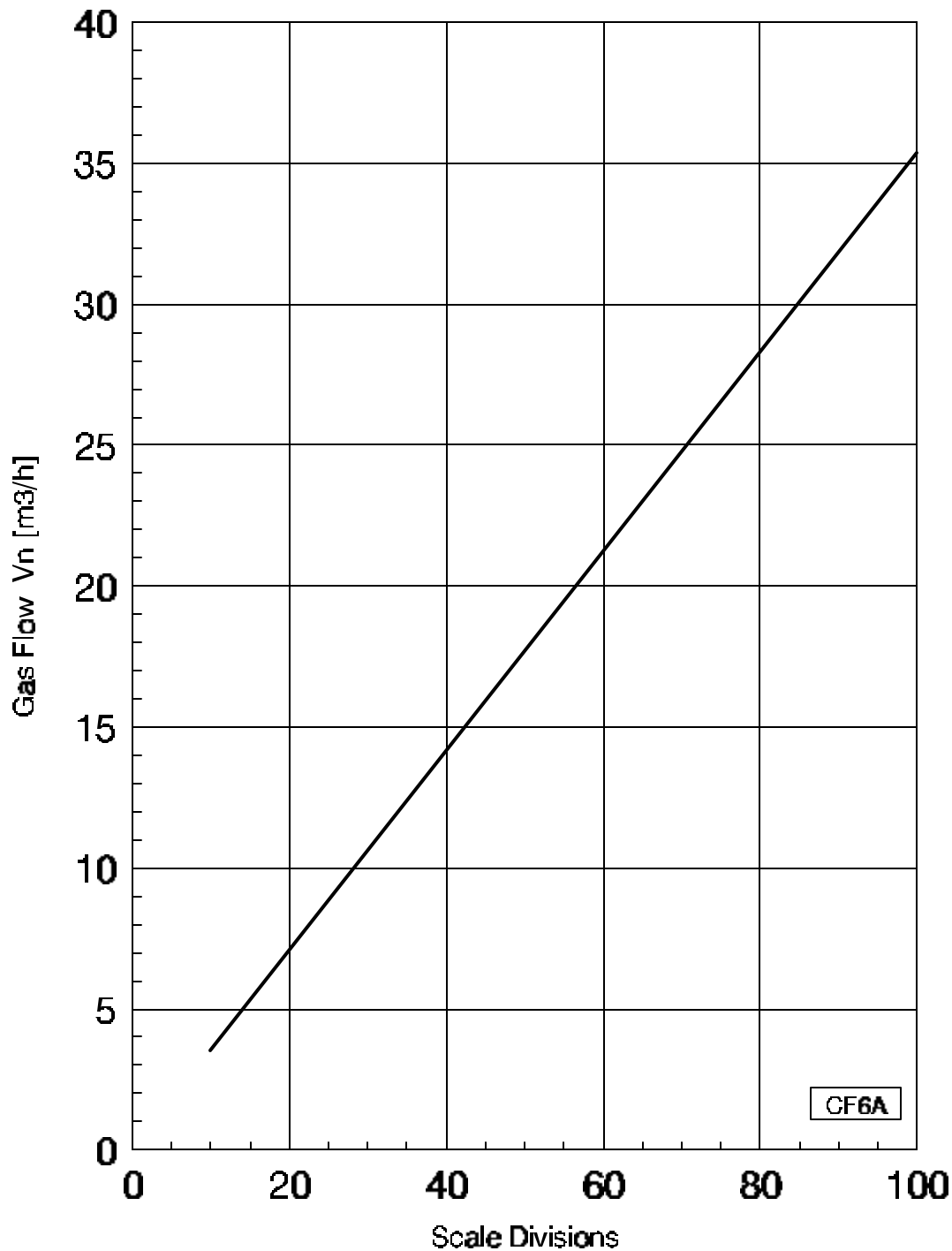
- | | |
|--|---|
| <p>1 Hose PU 12x2 (length as required)
for cooling media
Art. No: 1001619</p> <p>1 Hose 10x1 PTFE (length as required)
for oxygen and ozone
Art. No: 1001119</p> <p>13 Lampe 28V
Type: 731-963.2
Art. No: TE10146</p> <p>1 Discharging device
according drawing 18715
Art. No: TE10114</p> <p>1 Fusible cut-out 6.3x32
Type: F10A quick / 250V
Art. No: TE10613</p> <p>6 PTFE-flat gasket
for pipe union 1"
Art. No: 1001648</p> <p>4 PTFE-flat gasket
for pipe union $\frac{3}{4}$"
Art. No: 1001647</p> | <p>1 Hose 8x1 PTFE (length as required)
for oxygen
Art. No: 1001131</p> <p>1 Teflon band
Type: SO 841-9
Art. No: 1001148</p> <p>3 Fuses 14x51
Type: 6.621 CP URGB 14.51/32
Art. No: TE10600</p> <p>4 Filter mats
Type: PF 6.000 / 350g/m²</p> <p>1 Set connections
sundry connetion material
Art. No: 1001640</p> <p>1 Viewing window
for FI 201 $\frac{3}{4}$ 1"
Art. No: 1001560</p> <p>8 HV-cover
Art. No: 1001112</p> |
|--|---|

15. Appendix "Gas flow diagram"

Gas flow meter

for oxygen

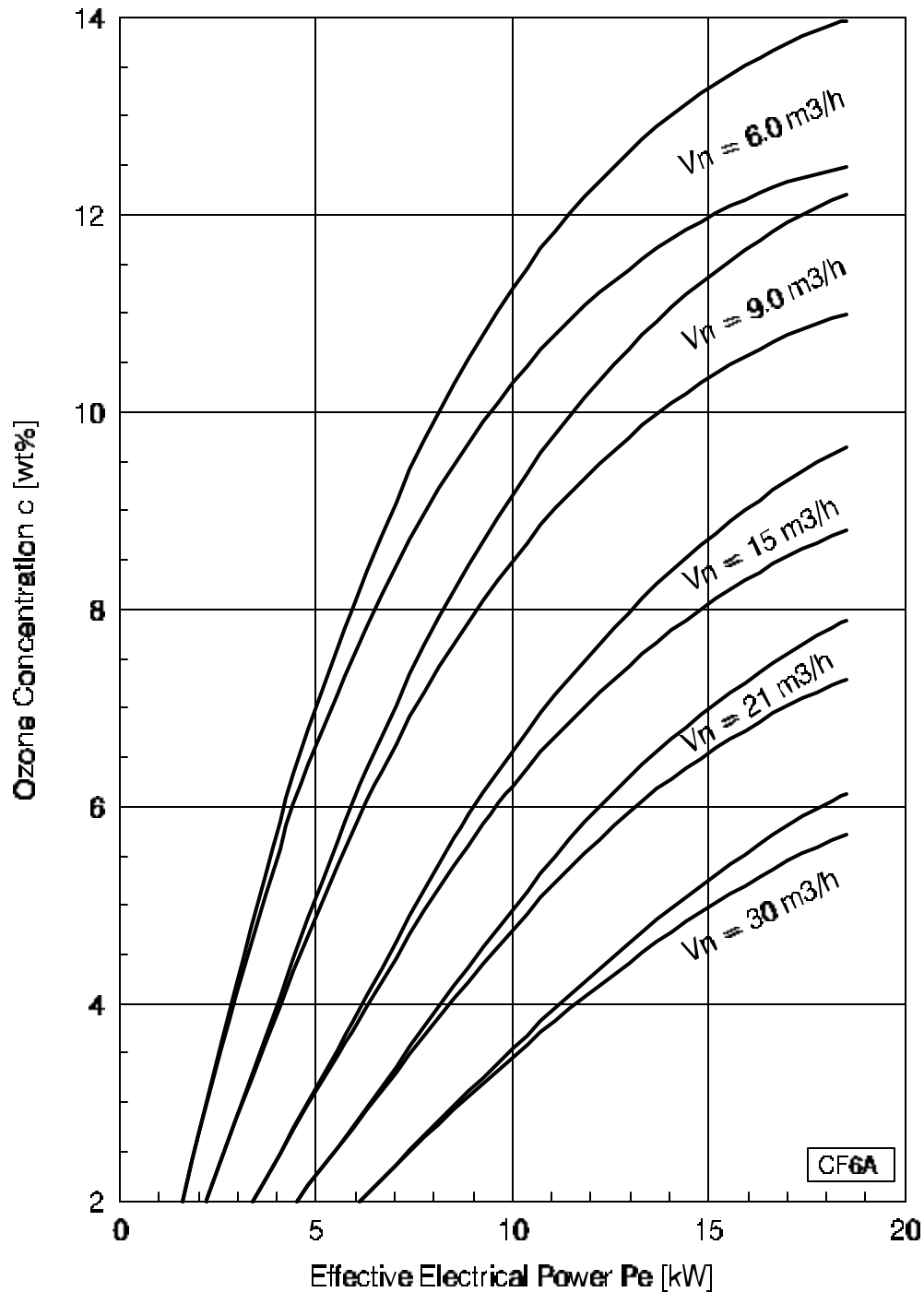
$t = 20\text{ °C}$ and $p = 1\text{ bar g}$ ($p_{\text{atm.}} = 1013\text{ mbar}$)



No respave all rights in this document and in the information contained therein in the name of Ozonia. Reproduction or use of this document without express authority is strictly prohibited.
Copyright © 2000

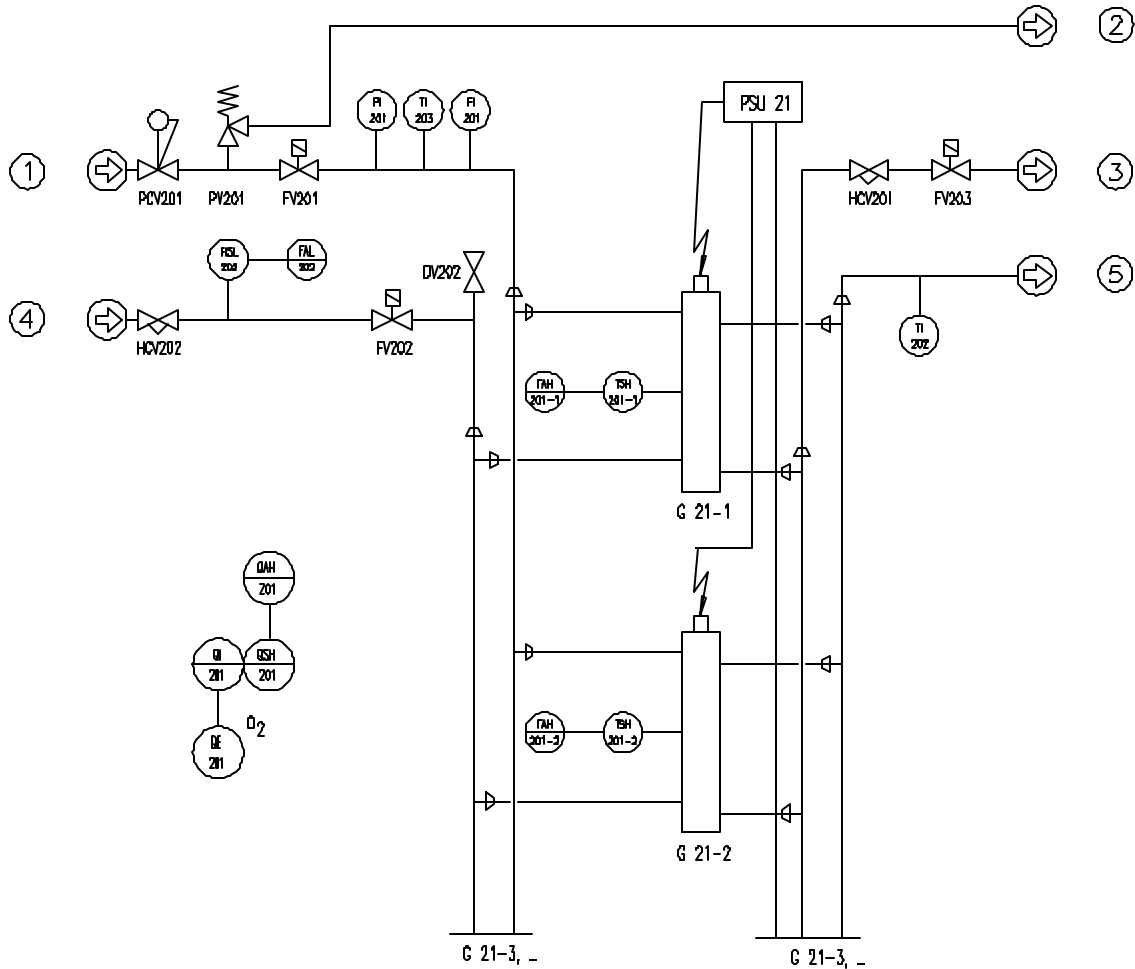
16. Appendix "Setting curves for OZAT CF5"

Ozone concentration dependent on the electrical real power
specified for Oxygen with approx. 2 % nitrogen
 $t = 20\text{ °C}$ and $p = 1\text{ bar g}$ ($p_{\text{atm.}} = 1013\text{ mbar}$)



We reserve all rights in this document and in the information contained therein. Reproduction, use or disclosure in form, print or digital, without express authority is strictly prohibited. ©2008 OZONIA

17. Appendix "P&I diagram"



Caption:

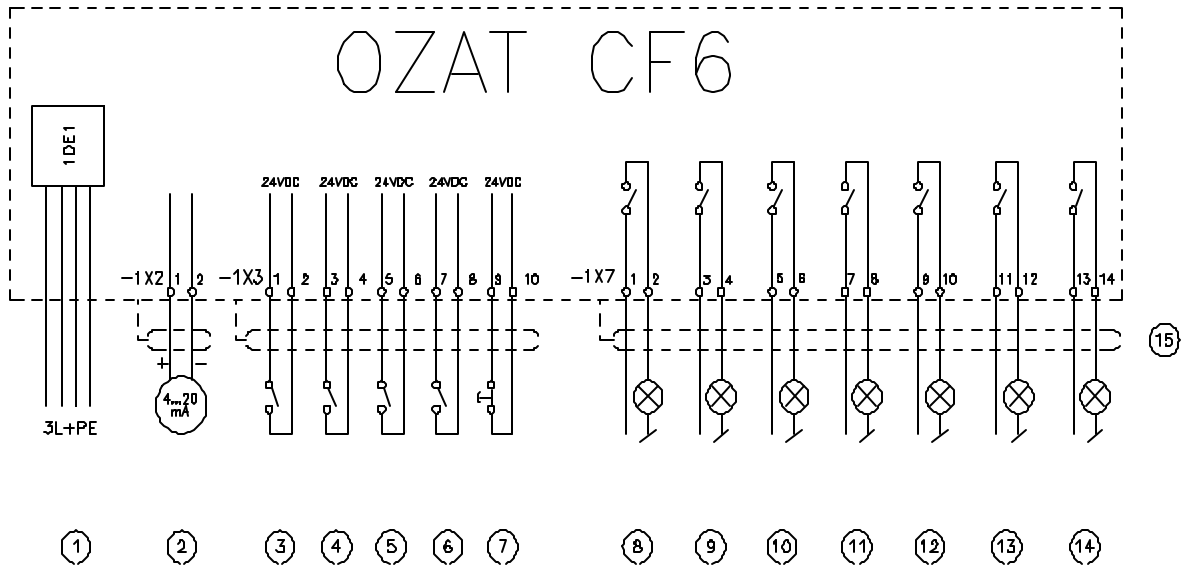
1	Feed gas INLET	TSH201	Temperature monitor switch
2	Pressure relief valve OUTLET	TAH201	Temperature alarm, high
3	Ozone gas OUTLET	FI201	Gas flow meter
4	Cooling media INLET	FISL202	Cooling water flow display, switch
5	Cooling media OUTLET	FAL202	Cooling water flow alarm low
		G21	Ozone generator
PCV201	Pressure control valve	HCV201	Hand operated control valve (gas)
PV201	Pressure relief valve	HCV202	Hand operated control valve (cooling water)
FV201	Gas valvel	DV202	Cooling water drain valve
FV202	Cooling water valve	PSU21	Electrical power supply
FV203	Ozone gas valve	QE201	Oxygen sensor
PI201	Gas pressure gauge	QI201	Oxygen monitoring device
TI202	Cooling water temperature display	QSH201	Oxygen monitoring device, concentration
		QAH201	Oxygen monitoring device, alarm

No reserve all rights in this document are in the information contained in this document. Reproduction, use, or disclosure in form, print, or digital, without express authority is strictly prohibited.

T1203 Gas temperature display

No reserve all rights in this document and in the information contained therein. Reproduction, use or disclosure in their own or other person's business without express written consent is strictly prohibited.

18. Appendix "Electrical connection circuit"

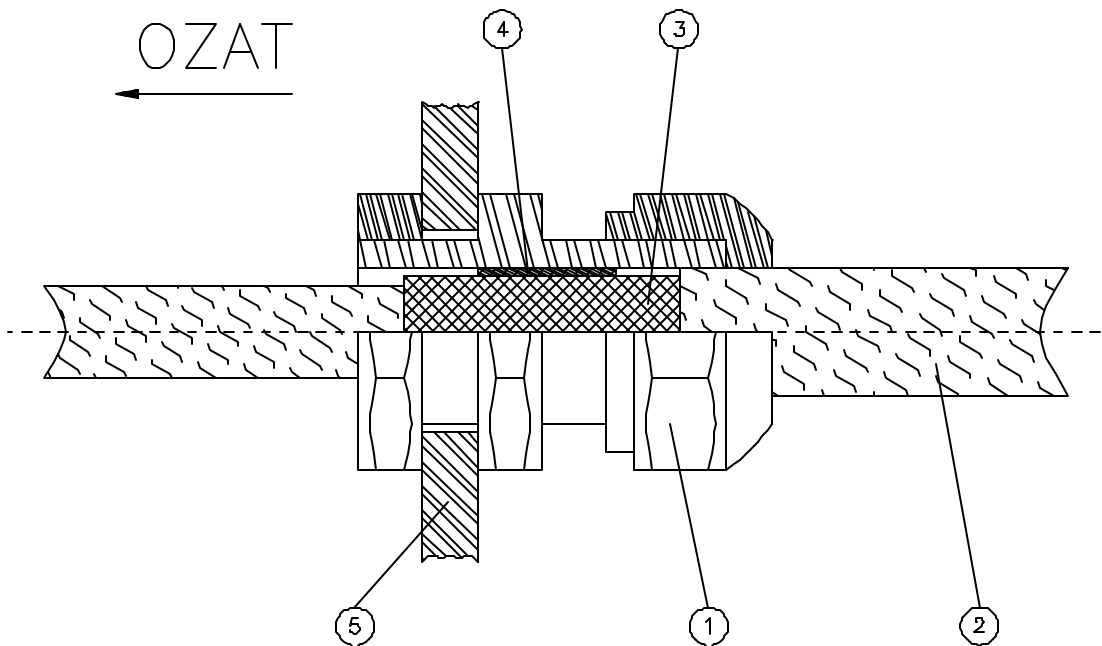


Caption:

1	-10E1	3- phase mains connection to the interference suppr. filter (phase sequence L1/L2/L3)
2	-1X2	External set-value 4...20 mA (= 0...100 %)
3	-1X3	External on command (contact closed)
4	-1X3	External reset command (contact closed)
5	-1X3	Gas valves open (contact closed)
6	-1X3	Cooling water valve open (contact closed)
7	-1X3	Emergency stop (contact open)
8	-1X3	External remote enable (contact closed)
9	-1X7	Supply ready (contact closed)
10	-1X7	Supply on (contact closed)
11	-1X7	Gas valves open (contact closed)
12	-1X7	Cooling water valve open (contact closed)
13	-1X7	Fault (collective alarm) (contact closed)
14	-1X7	Control location remote (contact closed)
15	-1X7	Set-value remote (contact closed)
16		Screened cable

No response all rights in this document are in the information con-
 sidered in this document. Reproduction or use in this document is
 without express authority is strictly prohibited.
 Copyright © 2000

19. Appendix "EMP cable fittings"

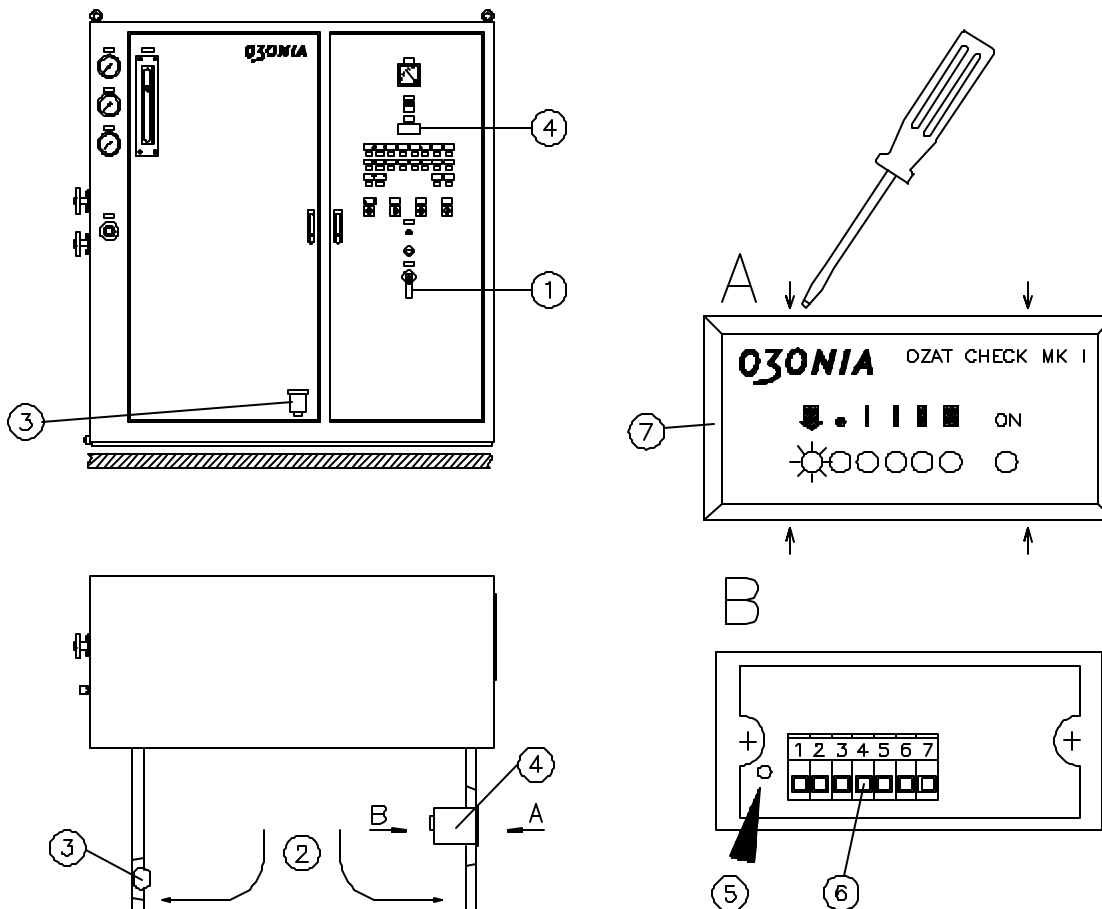


Caption:

- 1 EMP cable gland (**E**lectro-**M**agnetic-**P**ulse)
- 2 Screened cable
- 3 Screen proper
- 4 Screen contact surface
- 5 Gland plate (blank aluminium)

No response all rights in this document are in the information con-
 sidered in this document. Reproduction or use of this document in any form, partial or
 without express authority is strictly prohibited.
 Copyright © 2000

20. Appendix "Layout of the oxygen warning device"



Caption:

- | | | |
|---|------|------------------------------------|
| 1 | 10Q1 | Switch off mains switch |
| 2 | | Both doors completely open |
| 3 | 21B2 | Oxygen sensor |
| 4 | 21B1 | Evaluation unit OZAT CHECK MK I |
| 5 | 21B1 | Calibration knob |
| 6 | | plug-in terminals |
| 7 | | fixation frame with snap locks () |

No response all rights in this document are in the information contained in this document. Reproduction or use of this document without express authority is strictly prohibited.

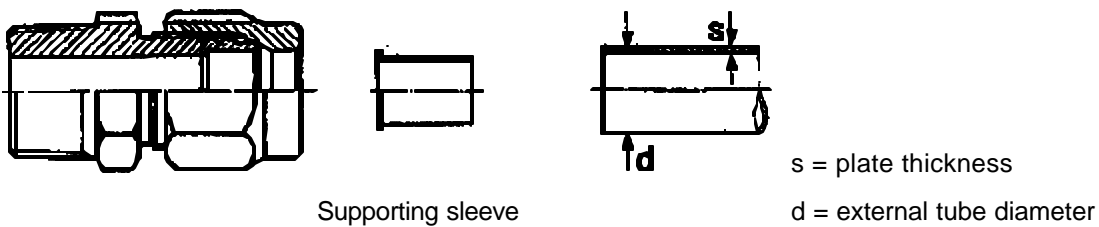
21. Appendix “Serto installation instructions”

GENERAL:

- PIPING:
Piping with a clean smooth surface and external diameters within $\pm 0,1$ mm is to be used.
- ROTATABLE CLAMPING RING:
It has no effect on the quality of the connection if the clamping ring can be turned on the tube or the tube in the connection nut after assembly.
- INSTALLATION SUPPORTS FOR PRE-ASSEMBLY:
SO 56000, stainless steel treated for Inox and brass M-programme SO 6000, CrNi-Steel hardened for steel.

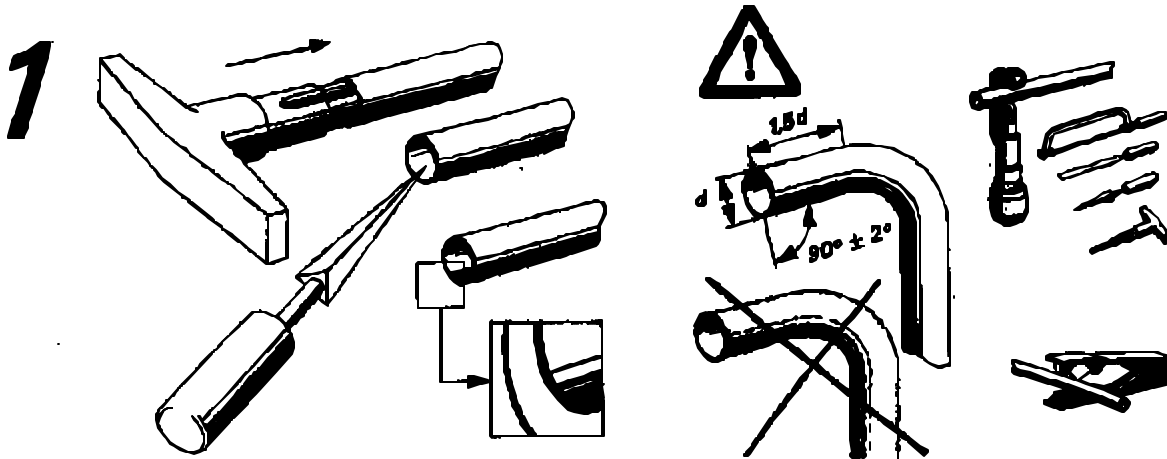
EXTENT OF DELIVERY:

- SERTO cable fittings are delivered ready for assembly:
Base part / connection nut / clamping ring



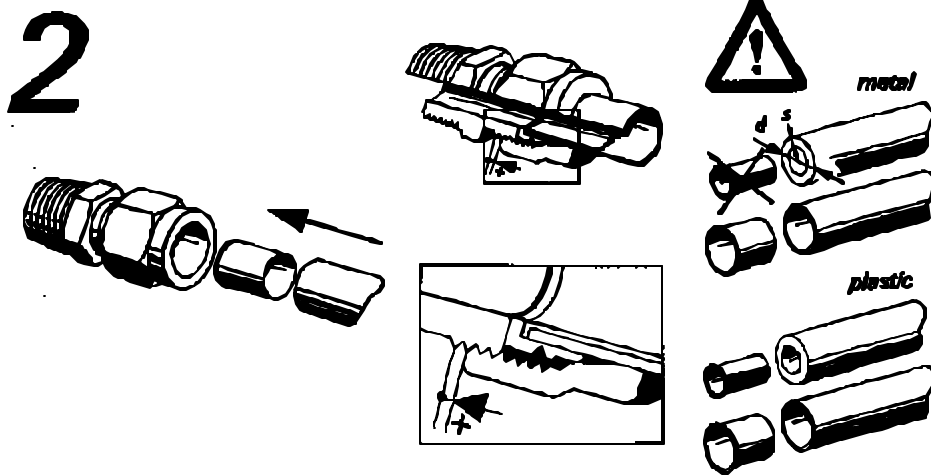
1) PREPARATION:

- Cut the pipe at right angles and remove burrs.
The pipe end must be straight for a length of about $1.5 d$, and have an undamaged surface. The fitting for the oxygen and ozone/Oxygen circulation must be free from oil and grease. For optimisation and a better assembly, an installation grease approved for use with oxygen can be used (e.g., Oxigenoex FF250 / Klüber company)



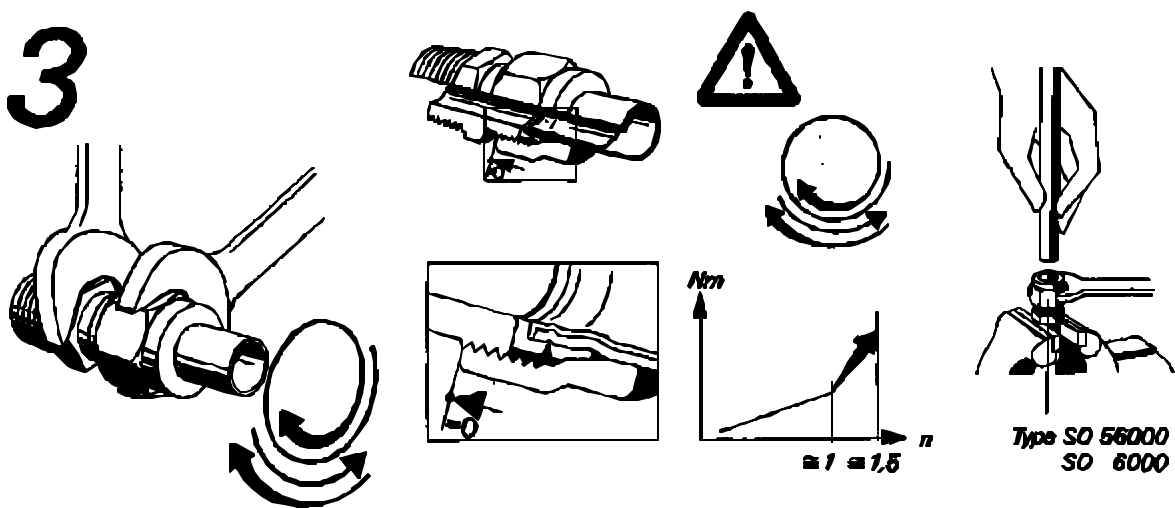
2) REINFORCE AND INSERT PIPE:

- The supporting sleeve is foreseen for thin-walled and/or soft piping, as well as for plastic pipes.
- Copper pipes: d = 10 mm & s 1,0 mm
 d 12 mm & s 1,5 mm
- Inox pipes: d 6 mm & s 0,5 mm
 d 10 mm & s 0,8 mm
 d 12 mm & s 1,0 mm
- Ensure alignment of the pipe and the fitting
 - Insert up to the stop.



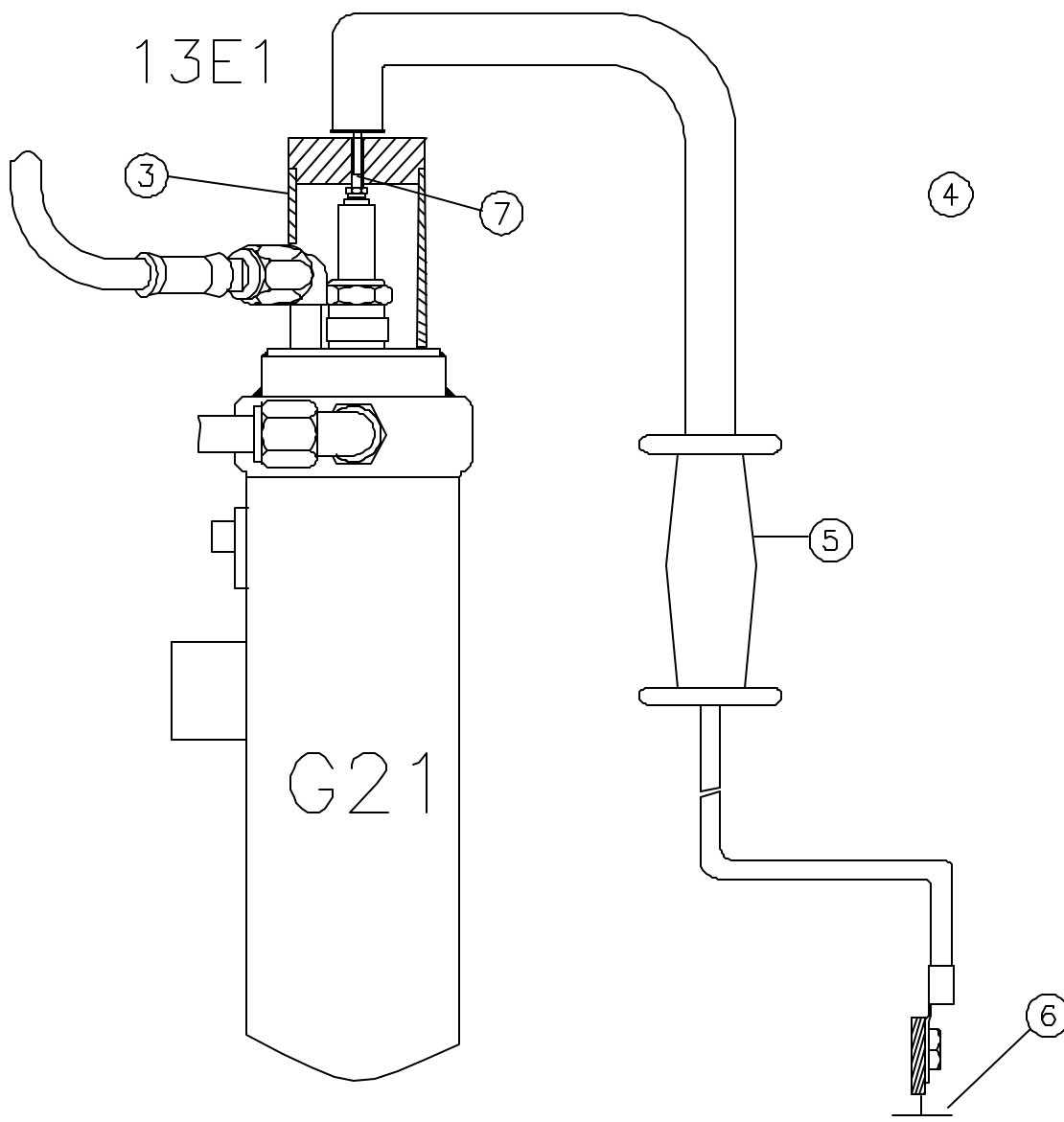
3) DEFORMATION, RELEASING TENSION, CHECKING:

- Tighten the fitting with a spanner until a strong resistance is encountered.
 - Slightly loosen the nut, to relieve the piping. For the definitive installation, tighten until resistance is felt.
 - Check the deformation.
- If the nut covers the connection thread, then the pipe and the clamping ring are correctly deformed.



No reserve all rights in this document and in the information contained therein. Reproduction or use in translation without express authority is strictly prohibited. © 2001/02/03

22. Appendix “Discharging the ozone generator module”



Caption:

- | | | |
|---|------|---|
| 1 | G21 | Ozone generator module |
| 2 | 13E1 | Electrical connection |
| 3 | | Connection cover |
| 4 | | Discharging device |
| 5 | | Isolated handle |
| 6 | | Make sure of earth connection (earth bar) |
| 7 | | Metal-to-metal contact |

No reserve all rights in this document and in the information contained therein. Reproduction or use in whatsoever form, partial or full, without express authority is strictly prohibited. © 2001 OZONIA

23. Appendix “Standards, regulations and guidelines”

General:

- EN 292 Machine guidelines
- EN 60204-1 Safety of Machines (European standard)
- prEN 1278 Ozone

Oxygen installations:

The regulations valid for the assembly and operation of oxygen installations must be complied with. Only the following regulations are referred to in this document:

- SVS 211.1 Guidelines for fixed storage systems for deep frozen, liquid, non-inflammable gases by the user.
- SVS 531.1 Guidelines for oxygen lines and their fittings for operating pressures up to 40 bar.
- IGC 04/93 Fire hazards in oxygen and concentrated oxygen atmospheres.
- VGB 62 Accident prevention regulation No. 28. Oxygen employer’s liability insurance association of the chemical industry. (1.4.69 / Germany).

Ozone installations:

The regulations valid for the assembly and operation of ozone installations must be complied with. Only the following regulations are referred to in this document:

- SBA-No. 143 Swiss sheets for Safety at Work. Accident prevention with protection of health at water treatment.
- DIN 19627 Ozone generation installations for water treatment.
- ZH 1/474 Guidelines for the use of ozone for water treatment.
- DVGW W225 Ozone in water treatment ; Terms used, reactions, application possibilities.
- FIGAWA
 - ◊ Nos. 12 & 13 Ozone technology in water treatment.
 - ◊ No. 6 Information sheet regarding the handling of ozone and ozone generating systems in the water treatment.

The above standards, regulations and guidelines do not form an integral part of this service manual and should be procured separately by the owner or user. In each and every case local regulations must be adhered to.

No reserve all rights in this document are in the information contained in this document. Reproduction or use of this document without express authority is strictly prohibited. © 2007/08/08 OZONIA