OPERATING INSTRUCTIONS

OZAT® OZONE GENERATOR

TYPE CFS-14

INSTRUCTION:

These operating instructions contain important safety instructions. They must be carefully read by both the owner and the user before commissioning.

Supplier: **Ozonia Ltd**
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Aftersales service: **T +41 (1) 801 86 63**

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 surrounding can be damaged.

INFORMATION:

Information and instructions that must also be followed.

IMPORTANT:

Measures recommended by Ozonia.

PROHIBITION:

No smoking or naked flames.

List of contents

1. CE certificate of conformity

EG-KONFORMITÄTSERKLÄRUNG
CE CERTIFICATE OF CONFORMITY
DECLARATION DE CONFORMITES AUX NORMES CE

im Sinne der EG-Richtlinie
in accordance with CE guidelines
selon les directives de la CE

Maschinen 98/37/EG Machines 98/37/CE Machines 98/37/CEE	Niederspannung 73/23/EWG Low voltage 73/23/EWG Basse tension 73/23/CEE	Elektromagnetische Verträglichkeit 89/336/EWG Electromagnetic compatibility 89/336//EWG Compatibilité électromagnétique 89/336/CEE

Die Bauart des Gerätes:
Type of apparatus:
Type de l'appareil:

Fabrikat	:	OZAT® Kompakt-Ozongenerator	Typenbezeichnung	:	CFS-14
Article	:	OZAT® compact ozone generator	Type	:	CFS-14
Fabrication	:	OZAT® générateur compact d'ozone	Désignation	:	CFS-14

Wurde entwickelt, konstruiert und gefertigt in Übereinstimmung mit den o.g. EG-Richtlinien, in alleiniger Verantwortung von:
The above has been developed, designed and manufactured in accordance with refered to EU guidelines by:
A été conçu, construit et fabriqué en accord avec les directives de la CE sous la propre responsabilité de:

Firma	:	Ozonia AG, Schweiz
Company	:	Ozonia Ltd, Switzerland
Raison sociale	:	Ozonia SA, Suisse

Folgende harmonisierte Normen wurden angewandt:
The following harmonised standards were applied:
Les normes harmonisées suivantes on été appliquées:

DIN EN ISO 12100-1,2	Sicherheit von Maschinen; Teil 1 und Teil 2 Safety of machinery; Part 1 and part 2 Sécurité des machines; Partie 1 et partie 2
EN 60204-1	Sicherheit von Maschinen - Elektrische Ausrüstung von Maschinen; Teil 1 Safety of machinery - Electrical equipment of machinery; Part 1 Sécurité des machines - équipements électriques des machines; Partie 1
IEC 60664-1	Isolationskoordination für elektrische Betriebsmittel in Niederspannungsanlagen; Teil 1 Insulation coordination for equipment within low-voltage systems; Part 1 Coordination de l'isolement des matériels dans les systèmes (réseaux) à basse tension; Partie 1
EN 61000-6-4	Elektromagnetische Verträglichkeit (EMV), Fachgrundnorm Störaussendung; Teil 2: Industriebereich Electromagnetic compatibility (EMC), Generic emission standard; Part 2: Industrial enviroment Compatibilité électromagnétique (CEM), Norme générique émission; Partie 2: Environnement industriel
EN 55011	Grenzwerte und Messverfahren für Funkstörungen von industriellen, wissenschaftlichen und medizinischen Hochfrequenzgeräten Limits and methods of measurement of radio disturbance characteristics of industrial, scientific and medical radiofrequency equipment Limites et méthodes de mesure des caractéristiques de perturbations radioélectriques des appareils industriels, scientifiques et médicaux à fréquence radioélectrique
EN 61000-6-2	Elektromagnetische Verträglichkeit (EMV), Fachgrundnorm Störfestigkeit; Teil 2: Industriebereich Electromagnetic compatibility (EMC), Generic immunity standard; Part 2: Industrial enviroment Compatibilité électromagnetique (CEM), Norme générique immunité; Partie 2: Environnement industriel
EN 61000-4-2	EMV; Teil 4: Prüf- und Messverfahren / Hauptabschnitt 2: Störfestigkeit gegen die Entladung statischer Elektrizität EMC; Part 4: Testing and measurement techniques / Section 2: Electrostatic discharge immunity test CEM; Partie 4: Techniques d'essai et de mesure / Section 2: Essais d'immunité aux décharges électrostatiques
EN 61000-4-4	EMV; Teil 4: Prüf- und Messver./Hauptabschnitt 4: Störfestigkeit gegen schnelle transiente elektrische Störgrössen/Burst EMC; Part 4: Testing and measurement techniques/Section 4: Electrical fast transient/burst immunity test CEM; Partie 4: Techniques d'essai et de mesure/Section 4: Essais d'immunité transitoires électriques rapides en salves

Eine Technische Dokumentation ist vollständig vorhanden. Die zum Gerät gehörende Betriebsanleitung liegt vor:
Full technical documentation is available. Service manuals for the equipment are available:
Une documentation technique complète est disponible. Le manuel d'opération relatif à l'appareil est obtenable en:

Originalfassung	:	deutsch	In den Sprachen	:	englisch
Original text	:	German	In the translation	:	English
Version originale	:	allemand	Traduction	:	anglais

Ort, Datum	:	Dübendorf, 03.März 2006
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2. General

Please ensure that the operating instructions are carefully read by all relevant pesons 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 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 should 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 for operating and maintenance personnel.

3. Product description

The OZAT® ozone generator is designed to generate air or oxygen ozone gas mixture suitable for use in all types of processes, for example:

- Drinking water
- Swimming pool water
- Waste water
- Aquaculture
- Disinfection
- Oxidation processes in 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 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 confined space nor to atmosphere.

PROHIBITION:

When oxygen is used as the feedgas, the relevant safety and security measures must also be complied with (Chapter 4).

3.1 Technical data

3.1.1 Cabinet dimensions of the OZAT® ozone generator

Width	1300	mm
Depth	670	mm
Height	1450	mm
Weight	Approx. 420	kg

3.1.2 Nominal data of the OZAT® ozone generator

Feedgas	Gas	Air	O_2	
	Nominal ozon concentration	3	6	wt%
	Nominal feedgas pressure	2.5	1.5	bar g
	Nominal production	490	980	g O_3/h
	Oxygen from PSA: 92.4wt% O_2 / 2.6wt% N_2 / 5.0wt% Ar [2)]		11.4	Nm^3/h
	Air requirement	12.7		Nm^3/h
Cooling medium	Water	1.1		m^3/h
	Nominal cooling temperature	12		°C
	Cw temperature rise	5		°C
Grid	Line voltage, single phase	3x 400 / 480 [1)]		V_{AC}
	Line frequency	50 / 60		Hz
	Line current	12.3		A_{AC}
	Mains circuit breaker	15		A
	Line power factor	0.99		cosφ
	Line power consumption	8.6		kW
	DC-Power measurement Pe at display	7560		W_{DC}

1) For 480V adjust transformer tapping on -10T1
Nominal altitude 1000m.a.s.l.

2) For feedgas Oxygen change tapping on HV-Transformer to -5%

INFORMATION:

The connection to the mains power is made using a plug and socket (L1/L2/L3/PE). The line fuse must be sufficient to meet the local regulations and our requirements.

3.1.3 Operational data of the OZAT® ozone generator

Feedgas	Gas	Air	O_2	
	LOX: [3] Oxygen purity Nitrogen addition		90-99.8 2.3	wt%
	PSA: [3] Oxygen purity resulting Nitrogen content resulting Argon content		90…93 5.1…1.9 4.9…5.1	wt%
	Dew point at 1 bar abs.	≤-65 [1]		°C
	Oil content	≤0.1		ppm
	Contamination: particle size	≤1		µm
	Hydrocarbons	<20		ppm
	Inlet pressure	3…8	3…8	bar g
	Operating pressure	2.5 $^{\pm 0.1}$	1.5 $^{\pm 0.1}$	bar g
	Outlet pressure	<2.0	<1.0	bar g
	Temperature	5...40		°C
	Gas flow, adjustable	1.86 ... 18.6	1.47 ... 14.7	Nm^3/h
	Maximum mass flow	24	21.2	
	Adjust. range of the ozone production	10...100		%
	Ozone concentration, adjustable	0…5	0...14	wt%
Cooling medium	Cooling medium	Water		
	Chloride content	≤50		mg/l
	Inlet temperature	4...30		°C
	Operational pressure	2...6		bar g
Mains	Line voltage, single phase	3x 400 / 480 ±10% [2]		V_{AC}
	Line frequency	48…63		Hz

1) Dryer than -65°C

2) For 480V adjust transformer tapping on -10T1

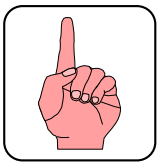
3) For feedgas Oxygen change tapping on HV-Transformer to -5%

3.1.4 Environmental conditions:

Ambient temperature for operation	5...40 (24 h average = 35 °C)	°C
Ambient temperature for transport and storage	-25...+55 (70 °C total max. 24 h)	°C
Altitude [1)]	0 - 3000	m.a.s.l.
Annual average air humidity - for 60 continuous days a year - occasionally	≤65 75 85	% % %
Aggressive environment	absolutely to be avoided	
Protection class for installation	IP 42	
Vibration/Shock	Installation in a vibration-free environment	
Sound pressure level (1 meter)	≤80	dB(A)
Heat dissipation to the environment	0 to 2000	W

1) Note Above 1000m a.s.l., electrical power reduction: 10% per 1000m

3.1.5 Appendixes to be observed for operation



For the adjustment of the gas flow and the ozone concentration use the follow appendixes:

Feedgas	Air	O_2	
Gas flow diagrams	16	18	Appendix
Setting curves	17	19	Appendix

An example for calculation see in chapter 9.1.1.

3.1.6 Regulation to ensure the product availability

INFORMATION:

The OZAT® ozone generator will reach nominal production only after about 400 hours from first commissioning.

WARNING:

To prevent harm to the OZAT® ozone generator units it is requested to not exceed 80% of electrical loading during the first 100 operating hours.

Feedgas: Air or Oxygen containing gas (with minimum 0.1%N_2)

The feedgas must have an atmospheric dew point drier than –65°C both during purging and during operation. During commissioning recommissioning or starting after a long shutdown period special attention must be given to the fact that dryer units and PSA type oxygen generators require conditioning until the specified dew-point is achieved. During this “conditioning period” the gas coming off the feedgas preparation units must not be passed through the ozone generator.

COOLING MEDIUM: Water

The cooling water should not contain substances that leads to formation of sludge, deposits, crusts or flow blockages in cooling water lines or cooling water jackets.

3.2 Connections

3.2.1 Electrical connections of the OZAT® ozone generator

External set-value signal: 4...20 mA (= 0...100%), (potential free)

- Load impendance: 200 Ω
- Max. permissible current: 25 mA

2 external control inputs: potential free contacts (for 24 V_{DC}, 2 mA)

- Supply ON/OFF
- Gas valves OPEN

4 Signals to master controller: potential free contacts (rating ≤50 $V_{AC/DC}$, 1 A)

- Supply ON
- Gas valves OPEN
- Control REMOTE
- ALARMBITS 0…2

Wiring to apparatus:

- Control signals, signals to master controller (Appendix 22).

3.2.2 Mechanical connections of the OZAT® ozone generator

Feedgas connection:	Bulkhead fitting Serto SO 41521-18 For pipe lines Outer ∅ 18
Ozone gas connection:	Bulkhead fitting Serto SO 51521-18 For pipe lines Outer ∅ 18
Pressure relief Generator out :	Bulkhead fitting Serto SO 51521-18 For pipe lines Outer ∅ 18
Cooling meduim in out:	Bulkhead fitting Serto SO 41521-15 For hose and pipe lines Outer ∅ 18

IMPORTANT:

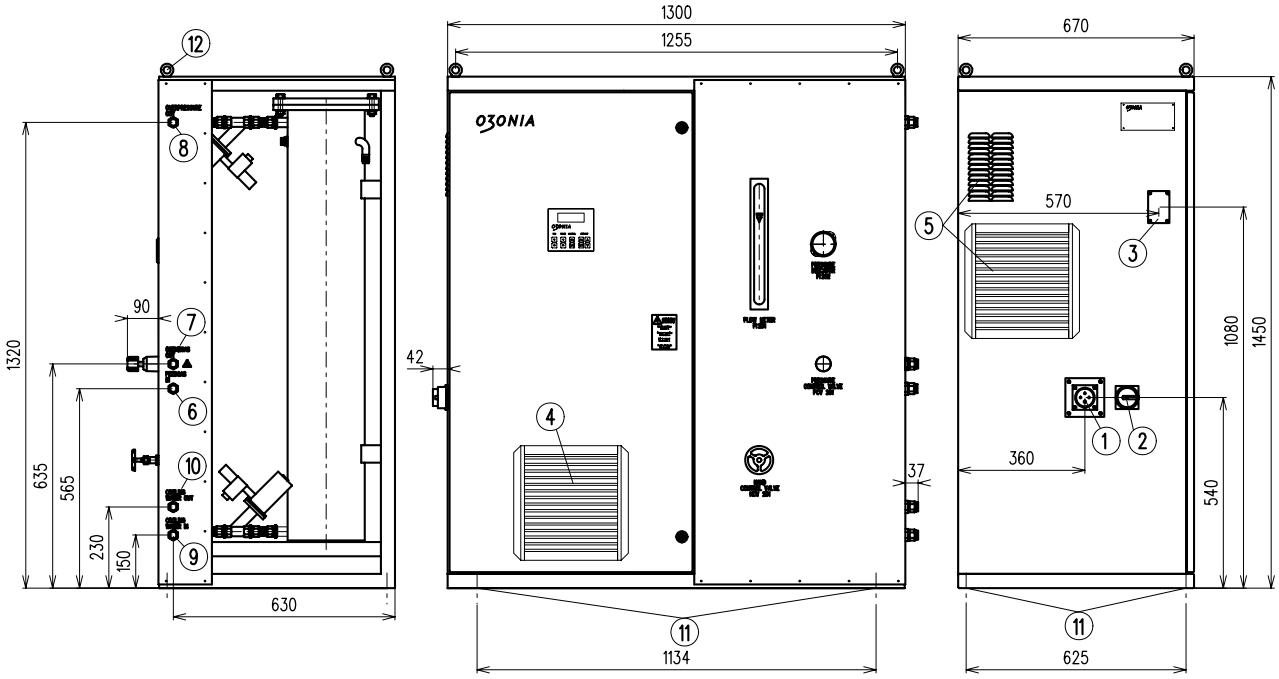
Material recommended for the external connections.

Ozone:	Stainless steel (e.g. 1.4571, 1.4435)
Oxygen:	Copper, brass, stainless steel (e.g. 1.4571, 1.4435)
Air:	Copper, brass, galvanized steel, Stainless steel (e.g. 1.4571, 1.4435)
Water:	Plastic (PVC, PTFE, PVDF, PE, PA), copper, brass, galvanized steel, Stainless steel (e.g. 1.4571, 1.4435)

WARNING:

Pressure, vibration or mechanical hits to the mechanical connections have to be avoided.

3.2.3 Dimensional drawing showing connections



Caption:

1	Mains socket
2	Mains switch
3	Gland plate for control-, external operating- and signal-cable
4	Air inlet
5	Air outlet (minimum clearance 500mm)
6	Feedgas inlet
7	Ozone gas outlet
8	Pressure relief generator outlet
9	Cooling medium inlet
10	Cooling medium outlet
11	Frame mounting
12	Lifting eyes

4. 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 suitable instructed.

For additional information please request the document HQM 101575 (Safety concept and room monitoring) from Ozonia.

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

- Oxygen
- Ozone
- SO_2
- Electricity
- Mechanical dangers
- Air pressure

4.1 Gaseous oxygen (if used as feedgas)

Characteristics:

- Colourless, odourless, tasteless
- Heavier than air (concentration in channels, etc.)
- Supports and accelerates burning (paricularly 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 from oil and grease
- Use only oxygen-suitable 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 (Appendix 25).

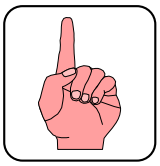
4.2 Ozone

In the OZAT® ozone generator, oxygen (feedgas) 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 an/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 (Appendix 25).

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. 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/m³	Effects
ca. 0.02	Odour awareness threshold in air.
0.1	**TWA value (Time Weighted Average)** [1)] Concentration for an 8 hour working day and a weekly working time of 40 hours.
0.3	Irritation symptoms possible in nose and throat after about 15 minutes exposure time.
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 25)
[1)] Please check, local regulations and guidelines can differ!

4.2.1 Recommended protective measures and precautions

- Observation of the regulations by the owner and/or user
- Compliance with local, national and 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 (Chapter 5.2).
- Have suitable breathing apparatus avalilable 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. Therfore, before opening equipment or piping, flush the equipment thoroughly until no ozone can be detected.

4.3 Electricity

The equipment may **only** be opened if the mains plug is removed. The main plug must **not** be pluged in again as long as the equipment is open.

WARNING:

As the smoothing capacitors can still hold a dangerous charge for up to 3 minutes after switching 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 be removed if the supply to the equipment has been shut off.

WARNING:

Before starting work the ozone generator G211 ensure that the ozone generator has been discharged (Chapter 11.1.2).

4.3.1 Working on live equipment

Working on live equipment is **forbidden**.

4.4 Mechanical dangers

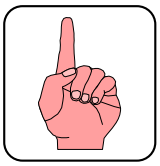
The equipment must be secured to prevent it moving and is to be set-up on a **stable bearing area**.

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 transmit any vibrations.

4.4.1 Periodical maintenance

In order to maintain the highest possible safety, the equipment should be periodically checked according to the instructions in Chapter 11.

4.5 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 from the accident prevention offices are to be observed.

4.5.1 First aid after exposure to ozone

Following exposure to ozone, the following first aid measures must be immediately carried out (Source: ZH 1/474, Appendix 25):

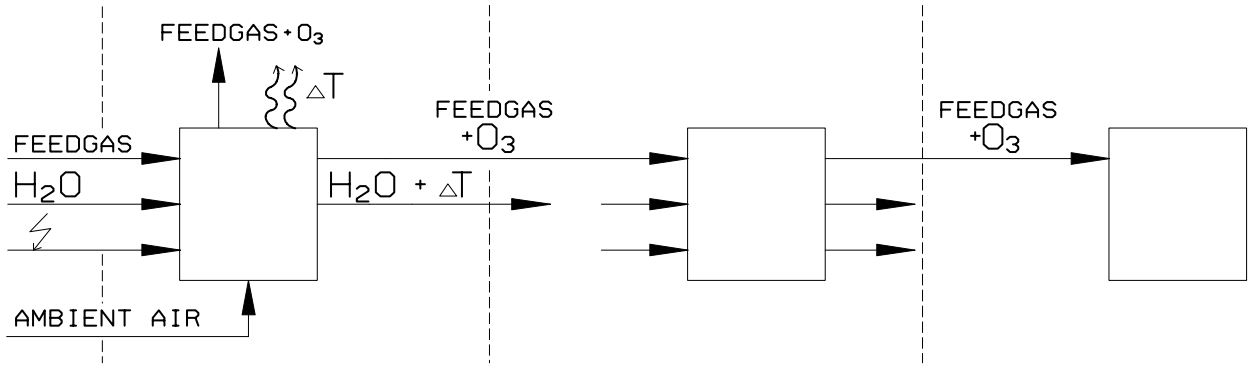
1. Bring the victim into the fresh air
2. Call emergency services, stating ozone exposure
3. Give medical-oxygen
4. Keep victim quiet
5. Check pulse, breathing, consciousness
6. If victim becomes unconscious, place in the prone position
7. If breathing stops, apply artificial respiration

4.6 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 suppliers or their representitives (e.g. Dräger, Lübeck, Germany).

5. Construction and function

5.1 Scope of delivery and interface



	OZAT® ozone generator	**Process**	**Vent ozone destruction**
Operator	Ozonia	Operator	Possibly from Ozonia (**not** dealt with in these operating instructions)

5.1.1 Ozonia delivery

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

5.1.2 Delivery limitations

The operator will supply:

- Feedgas
- Cooling Water
- Electrical energy
- Control signals
- Emergency Stop

} according to operational data (Chapter 3.1.3)

The equipment will produce:

- Feedgas containing ozone as given in the operational data.
- Supplied quantity of water as given in the operational data (outlet temperature 5 °C above inlet temperature).
- Signals and alarms.

Released to the environment:

- Heat loss through convection.
- Feedgas containing ozone when there is a leak.
- Heat loss through forced ventilation.

The owner and/or user must supply or install:

- Adequate room ventilation.
- Ambient monitoring in all areas in which ozone can escape.

5.2 Ambient monitoring for ozone

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

For additional information please request the document HQM 101575 (Safety concept and room monitoring) from Ozonia.

Ambient ozone monitors can be tripped by the following:

- An ozone leak in the operators plant.
- An ozone leak in the ozone generator.

WARNING:

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 part before opening to see if the unit contains a dangerous ozone concentration.

INFORMATION:

Ozonia recommends 1 ozone warning device per 50 m^2 floor area. A detection monitor is to be installed within 1 meter of the lower part of equipment, near floor level.

WARNING:

If the ambient monitors give a warning or fail, the feedgas 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. It is strictly prohibited to operate the unit with bypassed safety equipment.

5.3 Ambient monitoring for oxygen (if used as feedgas)

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

Ambient oxygen monitors can be tripped by the following:

- An oxygen leak in the operators plant.
- An oxygen leak in the ozone generator.

When an oxygen alarm has been given all personnel must be evacuated from the contaminated area into a safe zone, where the oxygen content is lower than 25 vol.-%.

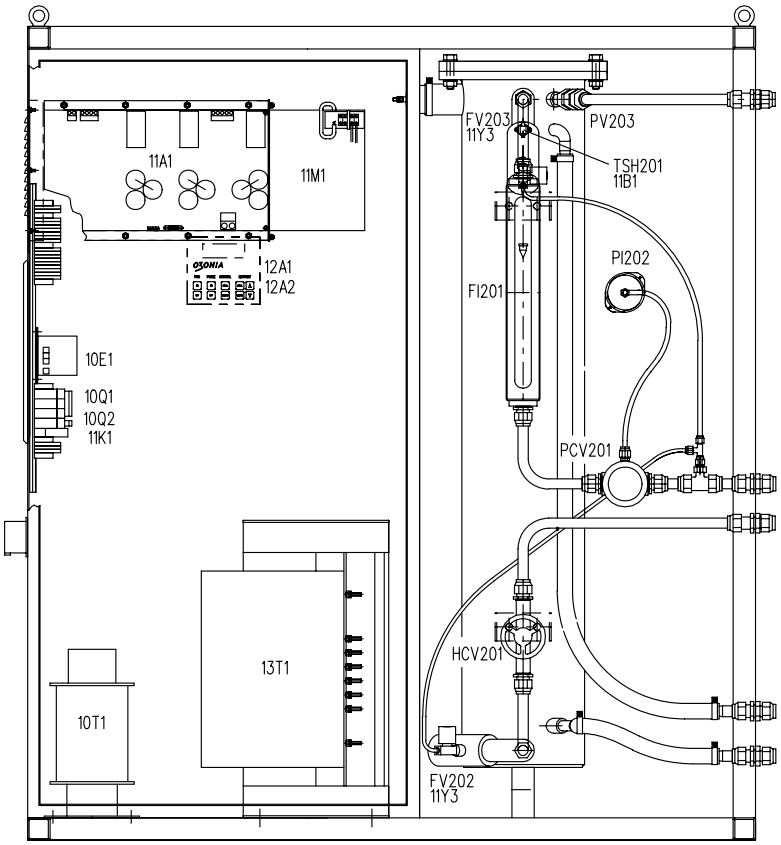
INFORMATION:

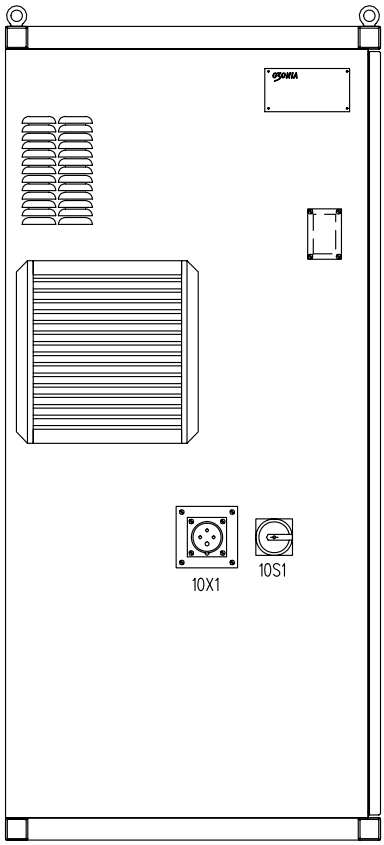
Ozonia recommends 1 oxygen warning device per 50 m^2 floor area. A detection monitor is to be installed within 1 metre of the lower part of equipment, near floor level.

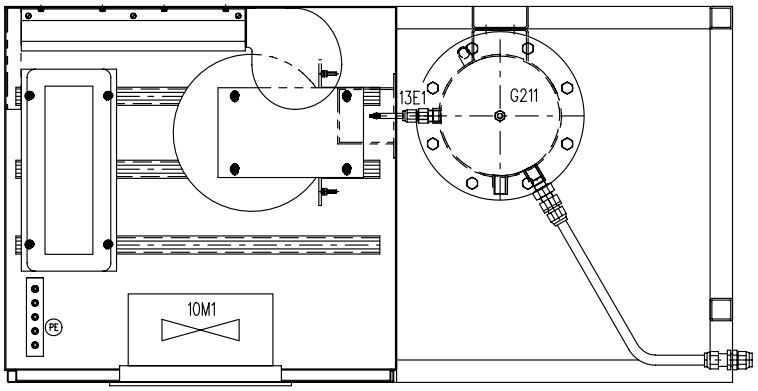
WARNING:

If the ambient monitors give a warning or fail, the feedgas 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 ambient monitors indicate a high oxygen concentration (>25 vol.-%), these rooms must not be entered. It is strictly prohibited to operate the unit with bypassed safety equipment.

6. Layout of the OZAT® ozone generator







Mechanical captions:

PI202	Gas pressure display
PCV201	Pressure control valve
FI201	Gas flow display
HCV201	Hand operated control valve
TSH201	Temperature monitor
FV202/203	Gas valve
PV203	Overpressure rupture disc
G211	Ozone generator

Electrical captions:

10X1	Mains socket
10S1	Mains switch
10Q1	Mains circuit breaker
10Q2	Circuit breaker fan
10E1	Interference suppressor filter
10T1	Mains transformer
10M1	Fan cubicle
11K1	Relais fan
11A1	Control electronics
11M1	Fan control electronics
11B1	Temperature monitor ozone generator
11Y2/Y3	Valve
12A1	Thin layer keyboard
12A2	MMI
13T1	High voltage transformer
13E1	Ozone generator

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

6.1 Mechanical part

The most important mechanical parts are:

Ozone generator G211:

In the ozone generator, a part of the feedgas is converted into ozone. The ozone generator has the following connections:

- Cooling media (inlet and outlet)
- Gas (inlet and outlet)
- Pressure relief (outlet)
- Electrical connections (high voltage bushing and earth terminal on the module tube)

The ozone generator can contain 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 45 °C) as a result of lack of cooling media occurs. The unit can be switched on again when the temperature drops to 35 °C.

Cooling media circuit:

The control devices are to be supplied and installed by the owner and/or user.

Feedgas circuit:

The installed gas line is equipped with the following devices:

Pressure control valve PCV201 (equipment front):

To reduce the input pressure to the optimal operational pressure.

Gas valve FV202/FV203 (in the equipment):

For automatic gas flow control. To protect the generators from invading humidity. It has an electrically operated override for purging procedures and maintenance work.

Gas pressure gauge PI202 (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 corresponding appendix.

Hand operated control valve HCV201 (equipment front):

For regulating the gas flow.

Rupture disc PV203 :

Used to protect the internal system against undesirable overpressures above 4.5 bar. 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 5 meters. For longer distances, the diameter of the line must be increased accordingly. The line has to be checked at regular intervals for blockages.

WARNING:

Because ozone as well as oxygen can be released when the Rupture disc burst, the outlet location must be a safe distance from paths or streets, so that there is no danger for persons or animals.

6.2 Electrical part

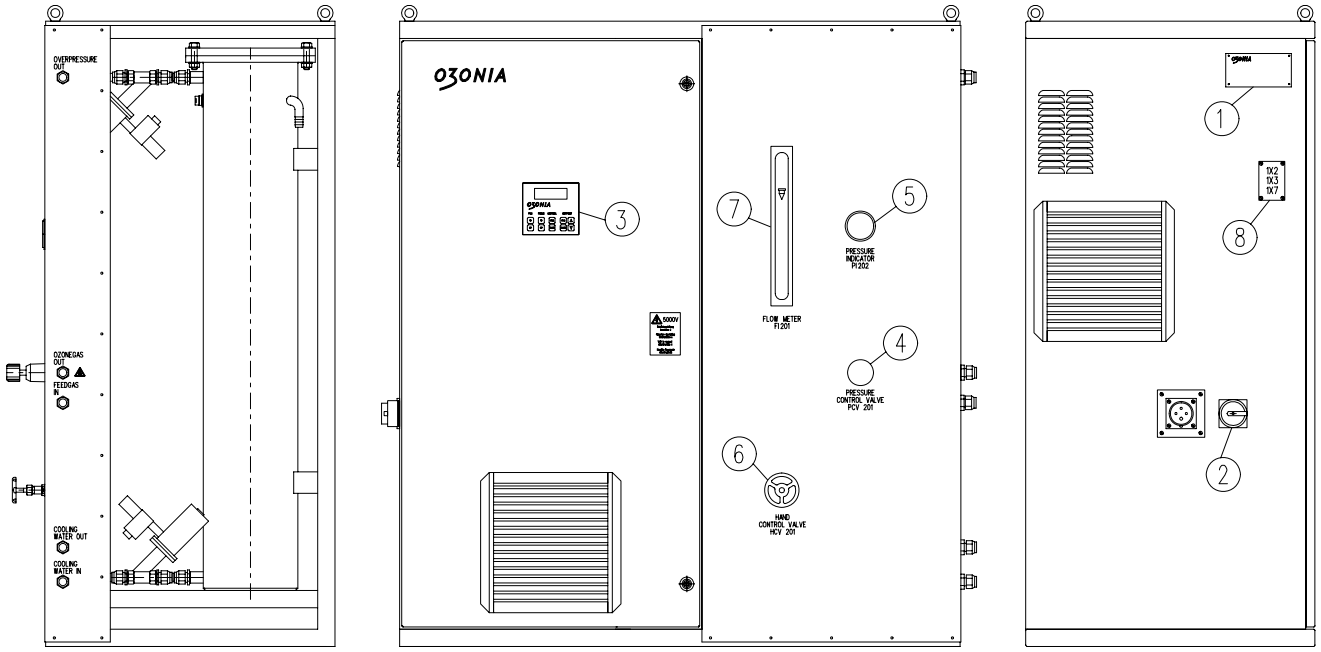
The electrical part is separated from the mechanical / process part by a partition, so that the electrical components are effectively protected from any possible leakages of cooling media. The layout of the individual components with captions can be seen on page 26.

The converter electronics (control board) are used to supply the ozone generator G211 with medium frequency H.V. The high voltage transformer 13T1 steps-up the output voltage from the converter electronics to the voltage required by the ozone generator.

The most important components are:

- Mains socket 10X1.
- Mains switch 10S1
- Mains transformer 10T1
- Control electronics 11A1 to regulate the DC power Pe and control the IGBTs.
- MMI 12A2 for the surveillance of the control electronics.
- High voltage transformer 13T1 to step-up the output voltage from the converter 11A1 to that required by the ozone generator G211.

7. Operational and display elements and operational modes



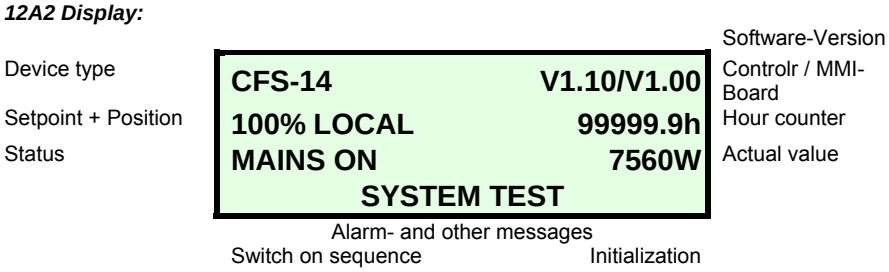
Caption:

1		Rating plate with CE marking
2	10S1	Mains switch
3	12A2	Display: DC-Power Pe, Mode, Service hour counter, Failures
4	PCV201	Pressure control valve
5	PI202	Gas pressure gauge
6	HCV201	Hand operated control valve
7	FI201	Gas flow meter
8		Gland plate for control-, external operating- and signal-cable

7.1 Software versions and initialisation

At switch-on proceeding (MAINS ON) of device, will initiate the control and the internal connections will be built. After that a system check starts and the current position of the operating elements will be displayed. When the system check is finished, the software versions of control electronics resp. MMI, the existing device type, the running hours and the current control position and status will be indicated.

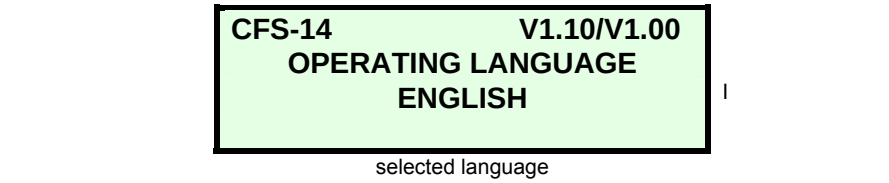
12A2 Display:



7.2 Selection of the displayed language

Five languages may be selected for the display (English, German, French, Italian, Spanish). The mains switch must be in the “MAINS OFF” position. Press the “SET POINT ▼” button continually and, at same time, switch on the mains. The selected language will be displayed for a short period. By continually pressing the “SET POINT ▲” switch either English, German, French, Italian or Spanish can be selected. When the “SET POINT UP” is not pressed within a period of 5 seconds, the displayed language will be selected and the control will go back to the service mode.

12A2 Display:



7.3 Selection of the control location

There are four possibilities:

	Control command Equipment ON/OFF		Performance Pre-set value		Gas flow setting
Selector switch	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)] Only “LOCAL”

12A2 Display:

Setpoint + Position
Status

```
CFS-14          V1.10/V1.00
100% LOCAL      99999.9h
PSU OFF LOCAL       0W
```

Hour counter
Actual value

Setpoint + Position
Status

```
CFS-14          V1.10/V1.00
100% REMOTE     99999.9h
PSU OFF REMOTE      0W
```

Hour counter
Actual value

Setpoint + Position
Status

```
CFS-14          V1.10/V1.00
100% REMOTE     99999.9h
PSU OFF LOCAL       0W
```

Hour counter
Actual value t

Setpoint + Position
Status

```
CFS-14          V1.10/V1.00
100% LOCAL      99999.9h
PSU OFF REMOTE      0W
```

Hour counter
Actual value

7.4 Ozone production

The ozone production is dependent on the gas flow and the electrical power. In addition the temperature of the cooling media has a certain effect. The combined effect of the individual values can be seen in the corresponding production diagram (Chapter 9.1.1).

The electrical power is set with the set value buttons “UP ▲ / DOWN▼“.

Setpoint	Indication	Remote signal	Power W
Lower limit	0 %	4 mA	Basic power (no O_3 production)
Upper limit	100 %	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 in the corresponding appendix. The gas flow is altered with the valve until the corresponding scale value is reached on the gas flow meter FI201.

12A2 Display:

Setpoint + Position
Status

CFS-14	**V1.10/V1.00**
0% LOCAL	**99999.9h**
PSU ON LOCAL	**0W**

Hour counter
Actual value

Setpoint + Position
Status

CFS-14	**V1.10/V1.00**
100% LOCAL	**99999.9h**
PSU ON LOCAL	**7560W**

Hour counter
Actual value

Setpoint + Position
Status

CFS-14	**V1.10/V1.00**
0% REMOTE	**99999.9h**
PSU ON LOCAL	**0W**

Hour counter
Actual value

Setpoint + Position
Status

CFS-14	**V1.10/V1.00**
100% REMOTE	**99999.9h**
PSU ON LOCAL	**7560W**

Hour counter
Actual value

7.5 Functional sequence

Precondition: Main is switched on.

7.5.1 Swich-on procedure local & remote

The switch-on sequence is as follows:

- On command “PSU ON” locally over the MMI, or by closing the remote contact “PSU ON REMOTE”.

12A2 Display:

Setpoint + Position	**CFS-14 V1.10/V1.00**	Hour counter
Status	**0% LOCAL 10.1h**	Actual value
	PSU ON LOCAL 0W	

Setpoint + Position	**CFS-14 V1.10/V1.00**	Hour counter
Status	**0% LOCAL 10.1h**	Actual value
	PSU ON REMOTE 0W	

- “PSU ON LOCAL / REMOTE” will be displayed.
- Solenoid valves FV202/FV203 will be opened.
- Service hour counter begins to count .
- Inverter released.
- Power will increase to the LOCAL or REMOTE pre-selected value. Electrical real power will increase within approx. 4 minutes from the basic power to the maximum admissible load.

12A2 Display:

Setpoint + Position	**CFS-14 V1.10/V1.00**	Hour counter
Status	**100% LOCAL 10.1h**	Actual value
	PSU ON LOCAL 7560W	

7.5.2 Switch-off procedure local & remote

The switch-off procedure is as follows:

- OFF command “PSU OFF” locally over the MMI, or by opening the remote contact ” PSU ON REMOTE”.

12A2 Display:

Setpoint + Position	CFS-14 V1.10/V1.00 0% LOCAL 10.1h PSU OFF LOCAL 0W	Hour counter
Status		Actual value

Setpoint + Position	CFS-14 V1.10/V1.00 0% LOCAL 10.1h PSU OFF REMOTE 0W	Hour counter
Status		Actual value

- “PSU OFF LOCAL / REMOTE” will be displayed.
- Inverter will switch off.
- Service hour counter will stop.
- Electrical real power set-value is blocked.
- About 90 seconds later, the solenoid valves FV203/FV202 closes and the ventilator will stop. During the delay time, the equipment will be purged with feedgas, and the residual ozone fed to the process. During those 90 seconds „PURGE“ will be displayed on the MMI.

12A2 Display:

Setpoint + Position	CFS-14 V1.10/V1.00 0% LOCAL 10.1h PSU OFF LOCAL 0W PURGE 90s	Hour counter
Status		Actual value

WARNING:

Even after the OZAT® ozone generator has been switched off, ozone generator and installations still contains ozone. Therefore, before opening equipment or piping, flush the equipment thoroughly until no ozone can be detected.

7.6 Purging the system local & remote

The solenoid valves (FV202/FV203) can be opened either with the button "PURGE ON" on the MMI, or by closing the contact "PURGE ON REMOTE" from remote. The purging time is indicated. Purging the system to dry out is described in chapter 8.2.4.

12A2 Display:

	CFS-14 V1.10/V1.00	
Setpoint + Position	**0% LOCAL 10.1h**	Hour counter
Status	**PSU OFF LOCAL 0W**	Actual value
	PURGE 99.9h	
	Purging time	

	CFS-14 V1.10/V1.00	
Setpoint + Position	**0% LOCAL 10.1h**	Hour counter
Status	**PSU OFF REMOTE 0W**	Actual value
	PURGE 99.9h	
	Purging time	

7.7 Production Stop circuit

In a production stop (switching off the mains switch or interrupting the power supply), the energy supply from the mains will be interrupted and at same time the gas flow stops. Contrary to a normal operational switch-off procedure, there is **no** purging of the equipment with a production stop.

WARNING:

After a production stop there will still be ozone inside the components (e.g. ozone generator module, piping and, possibly, in the equipment).

7.8 Switch-off following a fault (error) local

Function of the fault monitoring:

Fault	Release of the monitoring	Switch-off delay following occurrence of a fault	Remarks
Ozone generator module temperature too high	Mains is ON	approx. 1 second	On alarm status the unit will purge for 90 sec.
Heat sink temperature too high	Mains is ON	approx. 1 second	On alarm status the unit will purge for 90 sec.
HV- Transformator temperature too high	Mains is ON	approx. 1 second	On alarm status the unit will purge for 90 sec.
Inverter short circuit	PSU ON	approx. 1 second	On alarm status the unit will purge for 90 sec.
Ozone generator short circuit	PSU ON & power factor too small	approx. 20 second	On alarm status the unit will purge for 90 sec.
Remote set-value too low	Mains ON and set point is on REMOTE Signal < 3mA	approx. 5 second	On alarm status the unit will purge for 90 sec.
Mains voltage too low / high	Mains ON	approx. 10 second	On alarm status the unit will purge for 90 sec.
DC-Voltage too low / high	Mains ON	approx. 1 second	On alarm status the unit will purge for 90 sec.

12A2 Anzeige:

Setpoint + Position
Status

```
CFS-14              V1.10/V1.00
100% LOCAL            10.1h
ERROR                   0W
OZONEGENERATOR TEMP
```

Hour counter
Actual value

Setpoint + Position
Status

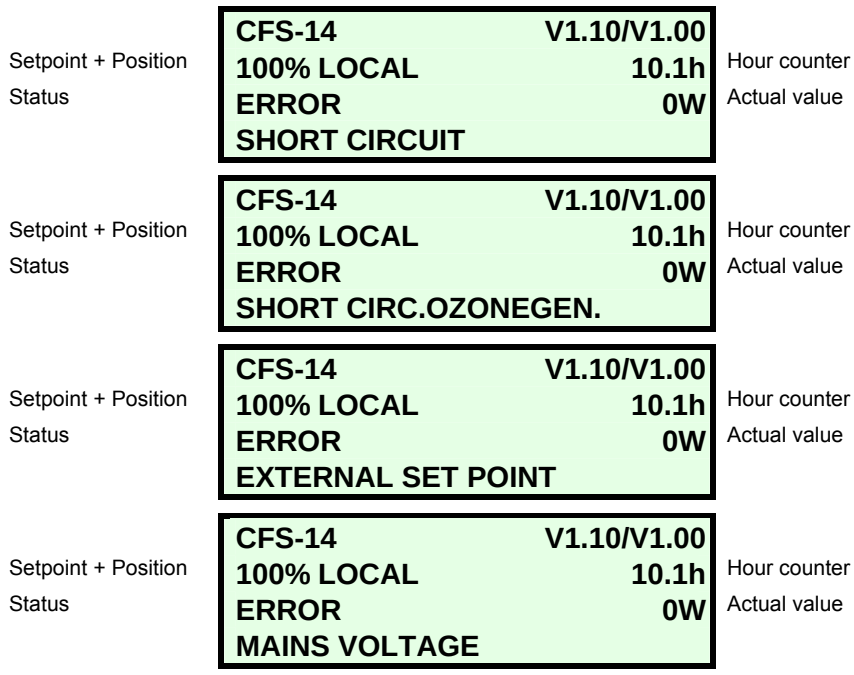
```
CFS-14              V1.10/V1.00
100% LOCAL            10.1h
ERROR                   0W
HEAT SINK TEMP
```

Hour counter
Actual value

Setpoint + Position
Status

```
CFS-14              V1.10/V1.00
100% LOCAL            10.1h
ERROR                   0W
TRANSFORMER TEMP
```

Hour counter
Actual value



7.8.1 Fault indication (error) remote

Three relay outputs for the external remote fault indication are available. The following 3 bit fault pattern will be created.

Error	Fault bit 2	Fault bit 1	Fault bit 0
No error	0	0	0
Ozone generator temp. too high	0	0	1
Heat sink temp. too high HV-Transformer temp. too high	0	1	0
Inverter short circuit	0	1	1
Ozone generator short circuit	1	0	0
External set point too low	1	0	1
Mains voltage too high Mains voltage too low temp. too high	1	1	1

7.9 Acknowledging an error

An alarm remains set until the fault is corrected and the alarm signal acknowledged by operating the “PSU OFF” switch, or by opening the “PSU ON REMOTE” contact from remote.

8. Commissioning

8.1 Setting-up and installation

8.1.1 Setting-up

The equipment is to be set-up on a stable table, on the floor or on a wall.

ATTENTION:

It is of utmost importance that **no** water enters the ozone generator - either in the form of water vapour in the feedgas (see feedgas specification in chapter 3.1.3), or in the form of water being back-fed from the operator's process.

To prevent water or humidity being back-fed from the process the operator must install a solenoid valve **and** a non-return valve between the ozone generator and the ozone contacting system. The solenoid valve is to be controlled to suit operating parameters and may **not** be closed during the purging time of the device.

FAILURE TO OBSERVE THESE INSTRUCTIONS COULD RESULT IN IRREVERSIBLE DAMAGE TO THE OZONE GENERATOR UNIT.

8.1.2 Ambient conditions

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

- Ambient temperature
- Altitude
- Humidity
- Protection class
- Vibration

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 in which ozone can be present (Chapter 4).

8.1.3 Installation of the equipment and the piping

During the **whole installation period**, the equipment is to be protected against dirt, dust and foreign bodies (metal swarf, screws, etc.) or humidity.

IMPORTANT:

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

8.1.4 Serto installation instructions

All external line connections for cooling media, feedgas and ozone should be made according to the Serto installation instructions in Appendix 21.

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

8.1.5 Protection of lines

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

8.1.6 Electrical installation

The electrical connections must comply with local regulations. If the equipment is fitted with an instrument socket, a corresponding mains cable with a suitable plug must be used (Chapter 3.1.2).

8.2 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.

8.2.1 Checking the installation

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

- Is the equipment secured against moving?
- Is the line feed protected?
- Are the lines for:
  - Feedgas (oxygen or air)
  - Ozone
  - Overpressure
  - Cooling medial

  connected to the correct unions on the equipment?

8.2.2 Further checks

The following additional points must be checked before commissioning:

- Is there adequate ventilation for normal operation and in the case of a malfunction?
- Is the feedgas and the cooling media (quantity, quality and pressure) in accordance with the technical data in Chapter 3 “Product description”?
- Have all connections been correctly made?
- Is the owner’s and/or user’s process, in which the ozone will be used, ready for the ozone and is the vent ozone destruction operational?
- Are the relevant safety elements tested and active?

8.2.3 Tightness check

If 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, under operational pressure and treat all connections on the gas side with leakage spray. Any connections where bubbles form, must be re-made.

As a 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.

8.2.4 Purging the system to dry it out

Before commissioning 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 feedgas (in accordance with the operational data). When doing this, the following sequence should be followed:

Check the dew point of the feedgas: -65°C or dryer.

1. Operate “PURGE ON” switch local, or close the contact “PURGE REMOTE” until the respective display appears.
2. Slowly open the stop valve in the feedgas line. Keep to the maximum permissible pressure given in the operational data!
3. **Variation of the pressure:**
   Adjust the pressure controle valve PCV201 on 2.5 bar gage (control with the gas pressure gauge PI202) and at the same time adjust the feedgas flow with the hand regulating valve HCV201 on20% scale-value (control with the gas flow display FI201). Hold in this condition for 30 minutes.
4. Adjust the pressure controle valve PCV201 on 0.5 bar gage and at the same time adjust the feedgas flow with the hand regulating valve HCV201 on20% scale-value. Hold in this condition for 30 minutes.
5. Adjust the pressure controle valve PCV201 again on 2.5 bar gage and at the same time adjust the feedgas flow with the hand regulating valve HCV201 on20% scale-value. Hold in this condition for 30 minutes.
   The variation of the pressure has to be repeated four times.
6. Adjust the pressure controle valve PCV201 on 0.5 bar gage and at the same time adjust the feedgas flow with the hand regulating valve HCV201 on20% scale-value.
   Hold in this condition for at least 12 hours.
   While purging make sure the gasflow never drop under 20%.
7. Close the stop devices in the feed line and the hand operated regulating valve.
8. Operate locally “PURGE OFF” switch, or open the contact “PURGE REMOTE”.

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 residual ozone will be destroyed.

WARNING:

If a smell of ozone is detected, the mains switch PRODUCTION STOP must be immediately switched off and the area evacuated in accordance with the safety measures and the leak found before commencing with the commissioning phase.

8.2.5 Commissioning LOCAL

1. Set the cooling media flow according to the operational data.
2. Open the stop valve in the feedgas line (owner and/or user).
3. Switch on the mains (power to the equipment).
4. Display will indicate the software version and the system check.
5. Switch the “CONTROL” to “LOCAL”.
6. Switch “SET POINT” to “LOCAL”.
7. Set the “SET POINT” to 0%.
8. Operate “PSU ON” switch, “PSU ON LOCAL” will be displayed.
9. Rating display will show minimum load.
10. Increase the gas flow with the hand operated control valve HCV201 and the pressure with the pressure regulating valve PCV201 to maximum permissible value see curves “APPENDIX“.
11. Increase the load with the „SET POINT ▲“ button slowly, in 5% increments, with at least 15 seconds pauses between the increments, up to the maximum (max. 80% during first 100 operating hours) permissible load.
12. Rating display will indicate maximum load.
13. Rating set value and gas flow to be set to minimum.
14. Switch off the unit with the switch “PSU OFF”. The display must indicate minimum load and “PSU OFF LOCAL” will appear.

8.2.6 Commissioning REMOTE

1. Set the cooling media flow according to the operational data.
2. Open the stop valve in the feedgas line (owner and/or user).
3. Switch on the mains (power to the equipment).
4. Display will indicate the software version and the system check.
5. Switch the “CONTROL” to “REMOTE”.
6. Switch “SET POINT” to “REMOTE”.
7. Set the “SET POINT REMOTE” to 4mA.
8. Close the remote contact “PSU ON/OFF”, “PSU ON REMOTE” will be displayed.
9. Rating display will show minimum load.
10. Increase the gas flow with the hand operated control valve HCV201 and the pressure with the pressure regulating valve PCV201 to maximum permissible value see curves “APPENDIX“.
11. Increase the load with the „SET POINT“ signal (4-20mA) from remote slowly with at least 15 seconds pauses between the increments, up to the maximum (max. 17mA during first 100 operating hours) permissible load.
12. Rating display will indicate maximum load.
13. Rating set value and gas flow to be set to minimum.
14. Switch off the unit by opening the contact “PSU ON/OFF from remote”. The display must indicate minimum load and “PSU OFF REMOTE” will appear.

IMPORTANT:

If the commissioning cannot be carried out, check in Chapter 11.3 for possible causes and, if necessary, contact the Ozonia service personnel.

9. 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 instruct further persons with partial functions.

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.

9.1.1 Operation and setting of the equipment

The preconditions for service are:

- The process (installation) is ready for taking up ozone.
- Power supply switched on.
- Mains switch on.
- Cooling media is flowing.
- Gas feed open.

The equipment can now, locally or remote, be switched on, to the pre-set values for gas flow and electrical set point. The necessary settings are found as follows; for the setting of the equipment the “gas flow diagram” and the setting curves can be used.

Setting the ozone production and concentration:

Example 1

Given: Ozone quantity M_{O3} and ozone concentration c

Wanted: Gas flow Vn and real power setting Pe

Procedure for a CFS-14 with air:

1. Calculation of the gas flow Vn

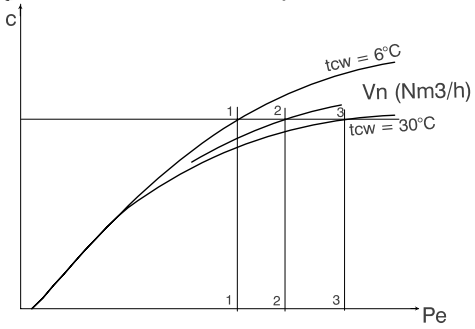
$$Vn = \frac{100}{\rho} \cdot \frac{MO3}{c}$$

c	=	Ozone concentration [wt%]
M_{O3}	=	Ozone production [kg/h]
ρ	=	Density ot the feedgas [kg/Nm^3] at standard conditions ρ_{Air} = 1.293 kg/Nm^3 or ρ_{Oxygen} = 1.429 kg/Nm^3 (t_n = 0 °C, $p_{atm.}$ = 1013 mbar)

for c = 4 wt%, M_{O3} = 0.3 kg/h and ρ = 1.293 kg/Nm^3 (air) it follows:

$$V_n = \frac{100}{1.293} \cdot \frac{0.3}{3} = 7.73 Nm^3 / h$$

2. The required electrical real power is determined from the setting curves.
   The intersection of the horizontal line of the desired ozone concentration c with the curve of the required feedgas quantity Vn gives the electrical real power Pe.



   If there is no suitable curve available for the required feedgas quantity, interpolate between the two curves (2).

   For the above example (c = 3 wt%, M_{O3} = 0.3 kg/h) an electrical real power Pe of about 4.48 kW results (12 °C cooling media inlet temperature).

3. From the gas flow diagram in the Appendix 16, the feedgas quantity for the corresponding scale value (indicated by the gas flow meter) can be found.

Example 2

Given: Electrical real power Pe and the gas flow V_n

Wanted: Ozone production M_{O3} and ozone concentration c

Aid: Setting curves given in appendix for CFS-14 and the respective feedgas.

1. Find the intersection of the vertical line from the electrical real power with the curve for the gas flow.
2. A horizontal line gives the ozone concentration c.
3. From c and V_n (gas flow), the ozone production M_{O3} can be calculated:

$$M_{O3} = \frac{\rho \cdot V_n \cdot c}{100}$$

9.1.2 Production stop

In cases of danger, such as.:

- Ozone leakage
- Electrical accident
- Etc.

The mains switch of the equipment must be switched off, which also functions as an production stop switch. In this way, the electrical energy supply and the feedgas flow will be **immediately** interrupted.

9.1.3 Alarm signals

If an alarm signal is given, the equipment will switch off. After the fault has been cleared, the alarm signal can be acknowledged by operating the “PSU OFF” switch local or by opening the contact “PSU ON/OFF” from remote and the equipment can be switched on again. If a fault repeatedly appears, the service personnel should be informed.

9.2 Required minimum gas flow

The actual feedgas flow should never be set to lower than 10% of the gas flow meter's scale value in order to avoid any inaccuracies due to low flow conditions.

9.3 Switching off for long periods

If the equipment is not to be used for a long period, operate "PSU OFF" local switch, or open the contact "PSU ON/OFF" from remote and "PSU OFF LOCAL/REMOTE" will be displayed. The solenoid valves will be closed. This will save gas and will avoid water and moisture entering the equipment and the ozone generator from the client`s process side.

INFORMATION:

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

9.4 Changing from air to oxygen feedgas

IMPORTANT:

If the ozone generator was initially operated with air as the feedgas, and it is changed to oxygen, the performance data will be lower than expected in the setting curves. Therefore, Ozonia recommends to clean the ozone generator.
If the feedgas is oxygen you have to change the tapping at the HV-Transformer to -5%.

9.5 Changing from oxygen to air feedgas

If the feedgas is changed from oxygen to air, the performance data should be as given in the setting curves (but only if there was no possibility for water vapour to enter the ozone generator module).
If the feedgas is air you have to change the tapping at the HV-Transformer to -0%.

10. 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.

Maintenance work should be conducted minimum once a year.

10.1 Periodical tightness check

It is recommeded that periodical tightness checks on 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 to the inlet valve is reduced to zero.
The starting pressure (i.e., after about 10 minutes) and the end pressure (after 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 8.2.3“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 indicated gas on the pressure gauge (effective pressure) PI202.

10.2 Condensation drain rupture disc

Open periodically the connection at the outlet of the pressure relief line (rupture disc), to drain some possible condensation. At the same time check the line for blockages.

10.3 Periodical check of the ambient 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.

10.4 Periodical check of the breathing apparatus

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

10.5 Terminal check

Once a year all electrical connection screws should be tightened. To do this the supply most be switched off and the mains plug removed. The cover should only be removed after waiting 3 minutes as the smoothing capacitors on the control electronic (11A1) require time to discharge.
Before beginning work, the ozone generator G211 has to be discharged (Chapter 11.1.2) and the control electronics (11A1) to be checked with a suitable measuring instrument (...750 V_{DC}).
After completing the work, replace the equipment cover.

WARNING:

If the time of 3 minutes between switching off the mains switch 10S1 and dismanting the equipment cover is not observed, there is a **danger of electrocution**.

WARNING:

External signal voltages are to be switched off!

10.6 Cleaning of the air in-/ outlet

Depending on the environment where the equipment is installed, the air outlet of control electronic (11A1) must be cleaned and the filter mats should be replaced at regular intervals.

11. Overhauling

Overhaul work must only be carried out by authorised and trained personnel. 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.

11.1 Replacement of defective fittings, lines or dielectrics

ATTENTION:

Before repair or service work, the complete system must first be purged (Chapter 11.1.1). The gas pressure is then to be reduced to atmospheric pressure, the cooling media and the mains switch are to be turned off and pull out the mains plug. The ozone generator G211 must be **separately** discharged directly at the high voltage bushing (Chapter 11.1.2).

Only original replacement parts from Ozonia must be used.

If in doubt contact Ozonia.

After installing a new fitting, ensure that the connections are properly made and carry out a tightness check (Chapter 10.1).

In case of replacement of dielectrics, proceed according to chapter 8.2.5 for recommissioning.

11.1.1 Purging the systems before overhaul work

Every time overhaul (repair) or service work has to be carried out on the pipeline guides or the fittings, the residual ozone in the system must be purged with feedgas. To purge the system proceed as follows:

1. Switch “PURGE ON”.
2. Set a medium gas flow with the hand control valve HCV201 (observe the gas flow display FI201).
3. Purge for at least 15 minutes.
4. Close the shut-off device in the feedgas line.
5. When the system pressure has dropped, close the hand operated control valve HCV201. Check on the gas pressure gauge PI202.
6. Switch “PURGE OFF”.
7. 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 (Chapter 10.1) and be dried out by purging (Chapter 8.2.4).
8. Put the equipment into operation (Chapter 8.2.5).

PROHIBITION:

When the system is opened, a concentration of oxygen can accumulate in the clothing, with an associated increased fire risk. The corresponding safety measures should therefore be taken (Chapter 4).

11.1.2 Discharging the ozone G211:

Discharging may only take place when mains switch (10S1) is switched off. The discharging device is first connected to earth terminal and only then may the discharge rod be introduced into the opening on the connector cover to discharge the ozone generator (Appendix 24).

WARNING:

The discharging device must only be held by the handle. It is essential to ensure that there is a metal-to-metal contact with H.V bushing on the ozone module (Appendix 24).

11.2 Setting the operational pressure

IMPORTANT:

Changes in the system pressure have a direct effect upon the ozone production. If the operational pressure has changed, this must be reset with the pressure control PVC201, to the values given in chapter 3.1.2

The operational pressure is set using the pressure control valve PCV201, on the front of the unit. Proceed as follows:

1. Set the required gas flow using the hand operated control valve HCV201 (observe the gas flow meter FI201).
2. Set the gas pressure using the pressure control valve PCV201. For reasons of safety, a pressure limiter is built in. The set operational pressure can be read from the gas pressure gauge PI202..
3. Put the equipment into operation (Chapter 8.2.5).

11.3 Correcting faults

ATTENTION:

The following described actions may only be performed with the mains plug pulled out (separated from electrical supply).

11.3.1 Temperature monitor TSH201

A temperature alarm TSH201 (11B1) on the ozone generator can have the following causes:

- Cooling media flow interrupted or turned off.
- Cooling media inlet temperature too high >30 °C.
- Ambient temperature >40 °C.
- Air bubbles in the ozone generator; cooling media operational pressure and/or cooling media flow too low.
- Temperature monitor defect.
- Cooling media flow too low (set-value: as in “Operational data” in Chapter 3.1.2).

After the error has been localised and corrected, the equipment can be put into operation.

11.3.2 Rupture disc PV203

The bursting of the rupture disc PV203 could have following causes:

- Failure of the pressure control valve PVC201.
- Failure of the pressure control valve PVC201, with additional leakage of the feedgas valve FV202, when the main circuit breaker is switched off.

When replacing the rupture disc, pay attention to following:

- Check the rupture disc-, holder and gasket visually.
- Check right assembly position of the rupture disc (arrowhead direction to outlet)

11.3.3 Inverter short circuit

An inverter short circuit alarm could have following reasons.

- Short circuit on the control electronics (11A1).
- Short circuit on the primary side of the high voltage transformer.

In both cases the defective part has to be replaced.

11.3.4 MCB tripped

One of the followed circuit breakers has tripped:

- 11Q1/11Q2

When the faults have been localised and repaired, the circuit breaker can be switched on, and the equipment restarted.

11.3.5 Ozone generator short circuit

An ozone generator short circuit can be repaired as followed.

- Replace the defective dielectric at the generator G211.
  After replacing, the system must be purged according chapter 8.2.4
- Check the operating parameter, adjust the operating pressure if necessary.
- Check if there is excessive moisture in the generator. If the capacity is higher than 29.4uf, purge the system according chapter 8.2.4.

11.3.6 Heat sink temperature high

If the bimetal switch on the heat sink trips, following points should be checked.

- Fan 10M1 or 11M1 defect.
- Filter mats dirty (blocked).
- Ambient temperature too high (max. 40°C).

11.3.7 Transformer temperature high

If the temperature switch on the HV-Transformer trips, following points should be checked.

- Fan 10M1 is faulty (control circuit breaker 11Q2).
- Filter mats dirty (blocked).
- Ambient temperature too high (max. 40°C).
- Short circuit.

11.3.8 External set point low

The detection of an external set value lower than 4mA can be caused by the following:

- External signal <3,0A.
- Broken wire in the external set value wiring.

11.3.9 Mains- & DC- Voltage low/high

The mains voltage monitored by the unit. As soon as the mains voltage fluctuates more than ±10% for longer than 10 seconds, the unit will switch off.

If the voltage is increased within the prescribed tolerance, the unit can be taken into service.

12. Taking out of operation, storage

There are two possibilities for taking the unit out of service:

- Shutdown of the equipment and permanently shut off the feedgas, cooling media and electricity supply.
- Dismantle the connecting lines and the equipment.
- Blind off gas-bulckhead-nossle with Serto blind caps (part of supply).

12.1 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 to be re-installed at another location, it must be purged with dry gas (dew point -65°C or lower).

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

12.2 Dismantling the equipment and the connecting pipelines

Dismantling the connecting pipelines:

PROHIBITION:

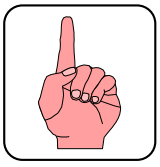
If oxygen has be used as feedgas when the lines are dismantled, oxygen can escape. There is therefore an increased risk of fire and increased oxygen concentration, particularly in the clothing. It is therefore very important to observe the regulations for the handling of gaseous oxygen (Chapter 4).

Dismantling the electrical connections:

WARNING:

Before disconnecting electrical connections, the power feed to the unit 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. Any possible external electrical signals must also be switched off.

Dismantling the equipment:



IMPORTANT:

The equipment is to be placed on a palette, using suitable lifting equipment, and secured. Before the units fixing elements are removed, the equipment must be secured (from tipping) by using the lifting gear.

13. Packaging, transport

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

Measures:

- The equipment has to be lifted with an appropriate lifting device.(Weight >420kg)
- Transport the equipment in the horizontal position.
- Seal the equipment in plastic, with a bag of silica gel to protect the equipment against moisture.
- Transport either fixed to palette or in a suitable wooden or carton container.

14. Disposal

For disposal, proceed as follows:

- Material, such as:
  - Electronic printed circuit boards
  - Power transistors
  - Capacitors
  - Plastics such as PTFE, PVDF, PE, PVC, Plexiglas (pipelines, conduits, cable channels, electrical components)
  - Non-ferrous metals such as nickel, brass, copper (fittings, rails, cables)
  - Stainless materials etc.

  Should be disposed by a special disposal company.

15. Part list

15.1 Electrical material =PSU21+S01...

Type			CFS-14
Pcs.	Article	Tag-No.	Art-No.
1	Interference suppressor filter	-10E1	TE23965
1	Main switch	-10Q1	TE23292
1	Circuit breaker	-10Q2	TE10267
1	Relais 2UK	-11K1	TE15158
1	Socket	-10X1	TE23041
1	Coupling	-10X1	TE23040
1	Control electronics RD602	-11A1	TE23931
1	Thin layer keyborad	-12A1	TE23243
1	Control electronics RD600	-12A2	TE23295
1	HV transformer	-13T1	TE23932
1	Mains transformer	-10T1	TE23933
1	Air fan radial	-11M1	TE15463
1	Air fan axial	-10M1	TE14162
1	Air outlet	-10M1	TE14163

15.2 Mechanical material =PSU21+G21...

Type			CFS-7
Pcs.	Article	Tag-No.	Art-No.
14	Dielectric	-(G211)	RD24408
1	Temperature monitor	-TSH201	TV23425
2	Gas valve	-FV202/3	TV24387
1	Hand control valve	-HCV201	TV24389
1	Gas pressure display	-PI202	TV23440
1	Pressure regulaton valve	-PCV201	TV24415
1	Gas flow display	-FI201	TV24388
1	Rupture disc	-PV203	TV24406

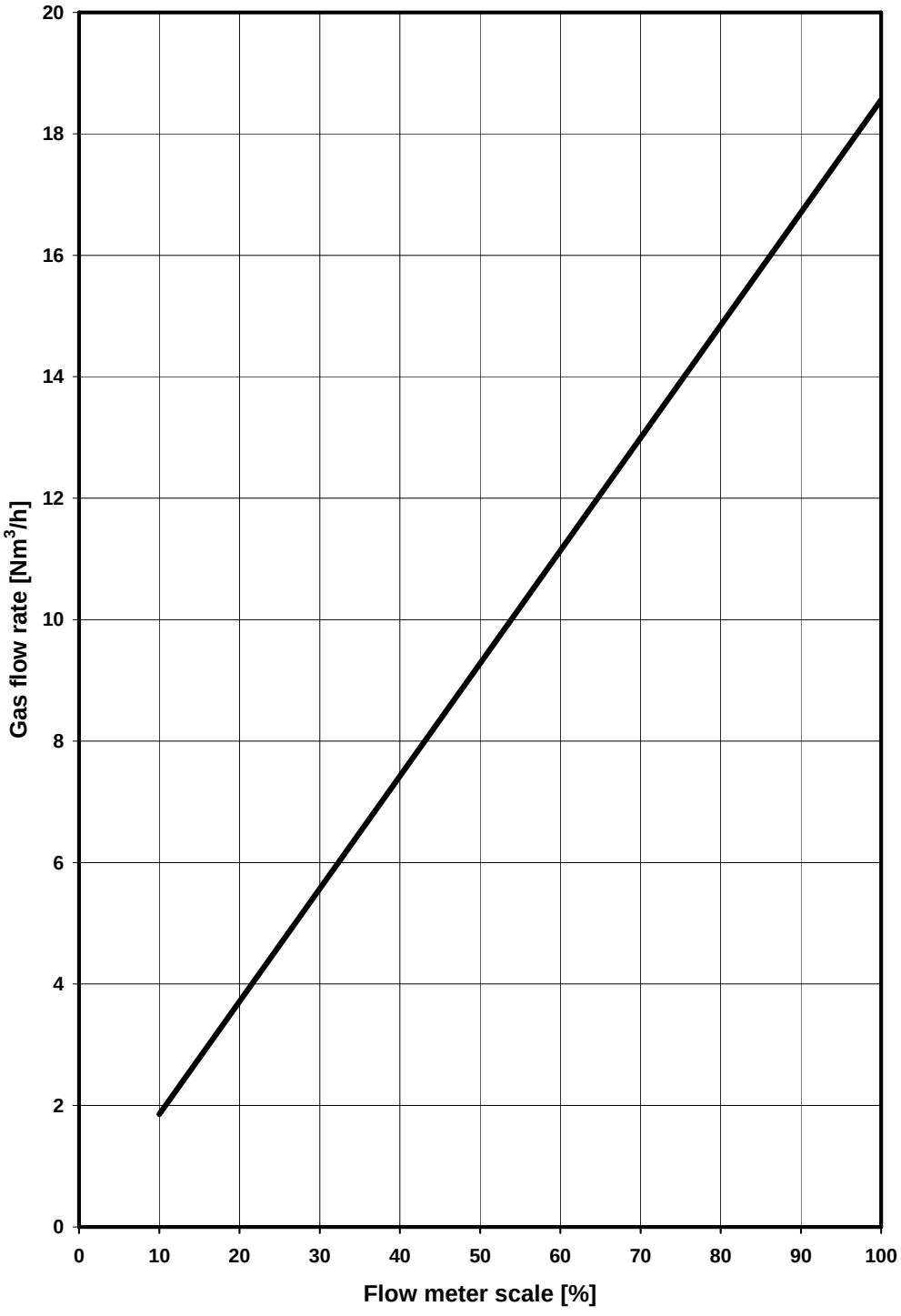
15.3 Other materials =PSU21...

Type			CFS-7
Pcs.	Article	Tag-No.	Art-No.
1	Generator O-ring	-G211	TV24468
1	HV-Bushing	-G211	TV24570
1	Tube 8x1 PTFE		TV12313
1	Tube 6x1 PTFE		TV12311
1	Tube D=19x27.5 cooling water		TV22909
1	support sleeve 8-6 brass		TV14409
2	support sleeve 6-4 brass		TV12372
2	clamping ring red. 8-6 brass		TV24455
1	Teflon tape SO841-9		TP10851
1	Grease for O_2 and O_3		TV15704
1	Filter mats P15 350S		TV15076

16. Appendix "Gas flow diagram Air"

Gas flow rates through flow meters

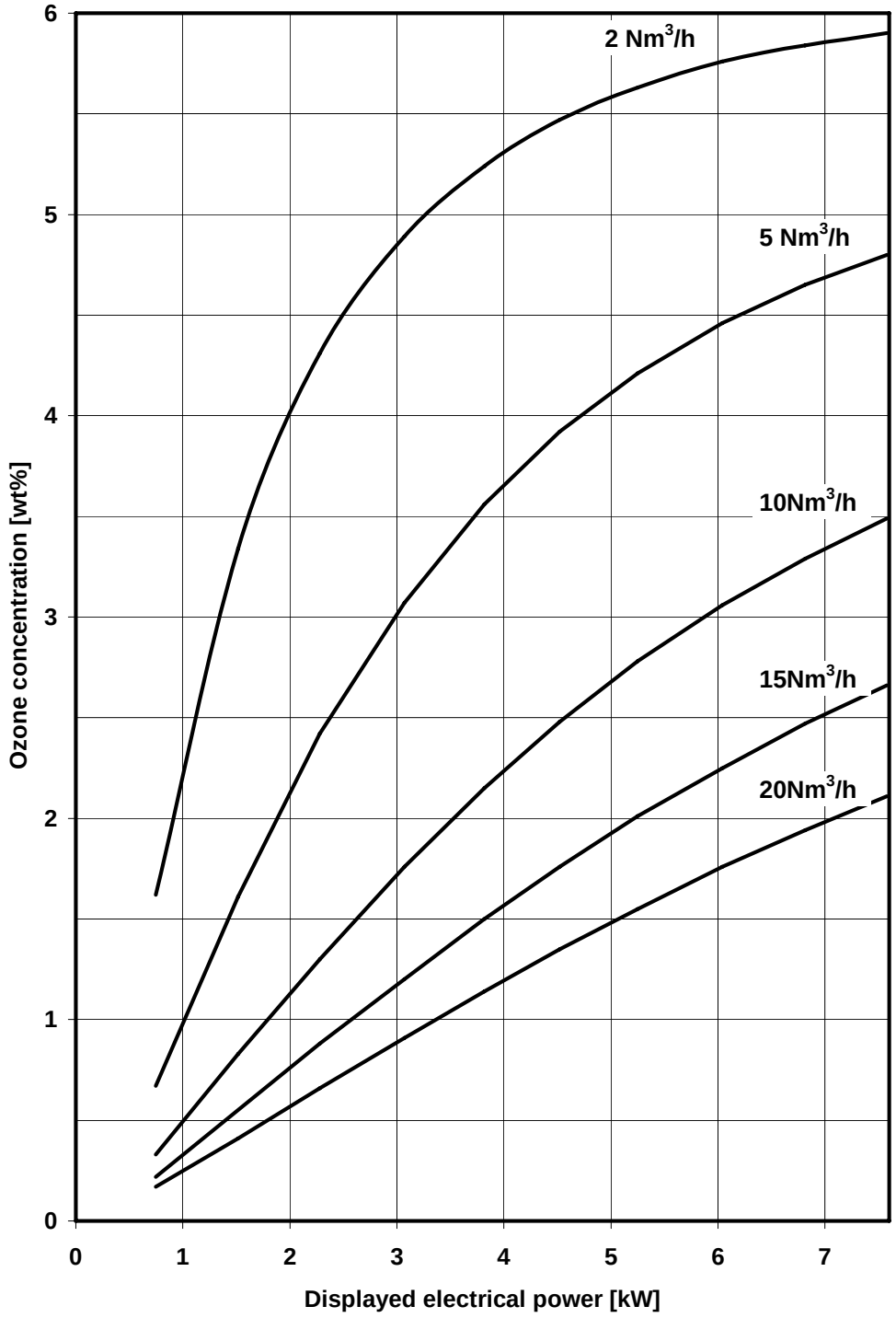
Feedgas: Air with atmospheric dew point of –65 to –100°C
20°C Inlet temperature and mean gas pressure of 2.5 bar (g)



17. Appendix "Setting curves Air"

Resulting ozone concentration

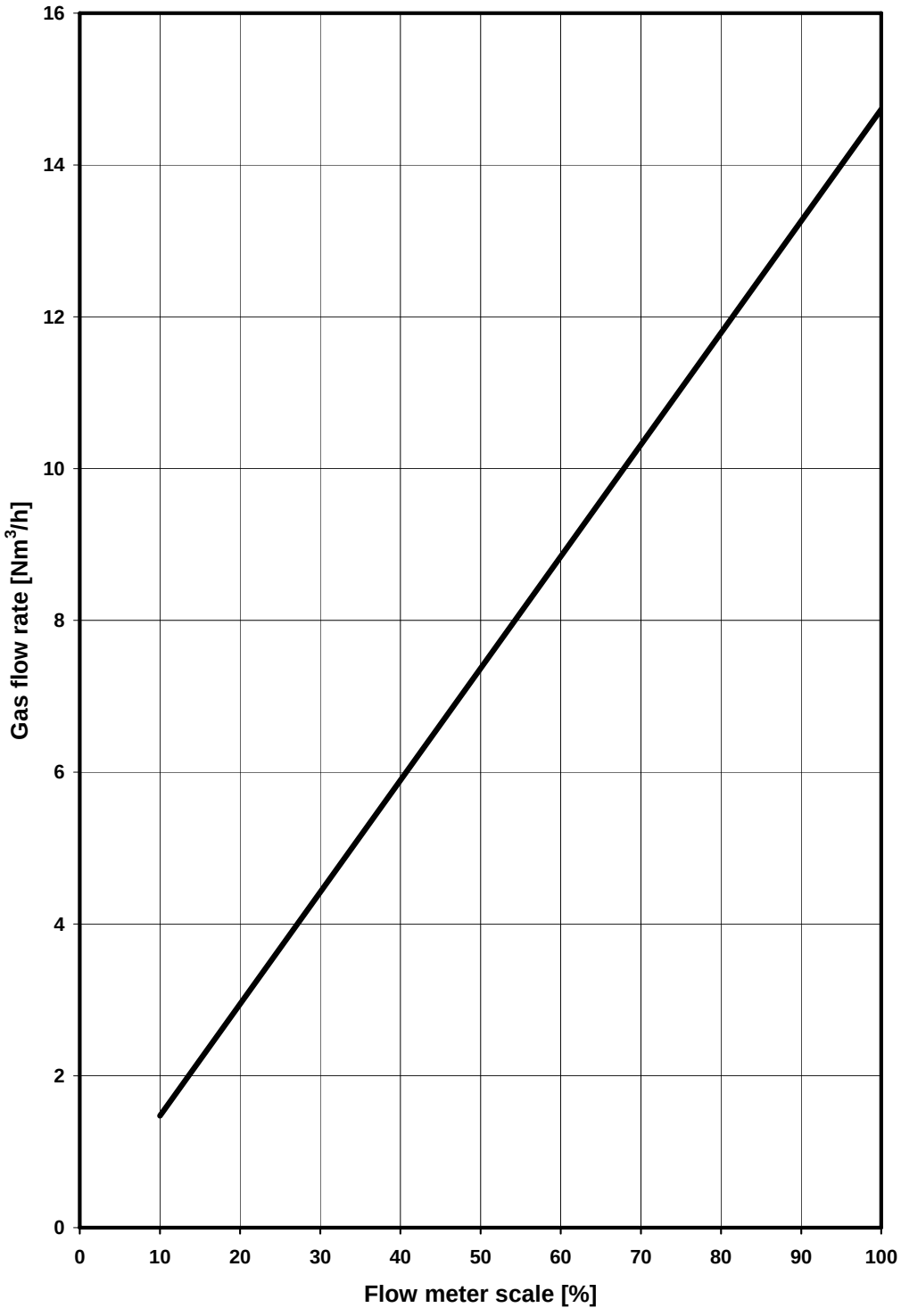
Feedgas: Air at 20°C, 2.5 bar (g) mean gas pressure and an atmospheric dew point of –65°C to –100°C
Cooling water inlet/outlet: 12 / 17°C



18. Appendix "Gas flow diagram O_2"

Gas flow rates through flow meters

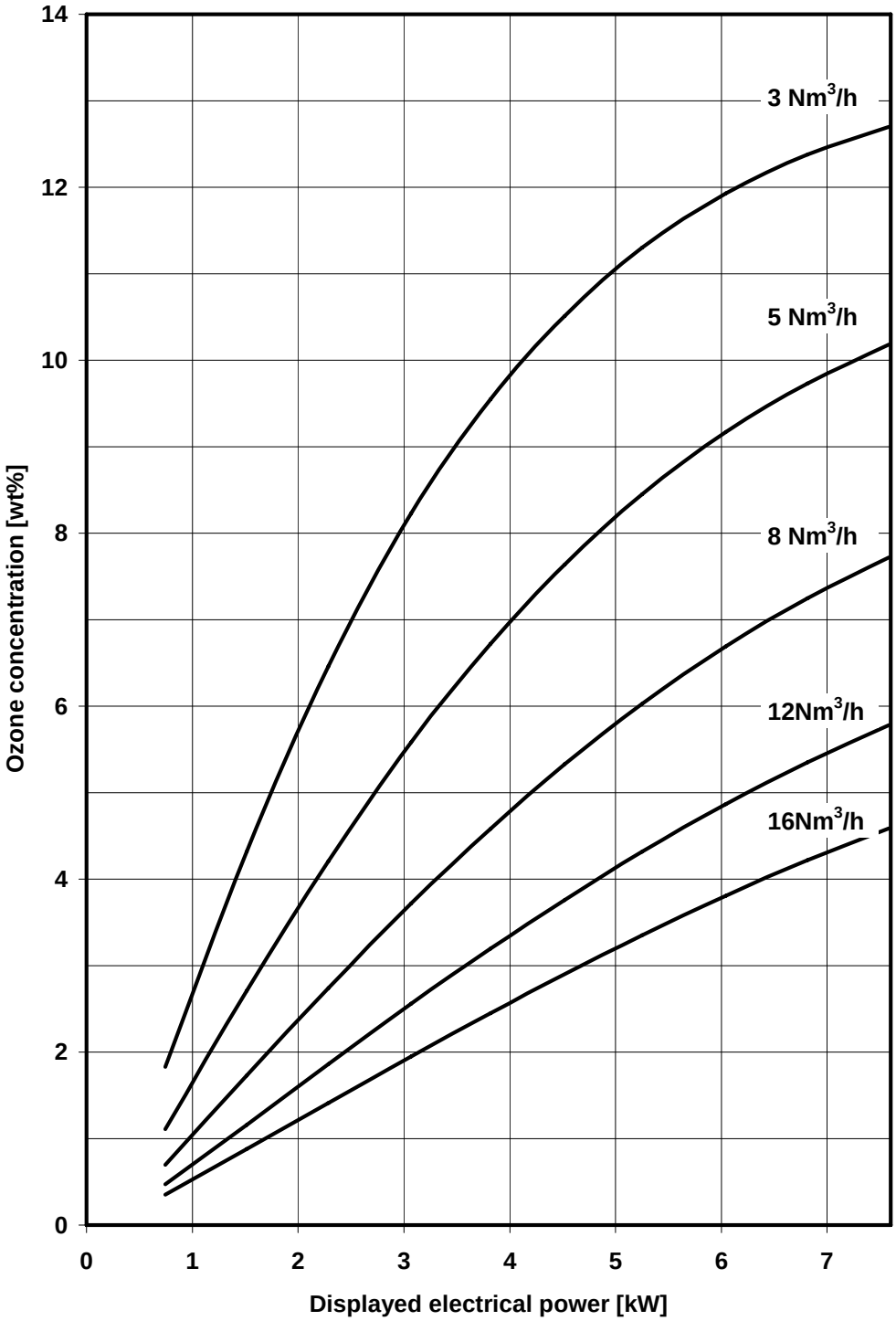
Feedgas: 92.4 wt% oxygen, 2.6 wt% nitrogen and 5 wt% argon
20°C Inlet temperature and mean gas pressure of 1.5 bar (g)



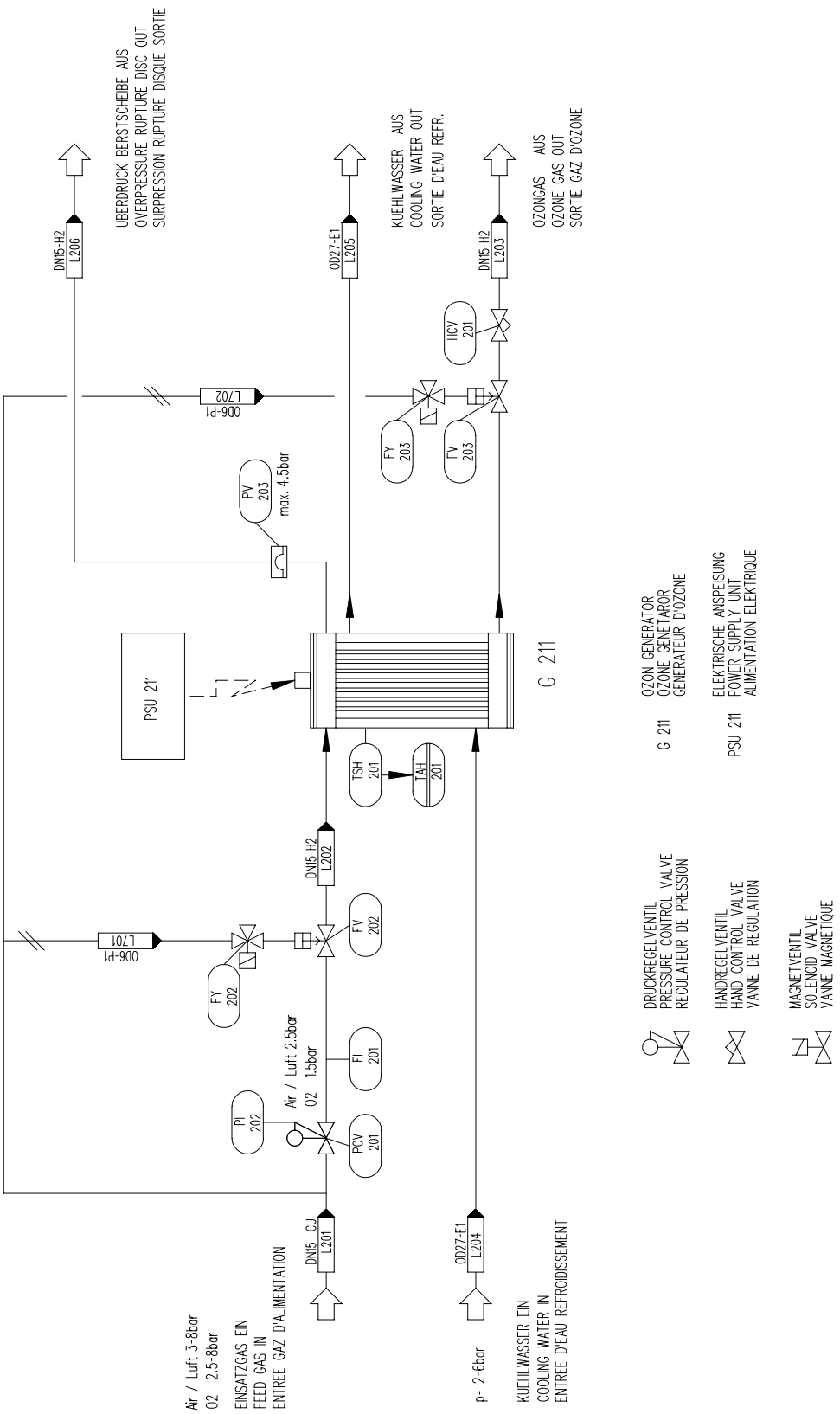
19. Appendix "Setting curves O_2"

Resulting ozone concentration

Feedgas: 92.4 wt% oxygen, 2.6 wt% nitrogen and 5 wt% argon
20°C Inlet temperature and mean gas pressure of 1.5 bar (g)
Cooling water inlet/outlet: 12 / 17°C



20. Appendix“P&I diagram”



Caption:

PCV201	Pressure control valve
FV202/FV203	Solenoid valve
PI202	Gas pressure display
FI201	Gas flow display
G211	Ozone generator
TSH201	Temperature monitor switch
TAH201	Temperature alarm, high
HCV201	Hand operated control valve
PV203	Rupture disc
PSU211	Electrical power supply

21. Appendix “Serto installation instructions”

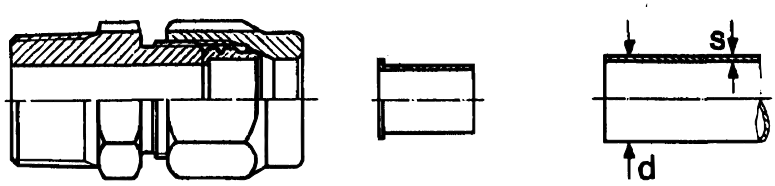
General:

- PIPING:
  Piping with a clean smooth surface is to be used, with external diameters within ± 0,1 mm.
- 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.

21.1 Metal fittings

EXTENT OF DELIVERY:

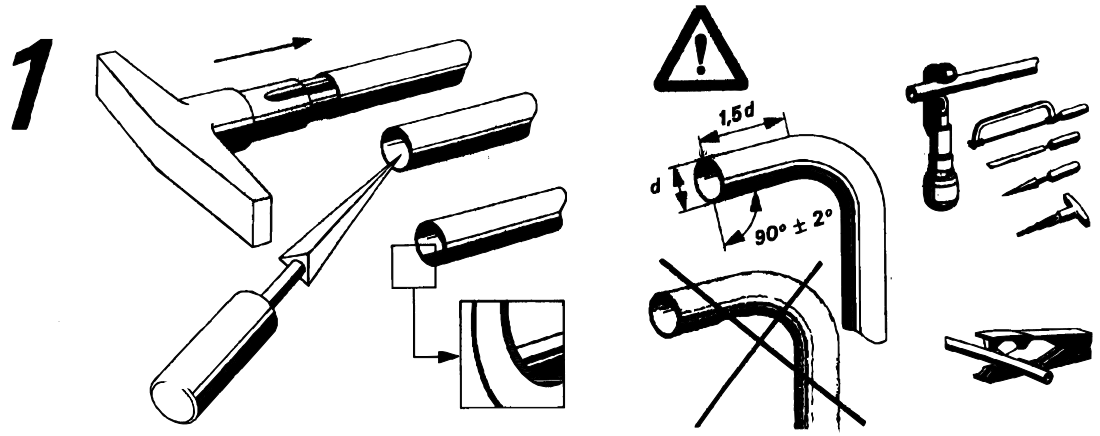
- SERTO cable fittings are delivered ready for assembly:
  Base part / connection nut / clamping ring



Supporting sleeve d = external tube diameter
S = wall thickness

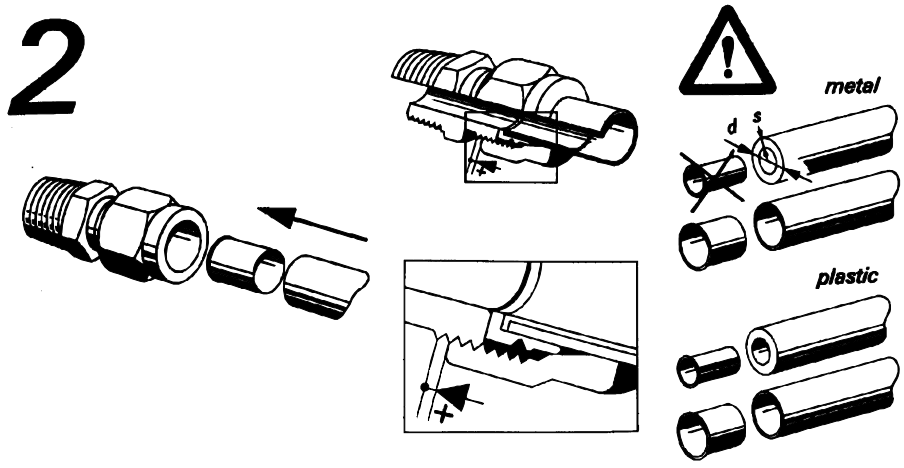
1) PREPARATION:

- 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.
- In order to prevent steel unions from seizing when tightening them up, the threads **and** the faces of the sealing collars **are to be** carefully lubricated with special grease suitable for oxygen service (e.g.: Oxigenoex S4 marketed by Klüber & Co). Special care is to be given to the sealing collar in order to ensure that the complete sealing surface is covered by a thin film of grease.



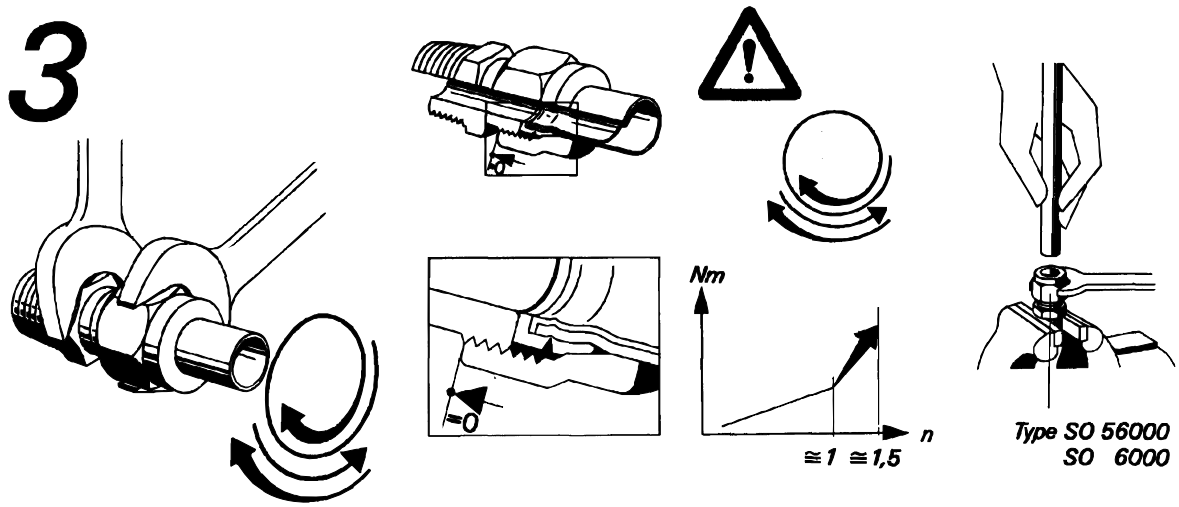
2) REINFORCE AND INSERT PIPE:

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



3) DEFORMATION, RELEASING TENSION, CHECKING:

- Screw on the union nut by hand until finger tight and tighten down the union nut 1 ½ rotation using an open ended spanner.
- Slightly release the nut once again to take the radial stress.
- screw on the union nut until finger tight again and tighten down the union nut with ¼ rotation for the final fit.

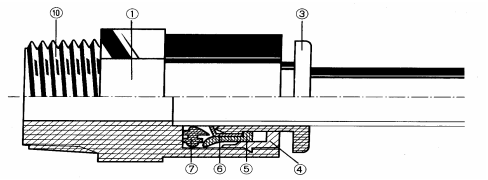


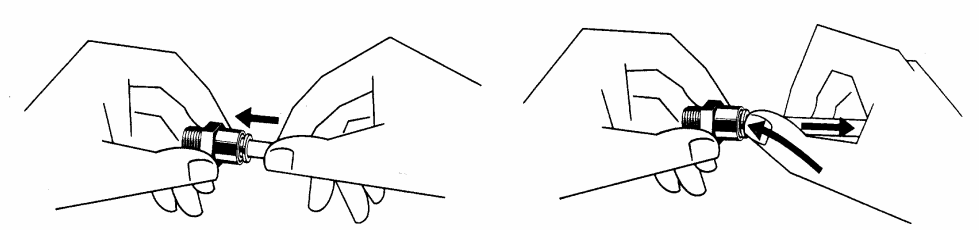
4) Repeated fitting of the union

- When refitting the same tube union, screw the union nut back on until finger tight and tighten down the union nut with an open ended spanner ¼ rotation for the final fit.

21.2 Chuck fittings FLIP

EXTENT OF DELIVERY:



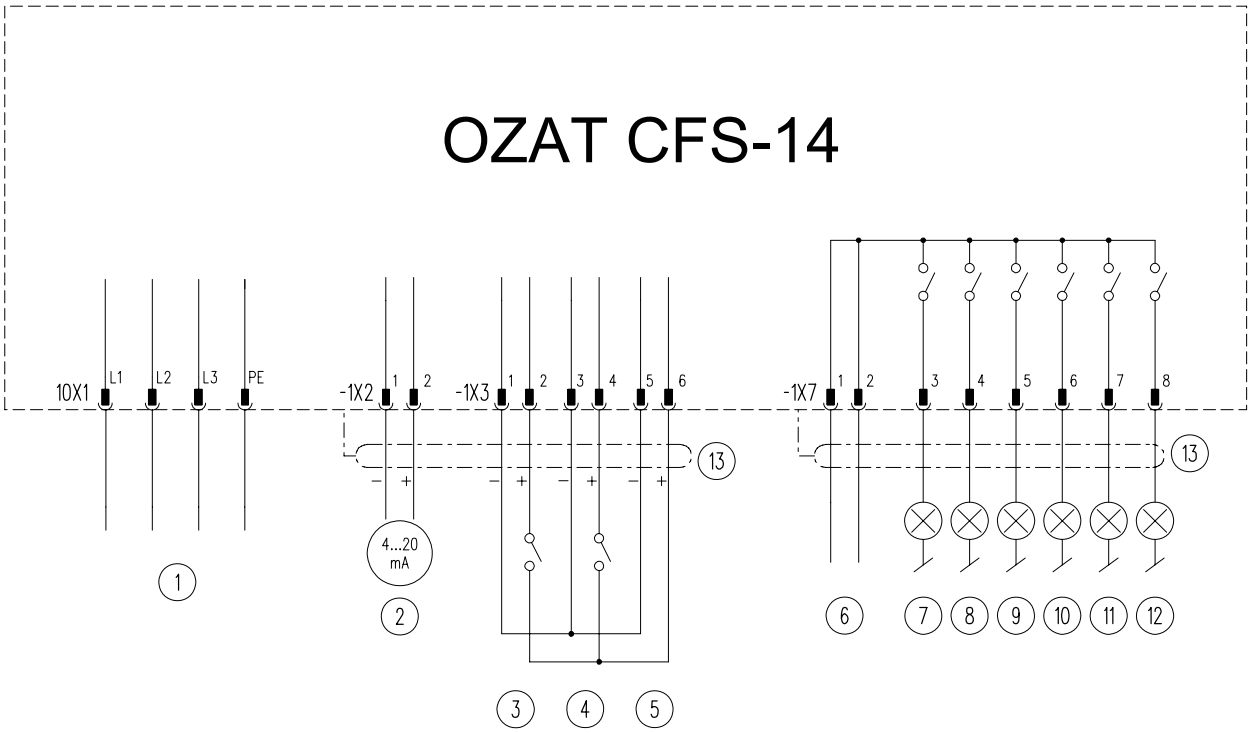


2) INSTALLATION INSTRUCTIONS (Tube installation and dismantling):

1. Cut plastic tube squarely and neatly to length (preferable with tube cutty SO 835). Damage to the end of the tube can result in leaks.
2. Insert the end of tube into the SERTO flip fitting and push it until it reaches the stop. The tube is held in the cartridge by the chuck and closed with the seal.
3. To dismantle the tube press the light-grey release button slightly and withdraw end of tube from the SERTO flip fitting. The chuck is opened by the button and releases the end of the tube.

Depending on the Quality of tube used, the end may need to be recut after several dismantlings.

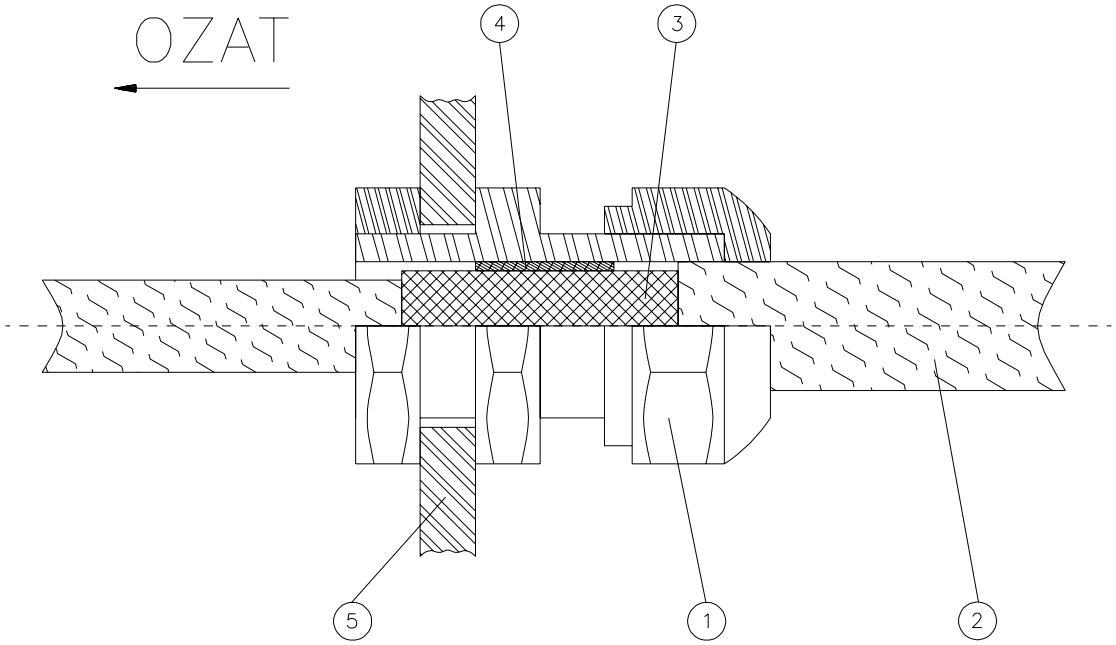
22. Appendix “Electrical connection circuit”



Caption:

1	-10X1	3-phase / PE mains connection	
2	-1X2	External set value 4...20 mA	(= 0...100 %)
3	-1X3	External on command	(contact closed)
4	-1X3	External gas valves open command	(contact closed)
5	-1X3	24 VDC power supply for external commands	**Use for external commands**
6	-1X7	Common potential	
7	-1X7	PSU running	(contact closed)
8	-1X7	Gas valves open	(contact closed)
9	-1X7	Control remote	(contact closed)
10	-1X7	Alarm Bit 0	
11	-1X7	Alarm Bit 1	
12	-1X7	Alarm Bit 2	
13		Screened cable	

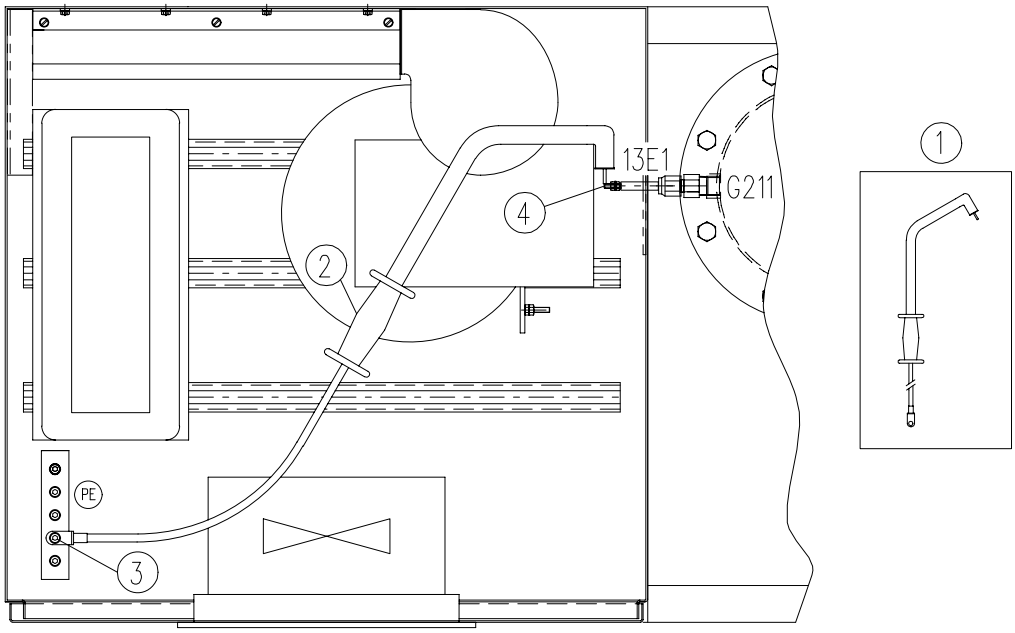
23. Appendix “EMP-Connector”



Caption:

1	EMP-Connector (**E**lektro-**M**agnetical-**P**ulse)
2	Screened cable
3	Screen
4	Electrical contacts
5	Gland plate (blank aluminium)

24. Appendix “Discharging the ozone generator module”



Caption:

G211	Ozone generator
13E1	Electrical connection
1	Discharging device
2	Isolated handle
3	Earth for discharge device
4	Metal to metal contact

25. Appendix “Standards, regulations and guidelines”

General:

- DIN EN ISO 12100 Machine guidelines
- EN 60204-1 Safety of Machines (European standard)
- EN 1278 Chemicals used for treatment of water intended for human consumption - 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 low temperature, 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 04/00/EDF 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-Nr. 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
  - Nr. 12 & 13 Ozone technology in water treatment.
  - Nr. 6 Information sheet regarding the handling of ozone and ozone generating systems in the water treatment.

The above standards, regulations and guidlines do not from a part of this service manual and should be procured separatly by the owner or user. In each and every case local regulations must be adhered to.

26. Electrical diagram

OZONIA

INSTALLATION : OZAT CFS-14

INSTALLATION : COMPACT OZONEGENERATOR

CLIENT : OZONIA AG

ORDER No. : 8022

CHANGE :	A	B	C	D	E	F
PREPARED:						
REVIEWED:						
APPROVED:						

NAME: CFS-14	EQUIPMENT COMPACT OZONEGENERATOR	OZONIA	SUPERSEDES :	=PSU21
ORDER No. : 8022	TITLE COVER SHEET		RESULT FROM:	+S01
PREPARED: 03.04.06Gi	REVIEWED: 03.04.06Mz	APPROVED: 03.04.06Mz	HSP107725	CHAN.: / SHEET 1 / TOTAL 15

SHEET-No	TITLE	PREPARED:	CHAN.:	CONT.T.CHAN.	REASON OF CHANGE
PSU21					
1	DECKBLATT	03.04.06 Gi			
2	BLATTVERZEICHNIS	03.04.06 Gi			
4	KENNZEICHNUNG VON BETRIEBSMITTELN	03.04.06 GI			
5	GRAPHISCHE SYMBOLE STARKSTROM	03.04.06 GI			
6	GRAPHISCHE SYMBOLE ELEKTRONIK	03.04.06 GI			
7	FARBKENNZEICHNUNG VON ELEKTRISCHEN LEITERN	03.04.06 GI			
8	BEZEICHNUNGSSYSTEM	03.04.06 GI			
9	BLOCKSCHALTBILD	03.04.06 GI			
10	EINSPEISUNG	03.04.06 GI			
11	STEUERPRINT	03.04.06 GI			
12	MMI	03.04.06 GI			
13	OZONERZEUGER	03.04.06 GI			
14	=PSU21+S01-1X3	03.04.06 GI			
15	=PSU21+S01-1X7	03.04.06 GI			
16	=PSU21+S01-1X2	03.04.06 GI			

CHANGE :	A	B	C	D	E	F
PREPARED:						
REVIEWED:						
APPROVED:						

NAME: CFS-14
ORDER No. : 8022
EQUIPMENT COMPACT OZONEGENERATOR
TITLE INDEX
PREPARED: 03.04.06Gi | REVIEWED: 03.04.06Mz | APPROVED: 03.04.06Mz

OZONIA

SUPERSEDES : =PSU21
RESULT FROM: +S01
HSP107725
CHAN.: | SHEET 2 | TOTAL 15

1 2 3 4 5 6 7 8

Kennbuchstaben der Gerätearten nach DIN 40719

ART DES BETRIEBSMITTEL	KENN-BUCH-STABE	BEMERKUNGEN
Baugruppen Teilbaugruppen Einschübe Rahmen Ortssteuerstelle	A	Gerätekombinationen, Baugruppen
Umsetzer von elektrischen auf nicht elektrische Grössen und umgekehrt	B	Messumformer, Thermoelemente, Widerstand Photowiderstand, Druckmessdosen Drehzahlregler, Geschwindigkeitsgeber
Kondensatoren	C	Kondensatoren aller Art
Verzögerungseinrichtungen Speichereinrichtungen UND- ODER-Glieder Digitale Regler Rechner	D	Einrichtungen der binären und digitalen Technik, Integrierte Schaltkreise
Verschiedenes Lüfter, Heizungen Elektrofilter	E	Betriebsmittel und Einrichtungen
Schutzeinrichtungen Spannungsableiter Fernmeldeschutzschaltungen Druckwächter Windfahnen elektronische Einrichtungen zur Sicherungsüberwachung	F	Sicherungen, Feinsicherungen
Generatoren Stromversorgungen	G	Rotierende und ruhende Generatoren Stromrichtgeräte, Taktgeber
Meldeeinrichtungen Fallklappenrelais Uhren, Zeitmeldungen	H	Optische und akustische Meldegeräte
Relais, Schützen Zeitrelais	K	Hilfsschütze, Leistungsschütze Relais
Induktivitäten	L	Drosseln, Spulen
Motoren	M	Motoren aller Art
Verstärker, Regler elektronische und elektromechanische Art Trennverstärker Analogrechner Integrierte Schaltkreise	N	Einrichtungen der analogen Steuerung

Kennbuchstaben der Gerätearten nach DIN 40719

ART DES BETRIEBSMITTEL	KENN-BUCH-STABE	BEMERKUNGEN
Messgeräte Prüfeinrichtungen Oszillographen, Datensichgeräte Einspeisepunkte	P	Analog, binär und digital Anzeigen Schreiber, Zähler
Starkstromschaltgeräte Schaltwalzen, Trennlaschen Installationsschaltgeräte	Q	Schalter in Hauptstromkreis, Trenner Schnellschalter
Widerstände, Heiss-, Kaltleiter Messwiderstände	R	Fest-, Einstell-, Regelwiderstände
Schalter, Wähler Endschalter, Wahlschalter Steuerwalzen Wählscheiben Drehwächter	S	Befehlsgeräte, Einbaugeräte, Druckgeräte
Transformatoren Wechselstrom Transduktoren	T	Netztrafos, Steuertrafos, Trenntrafos Stromwandler
Modulatoren Umsetzer von elektrischen in andere elektrische Grössen Optokoppler	U	Frequenzwandler; Demodulatoren; Frequenz-Spannungs(Strom)-Umformer; Signaltrennstufen
Röhren, Halbleiter Dioden, Transistoren	V	Anzeigeröhren, Verstärkerröhren
Übertragungswege Hohlleiter Meldeleitungen	W	Leitungen, Kabel, UKW-Richtfunk,HF-Leitungen
Klemmen, Stecker Steckdosen Klemmenleisten Lötleisten	X	Trennstecker, Prüfstecker, Koaxialleisten Steckverteiler, Rangierverteiler
Elektrisch betätigte mechanische Einrichtungen Schreiber	Y	Bremsen, Kupplungen, Ventile, Stellanzeigen Sperrmagnete, mechanische Sperren
Abschluss Ausgleichseinrichtungen Filter, Begrenzer Kabelanschluss	Z	A/C- und L/C- Filter, Funkentstörpässe Hochpässe, Tiefpässe und Bandpässe

CHANGE :	A	B	C	D	E	F
PREPARED:						
REVIEWED:						
APPROVED:						

NAME: CFS-14
ORDER No. : 8022
PREPARED: 03.04.06GI | REVIEWED: 03.04.06Mz | APPROVED: 03.04.06Mz

EQUIPMENT COMPACT OZONEGENERATOR
TITLE CLASSIFICATION OF APPARATUS

OZONIA

SUPERSEDES : =PSU21
RESULT FROM: +S01
HSP107725

CHAN.:	SHEET	TOTAL
	4	15

1		JUNCTION OF CONDUCTORS	21		BATTERY	41		ISOLATING LINK	61		CURRENT TRANSFORMER
2		ROOTING WIRE	22		SHUNT	42		DIRECTION OF FORCE OR MOTION	62		SINGLE-PHASE (VOLTAGE) TRANSFORMER
3		TERMINAL BLOCK	23		CAPACITOR	43		EARTH	63		THREE-PHASE (VOLTAGE) TRANSFORMER
4		PLUG AND SOCKET	24		MAKE CONTACT (NORMALLY OPEN, N/O)	44		PROTECTION EARTH	64		AUTO-TRANSFORMER, THREE-PHASE
5		RESISTOR	25		BREAK CONTACT (NORMALLY CLOSED, N/C)	45	PA	SCREEN EARTH	65	V	INDICATING INSTRUMENT, e.G. VOLTMETER
6		RESISTOR WITH PRESET ADJUSTMENT	26		CHANGE-OVER CONTACT, BREAK BEFORE MAKE	46		RELAY COIL WITH ONE WINDING	66	kWh	RECORDING INSTRUMENT e.G. WATTMETER
7		RESISTOR VARIABLE IN STEPS	27		N/O CONTACT WITH DELAYED CLOSING	47		RELAY COIL, DELAYED PICK-UP	67		
8		VARIABLE RESISTOR	28		N/O CONTACT WITH DELAYED OPENING	48		RELAY COIL, DELAYED DROP-OUT	68		THERMOCOUPLE
9		RESISTOR WITH MOVING CONTACT	29		N/C CONTACT WITH DELAYED OPENING	49		LIMIT SWITCH	69		SENSOR, PHOTOELECTRIC ELEMENT
10		RESISTOR WITH FIXED TAPPINGS	30		N/C CONTACT WITH DELAYED CLOSING	50		FLOAT SWITCH	70		
11		LINEAR	31		KEY SWITCH	51		THERMOSTAT	71		THERMOMETER WITH CONTACT
12		NON LINEAR	32		HAND SWITCH	52	P	PRESSURE SWITCH	72		
13		FLEXIBLE CONDUCTOR	33		PUSH-BUTTON	53	F	FLOW SWITCH	72	M 3~	THREE-PHASE SQUIRREL-CAGE MOTOR
14		WINDING (INDUCTANCE)	34		ILLUMINATED PUSH-BUTTON	54	I>	OVERCURRENT RELAY	74		
15		FUSE	35		STEPPING SWITCH	55	U<	OVERVOLTAGE RELAY	75		SOLENOID VALVE, CLOSED
16		ISOLATING FUSE-SWITCH	36		MINIATURE CIRCUIT-BREAKER	56		THERMAL RELAY	76		SOLENOID VALVE, OPEN
17		ISOLATING FUSE-SWITCH FOR ON-LOAD SWITCHING	37		MOTOR PROTECTION SWITCH	57		INDICATOR LAMP	77		BELL
18		CUT-OUT WITH ALARM CONTACT	38		CIRCUIT BREAKER	58		MECH. COUPLING, DISENGAGED	78		HORN
19		OVER-VOLTAGE ARRESTER	39		ON-LOAD ISOLATOR	59		MECH. COUPLING, ENGAGED	79		SIREN
20		RECTIFIERS, GENERAL SYMBOL	40		ISOLATOR	60		SOLENOID COUPLING	80		

CHANGE :	A	B	C	D	E	F
PREPARED:						
REVIEWED:						
APPROVED:						

NAME: CFS-14	EQUIPMENT COMPACT OZONEGENERATOR	OZONIA	SUPERSEDES : =PSU21
ORDER No. : 8022	TITLE SYMBOLS POWER CURRENT		RESULT FROM: +S01
PREPARED: 03.04.06GI	REVIEWED: 03.04.06Mz	APPROVED: 03.04.06Mz	HSP107725

CHAN.:	SHEET	TOTAL
	5	15

1	SUPPLY VOLTAGE, NEGATIVE POLE	19	SEMICONDUCTOR DIODE				
2	SUPPLY VOLTAGE, POSITIVE POLE	20	ZENER DIODE				
3	SUPPLY VOLTAGE, COMMON POLE	21	LIGHT EMITING DIODE (LED)				
4	DETACHABLE CONNECTION	22	THYRISTOR				
5	OPERATIONALLY NON-DETACHABLE CONNECTION	23	BREAK-OVER-DIODE				
6	CONTROL ZERO	24	PNP TRANSISTOR				
7		25	NPN TRANSISTOR				
8		26	FET N TRANSISTOR				
9		27	FET P TRANSISTOR				
10		28	VARIABLE CAPACITANCE DIODE (VARACTOR)				
11	COAXIAL CABLE	29	UV ULTRA-VIOLET LAMP				
12	COAXIAL PAIR WITH SCREEN	30					
13	TRIAXIAL CABLE	31					
14	TWISTED CONDUCTORS	32					
15	SCREENED CABLE	33	VOLTAGE DEPENDENT RESISTANCE (VARISTOR)				
16	MULTI-CORE SCREENED CONNECTION	34	TEMPERATURE DEPENDENT RESISTANCE				
17	4 OF 7 CONDUCTORS ARE TWISTED TOGETHER	35	MAGNETIC FIELD DEPENDENT RESISTANCE				
18	4 OF 7 CONDUCTORS ARE WITHIN ONE EARTHED SCREEN	36					
		37	CONVERTER (SUPPLY DEVICE OR SIGNAL CONVERTER) e.G. 125V TO 24V				

CHANGE :	A	B	C	D	E	F
PREPARED:						
REVIEWED:						
APPROVED:						

NAME: CFS-14	EQUIPMENT COMPACT OZONEGENERATOR	OZONIA	SUPERSEDES : =PSU21
ORDER No. : 8022	TITLE SYMBOLS ELECTRONIC		RESULT FROM: +S01
PREPARED: 03.04.06GI	REVIEWED: 03.04.06Mz	APPROVED: 03.04.06Mz	HSP107725 CHAN.: SHEET 6 TOTAL 15

IDENTIFICATION OF COLORS FOR ELECTRICAL CABLES

EN 60204-1/15.2

IEC 757

PROTECTIVE CONDUCTOR	YELLOW-GREEN
NEUTRAL CONDUCTOR	LIGHT BLUE
MAIN CURRENT CIRCUIT WITH AC AND DC CURRENT	BLACK
CONTROL CIRCUIT WITH AC VOLTAGE	RED
CONTROL CIRCUIT WITH DC VOLTAGE	BLUE
INTERLOCKING CIRCUIT EXTERNAL VOLTAGE	ORANGE
POTENTIAL FREE CURRENT CIRCUIT	WHITE
0V - REFERENCE	WHITE / GREEN
ELECTROSTATIC SHIELDING	WHITE / YELLOW

KABELFARBCODE NACH DIN47100 FÜR KLEINSPANNUNG <=50V

ADER-NR: 1 -> WEISS

ADER-NR: 2 -> BRAUN

ADER-NR: 3 -> GRÜN

ADER-NR: 4 -> GELB

ADER-NR: 5 -> GRAU

ADER-NR: 6 -> ROSA

CABLE TYPE KEY ACORDING TO CENELEC HD361

SECTION OF THE WIRES WITHOUT INDICATION : 1 mm2

CHANGE :	A	B	C	D	E	F
PREPARED:						
REVIEWED:						
APPROVED:						

NAME: CFS-14	EQUIPMENT COMPACT OZONEGENERATOR	SUPERSEDES :	=PSU21
ORDER No. : 8022	TITLE IDENTIFICATION OF COLORS FOR ELECTRICAL CABLES	RESULT FROM:	+S01
PREPARED: 03.04.06MI	REVIEWED: 03.04.06Mz / APPROVED: 03.04.06Mz	HSP107725	CHAN.: / SHEET 7 / TOTAL 15

=	A A A	N N N	+	A A	N N	–	N N A	N . N N	:	N N N

INSTALLATION

INST. MARKING

INST.-NO

SITE

SITE MARKING

SITE-No

DEVICE

SHEET-No/CODE

DEVICE-No

TERMINAL

TERMINAL-NO

= INSTALLATION

\+ SITE

– DEVICE

: TERMINAL

A LETTERS

N NUMBER

TERMINAL MARKING

-X1	POWER SUPPLY >50 VAC / >75 VDC
-X2	MEASURING AND REGULATING SIGNALS
-X3	CONTROL SIGNALS <=50 VAC / <=75 VDC
-X4	CONTROL SIGNALS >50 VAC / >75 VDC
-X5	INTRINSICALLY SAFE AND EXPLOSION-PROOF CIRCUITS
-X6	MEASURMENTS IN POWER CIRCUIT (I,U,P)
-X7	EXTERNAL SIGNALISATION
-X8	INTERFACE TERMINALS FOR TRANSPORT DIVISIONS

INSTALLATION

= EC21	:	CONTROL MAIN
= PSU21	:	OZONE GENERATOR POWER SUPPLY

SITE MARKING

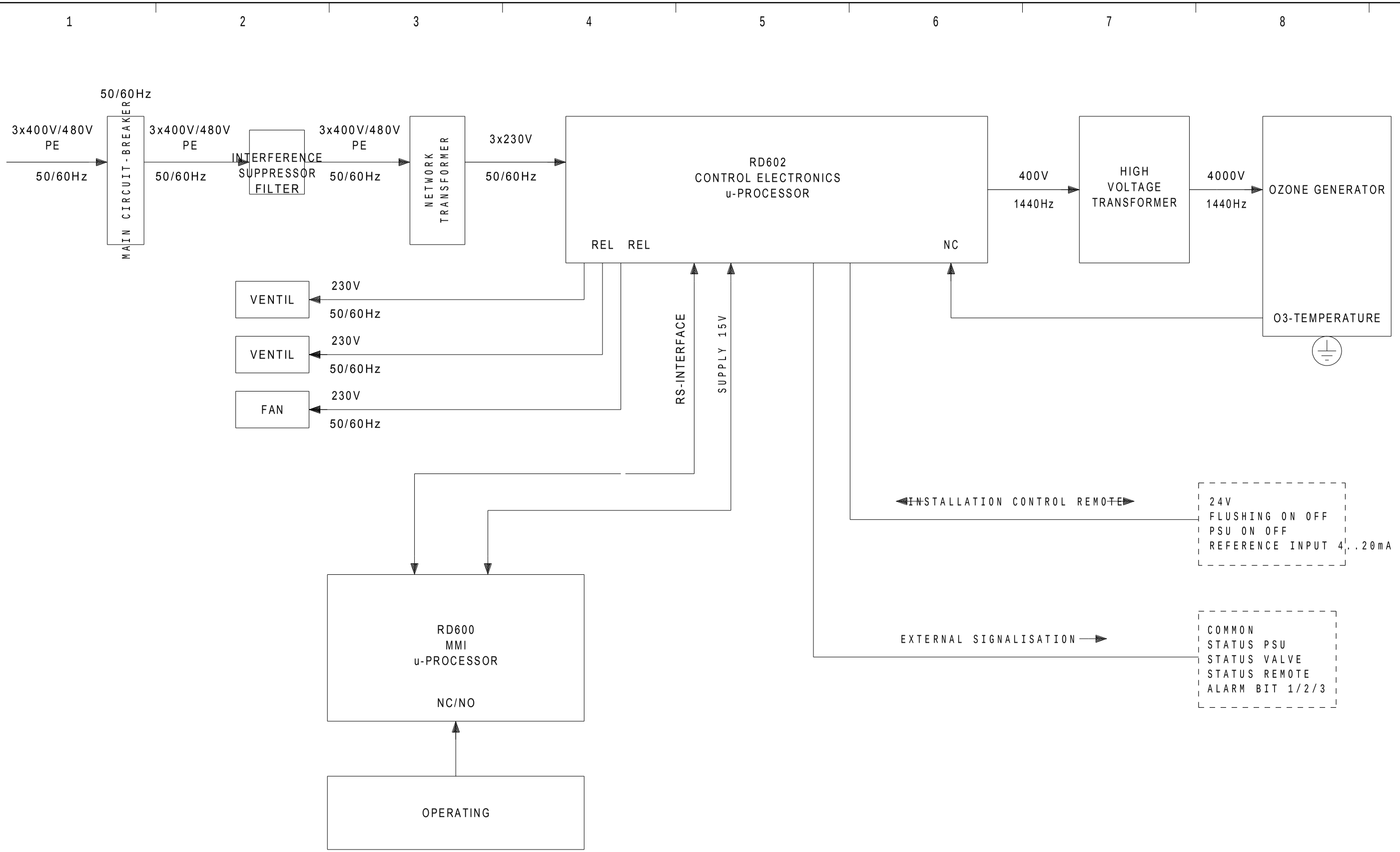
+ S01	:	CUBICLE
+ EC00	:	CUSTOMER
+ G21	:	OZONE GENERATOR

CHANGE :	A	B	C	D	E	F
PREPARED:						
REVIEWED:						
APPROVED:						

NAME:	CFS-14	EQUIPMENT COMPACT OZONEGENERATOR	
ORDER No. :	8022	TITLE INTRODUCTION OF CLASSIFICATION	
PREPARED: 03.04.06 GI	REVIEWED: 03.04.06 Mz	APPROVED: 03.04.06 Mz	

OZONIA

SUPERSEDES :	= PSU21
RESULT FROM:	+ S01
HSP107725	CHAN.: / SHEET 8 / TOTAL 15

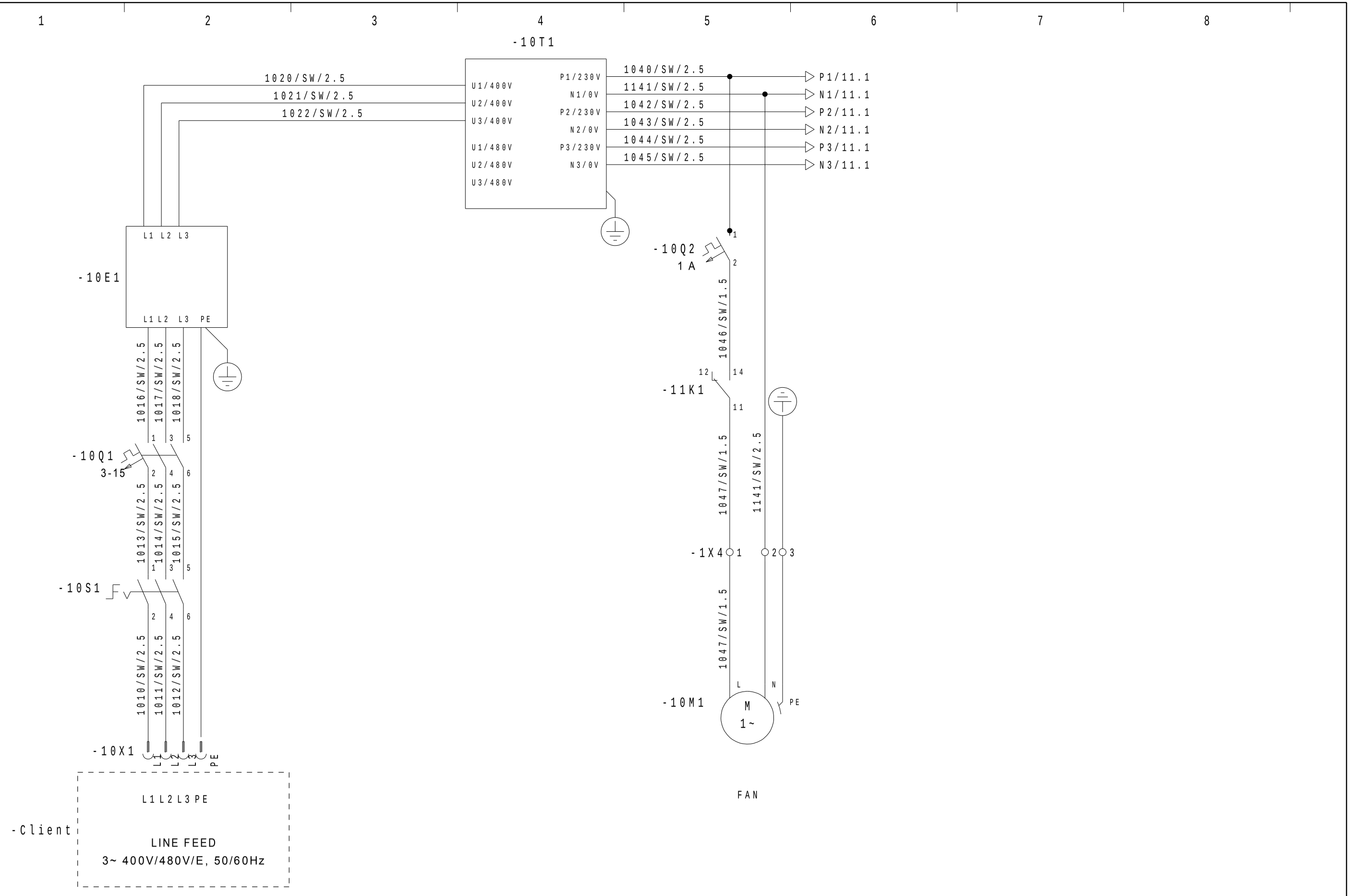


CHANGE :	A	B	C	D	E	F
PREPARED:						
REVIEWED:						
APPROVED:						

NAME:	CFS-14	EQUIPMENT COMPACT OZONEGENERATOR	
ORDER No. :	8022	TITLE BLOCKSCHALTBILD	
PREPARED: 03.04.06GI	REVIEWED: 03.04.06Mz	APPROVED: 03.04.06Mz	

OZONIA

SUPERSEDES :	=PSU21		
RESULT FROM:	+S01		
HSP107725	CHAN.:	SHEET 9	TOTAL 15



CHANGE :	A	B	C	D	E	F
PREPARED:						
REVIEWED:						
APPROVED:						

NAME:	CFS-14	EQUIPMENT COMPACT OZONEGENERATOR	
		TITLE LINE FEED	
ORDER No. :	8022		
PREPARED: 03.04.06GI	REVIEWED: 03.04.06Mz	APPROVED: 03.04.06Mz	

OZONIA

SUPERSEDES :				=PSU21
RESULT FROM:				+S01
HSP107725	CHAN.:	SHEET 10	TOTAL 15	

-11A1

PE -X1

P1/10.6 1040/SW/2.5 2
N1/10.6 1041/SW/2.5 3
P2/10.6 1042/SW/2.5 4
N2/10.6 1043/SW/2.5 5
P3/10.6 1044/SW/2.5 6
N3/10.6 1045/SW/2.5 7

RD602

DIVERSE MESSPUNKTE FUER
REFERENZ-, IST- UND EINSTELLWERTE
(Z.B. NENNSTROM, STEUERSPANNUNG,
IMPULSE USW.)

-J3
REFERENCE INPUT REMOTE - 1 1150/BL/0.34
REFERENCE INPUT REMOTE + 2 1151/BL/0.34
PSU REMOTE - 3 1152/BL/0.34
ENABLE + 4 1153/BL/0.34
FLUSHING EXTERNAL - 5 1154/BL/0.34
FLUSHING EXTERNAL + 6 1155/BL/0.34
24 VDC - 7 1156/BL/0.34
24 VDC + 8 1157/BL/0.34

-J4
COMMON 1 1160/WS/0.34
COMMON 2 1161/WS/0.34
STATUS PSU 3 1162/WS/0.34
STATUS VALVE 4 1163/WS/0.34
STATUS REMOTE 5 1164/WS/0.34
ALARM BIT0 6 1165/WS/0.34
ALARM BIT1 7 1166/WS/0.34
ALARM BIT2 8 1167/WS/0.34

-1X2 1 2
-1X3 1 2 3 4 5 6
-1X7 1 2 3 4 5 6 7 8
=PSU21+EC00

0.34 mm2 BR -J1 1
WS 2
0.34 mm2 BR -J2 1
WS 2

-X3 1 2 3 4
-X4 1 2
-X2 V1 U1
-J5

BR HLBL BR HLBL BR HLBL

10 MMI/12.3
1140/SW/10 U1/13.1
1141/SW/10 V1/13.1

-11C1
1130/SW/1.0
1131/SW/1.0
-11K1 A1 A2
1 2 3
U1 V1 Z PE
M 3~ -11M1
14 12 11 /10.5
FAN

1.0 mm2 PE1
1.0 mm2 PE1

-11B1 T TSH201-1
-11B2 T TSH201-2

OZONE GENERATOR HV-TRANSFORMER
TEMPERATURE HIGH TEMP. HIGH

-11Y2 FV202
-11Y3 FV203

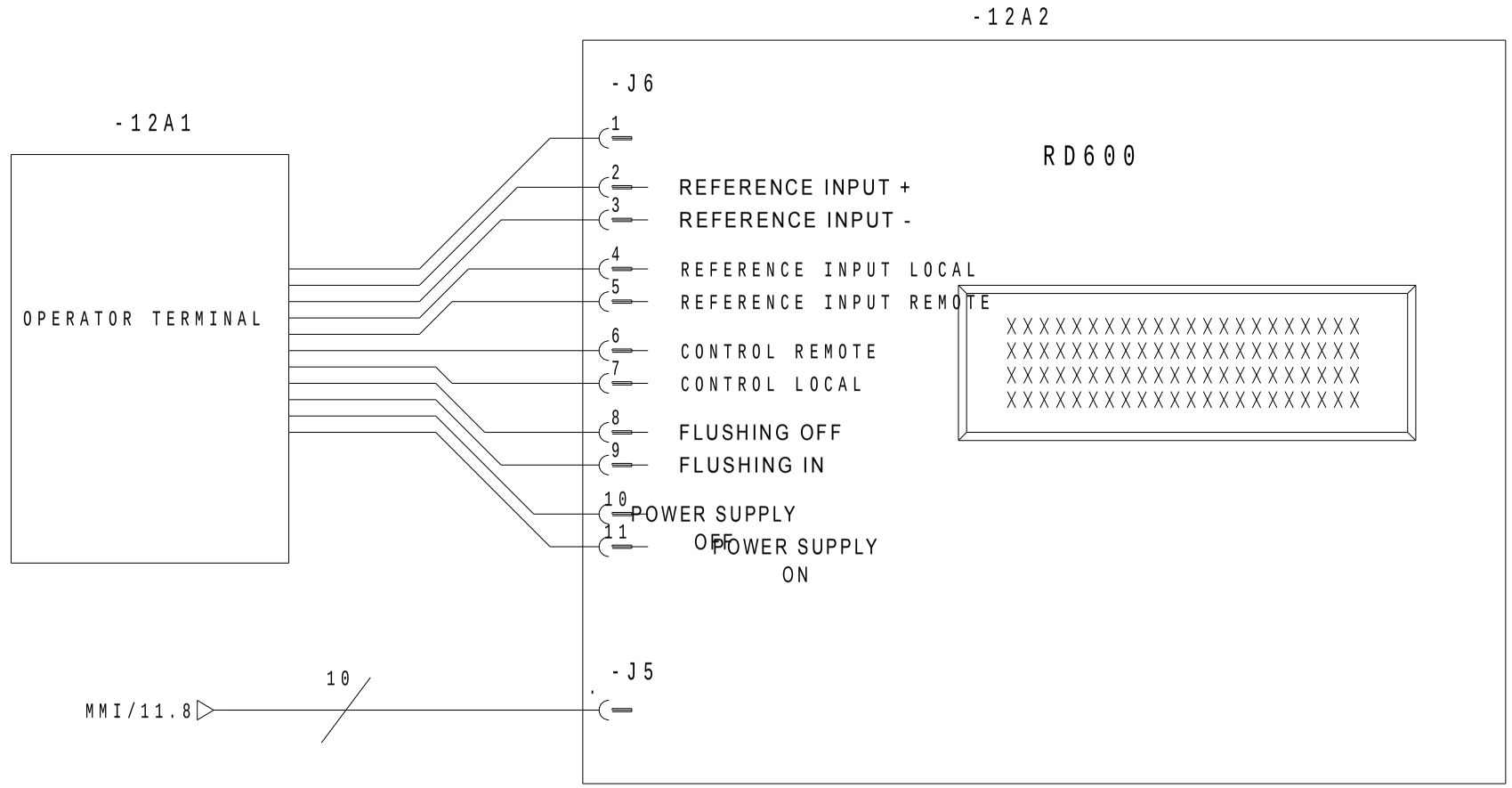
=PSU21+G21

CHANGE :	A	B	C	D	E	F
PREPARED:						
REVIEWED:						
APPROVED:						

NAME:	CFS-14	EQUIPMENT COMPACT OZONEGENERATOR	
		TITLE CONTROL ELECTRONICS	
ORDER No. :	8022		
PREPARED: 03.04.06GI	REVIEWED: 03.04.06Mz	APPROVED: 03.04.06Mz	

OZONIA

SUPERSEDES :		=PSU21	
RESULT FROM:		+S01	
HSP107725	CHAN.:	SHEET 11	TOTAL 15



CHANGE :	A	B	C	D	E	F
PREPARED:						
REVIEWED:						
APPROVED:						

NAME: CFS-14	EQUIPMENT COMPACT OZONEGENERATOR	OZONIA	SUPERSEDES :	=PSU21
ORDER No. : 8022	TITLE MMI		RESULT FROM:	+S01
PREPARED: 03.04.06MI	REVIEWED: 03.04.06Mz	APPROVED: 03.04.06Mz	HSP106364	CHAN.: / SHEET 12 / TOTAL 15

=PSU21+G21

-13T1

U1/11.8

V1/11.8

1331

1132/SW/1.5

HV.1.5
mm2

U

V

16kVA

400VP

3900VS

1440Hz

%ANZ.

PE

HV

O_3

-13E1

E

1.5
mm2

13T1	AIR	O2
+10%		
+5%		
0%	X	
-5%		X
-10%		

HIGH VOLTAGE TRANSFORMER

OZONE GENERATOR

CHANGE :	A	B	C	D	E	F
PREPARED:						
REVIEWED:						
APPROVED:						

NAME: CFS-14
ORDER No. : 8022
PREPARED: 03.04.06GI | REVIEWED: 03.04.06Mz | APPROVED: 03.04.06Mz

EQUIPMENT COMPACT OZONEGENERATOR
TITLE OZONE GENERATOR

OZONIA

SUPERSEDES : =PSU21
RESULT FROM: +S01
HSP107725

CHAN.:	SHEET	TOTAL
	13	15

TERMINALBLOCK:

=PSU21+S01-1X3

ORIGIN				DESTINATION
+DESTINATION-	CROSS REF.	JUMPER	TERMINAL-No.	+DESTINATION-
-J3:3	11.7	○	1	
-J3:4	11.7	○	2	
-J3:5	11.7	○	3	
-J3:6	11.7	○	4	
-J3:7	11.7	○	5	
-J3:8	11.7	○	6	

P+I.No.

CORE MARKING

CABLE No. TYPE mm2

ITEMNUMBER

CHANGE :	A	B	C	D	E	F
PREPARED:						
REVIEWED:						
APPROVED:						

NAME: CFS-14
EQUIPMENT TERMINAL DIAGRAM
TITLE =PSU21+S01-1X3
ORDER No. : 8022
PREPARED: 03.04.06GI REVIEWED: 03.04.06Mz APPROVED: 03.04.06Mz

OZONIA

SUPERSEDES : .
RESULT FROM:
HSP107725

=PSU21
+S01
CHAN.: SHEET 14 TOTAL 15

TERMINALBLOCK:

=PSU21+S01-1X7

ORIGIN +DESTINATION-	CROSS REF.	JUMPER	TERMINAL-No.	DESTINATION +DESTINATION-	P+I.No.	CORE MARKING	CABLE No. TYPE mm2	ITEMNUMBER
-J4:1	11.7	○	1					

CHANGE :	A	B	C	D	E	F
PREPARED:						
REVIEWED:						
APPROVED:						

NAME: CFS-14
ORDER No. : 8022
EQUIPMENT TERMINAL DIAGRAM
TITLE =PSU21+S01-1X7
PREPARED: 03.04.06GI REVIEWED: 03.04.06Mz APPROVED: 03.04.06Mz

OZONIA

SUPERSEDES : .
RESULT FROM:
HSP107725
=PSU21
+S01
CHAN.: SHEET 15 TOTAL 15

TERMINALBLOCK:

=PSU21+S01-1X2

ORIGIN +DESTINATION-	CROSS REF.	JUMPER	TERMINAL-No.	DESTINATION +DESTINATION-
-J3:1	11.7	○	1	
		○		
		○		
		○		
		○		
		○		
		○		
		○		
		○		
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		○		

P+I.No.

CORE MARKING | CABLE No. TYPE | mm2

ITEMNUMBER

CHANGE :	A	B	C	D	E	F
PREPARED:						
REVIEWED:						
APPROVED:						

NAME: CFS-14 | EQUIPMENT TERMINAL DIAGRAM | TITLE =PSU21+S01-1X2

ORDER No. : 8022

PREPARED: 03.04.06GI | REVIEWED: 03.04.06Mz | APPROVED: 03.04.06Mz

OZONIA

SUPERSEDES : .
RESULT FROM:
HSP107725

=PSU21
++S01
CHAN.: | SHEET 16 | TOTAL 15