



# ITT

## EFFIZON Ozone Generator Series GSO

### Operating Instructions



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**WEDECO**



**ITT**

**WEDECO**

**Operating instructions**

**Series GSO**

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# **1 Fundamental References**

## **1.1 Information for the customer**

The basic prerequisite for safe handling and trouble free operation of this system is good knowledge of the fundamental safety instructions. Ensure that all personnel working on and with the system observe these operating instructions, particularly the part containing the safety instructions. In addition, observe the accident prevention rules and regulations valid for the place of application.

## **1.2 General**

In case of doubt always contact **WEDECO**.

Prior to operating the system and/or performing any conversion or maintenance work, read the respective chapter first; i.e., read the chapter on cleaning, for example, before you start with the cleaning work.

The required protection devices, e.g., personal breathing mask, measuring device to monitor the room air, car plugs, etc., must be provided by the owner/user.

The owner/user of the system must ensure that, in accordance with the local, valid regulations, appropriate escape routes have been provided for the personnel in case of EMERGENCY. The owner/user must ensure that the escape routes are neither obstructed nor their function impaired (e.g., doors opening in the escape route direction).

## **1.3 Intended Use of the System**

Use the system exclusively for its intended purpose. This will be explained in more detail in chapter "Technical data".

This system has been built in accordance with the current state-of-the-art technology, and is operationally safe, when the operating instructions as well as the system and operation related specifications and the accident prevention regulations are observed.

However, this system can pose a danger to life and limb of the user or third persons, as well as damage to the system and other property.

Only use the system when in perfect technical condition for its intended purpose. Always work in a safety conscious manner, being aware of possible dangers, while observing the operating instructions! Immediately rectify malfunctions which could influence the safety! (or have them rectified)

## **1.4 Inadmissible Use of the System**

Danger may emanate from any machine, when it is used improperly by untrained personnel or not used in line with its intended purpose. Ensure that the operating instructions for the system are accessible to the user and the maintenance and repair



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personnel for the duration of the system service life. This system shall not be used for water treatment according to DIN 19627.

Keep a copy of these operating instructions in close vicinity of the system! Keep a copy of these operating instructions available for maintenance and repair work!!

The operational safety of the supplied system is only guaranteed when it is appropriately in accordance with our instructions.



Always observe these operating instructions! Any use deviating from this will invalidate the liability and guarantee of **WEDECO**!

Dispose of pollutants/contaminants in a manner to exclude any danger for people and the environment. Leakage of hazardous substances also endangers our environment. Strictly observe the legal regulations.

## 1.5 User Qualification

These operating instructions are an integral part of the delivery scope of the ozone generation system.

Ensure that the operating instructions are studied in detail, and are fully understood. In all cases, ensure that the chapter "Safety" is read very attentively.

Restrict system operation to qualified persons:

### User Qualification:

- a) The **owner/user**, as a higher ranking, legal person, is responsible for the intended use of the system, and for the training as well as employment of the authorized persons. The owner/user defines the legal competencies and authority to issue directives for the authorized personnel of his company.
- b) **Qualified personnel** are persons who, due to their technical training, knowledge and experience, as well as their knowledge of the relevant regulations, can correctly judge the work appointed to them, and who can recognize possible danger.  
Here, only trained specialized personnel, who have been selected and deemed to be capable by the owner/user, are taken into account.
- c) **Trained persons** are those who have been informed and trained with regard to the tasks appointed to them and possible danger in the event of improper behavior, they have also been instructed with regard to the required protection devices and protective measures.
- d) **Unskilled labour** are those who are qualified neither according to paragraph b) (qualified personnel) nor according to paragraph c) (trained persons).

Only allow **qualified personnel** to perform installation, disassembly, maintenance and repair work.

Restrict all other work to be performed on or with the system to **trained personnel**.

A form to confirm the instruction is contained in the appendix.

Observe the legal, admissible minimum age!  
Restrict work on the system to persons over 18 years of age.

## **1.6 General Information Operating Instructions**

This chapter contains general information of the operating instructions. In order to ensure safe use do read this chapter carefully prior to operating the system.

### **1.6.1 Structure of the Operating Instructions**

The operating instructions are divided into sections in accordance with the following scheme:

- In the chapters "fundamental references" and "fundamental safety instructions" we provide all the information on safety and on safety precautions whilst using the system.
- The chapter "technical data" contains all the data of the system, the specification of the gases which are to be used and the surrounding conditions.
- The chapter "description and function" contains fundamentals of the ozone production.
- The chapter "transport and storage" contains work instructions for maintenance technical personnel concerning transport of the system. Here the general procedure is described with these activities.
- The chapter "commissioning/start-up" contains the instructions for maintenance men and technical personnel for starting up the system.
- The chapter "operation" describes the normal operation of the system, and how to switch the system on and off. In addition the measures necessary with feed gas change are described.
- In the chapter "maintenance and repair" the maintenance table of the system is specified.
- In the chapter "spare parts" the procedure for ordering spare parts is described.
- The chapter "system shut - down and disposal" describes the actual procedure for the shut - down of the system. The chapter contains the work instructions for maintenance men/technical personnel in the case of the shut - down ( storage ) and/or disassembly of the system.
- The "appendix" contains a form "confirmation of instruction", an explanation (written and diagrammatic) of the characteristics, the spare part lists, the EMV test certificate and the EEC conformity declaration"

### **1.6.2 Liability and Warranty**

All data and information concerning operation and maintenance of the system are to the best of our knowledge based on our previous experience and know-how.

We are only liable within the framework of the warranty obligation agreed upon in the main contract for any legal entitlements resulting from this contractual agreement.

The original version of these operating instructions has been prepared in the German language, and objectively examined by us. The translation into the respective country/contractual language was performed by an approved translations company.

All responsibilities of **WEDECO** become invalid in the event:

- of insufficient or non-observance of the information contained in this manual;
- the system is used contrary to its specifications or in a manner for which it was not intended;
- spare parts or parts are used which are not approved by **WEDECO**;
- of incorrect operation;
- protection devices are removed, manipulated or not used/installed;
- functions or materials to be processed are changed/modified in a manner not expressly approved for this system;
- of unauthorized changes/modifications of the system;
- maintenance is performed not in line with the operating instructions;
- parts subject to wear are excluded from the manufacturer's warranty;
- when replacing parts or procuring spare parts, only use original spare parts approved by WEDECO.

Liability and legal responsibility is excluded when operating and/or usage errors can be proven.

Changes and/or adaptations of the system are possible in certain cases. These, however, require prior written approval from WEDECO.

These operating instructions were prepared and compiled with the greatest of care. However, should you detect incompleteness and/or errors, please inform us.

Our operating instructions are updated on a regular basis. Your improvement suggestions will assist us in preparing a user-friendly operating manual.

Therefore, if you can submit suggestions, please let us know so that we may take them into account.

We kindly request you to inform us of any possible errors or uncertainties in writing immediately.

All documentation is the intellectual property of WEDECO and must neither be copied nor published without our consent.

### **1.6.3 Safekeeping of the Operating Instructions**

Ensure that the operating instructions for the GSO series Ozone Generator are accessible to the user and the maintenance and repair personnel for the duration of the system service life. Keep a copy of these operating instructions in close vicinity of the system! Keep a copy of these operating instructions available for maintenance and repair work! Ensure that these operating instructions are always accessible!

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If you have any further questions, suggestions or problems, please do not hesitate to contact our customer service. Further copies of these operating instructions may be ordered. Please note that such order is subject to a fee.

**1.6.4 Copyright**

All rights exclusively withheld. Do not copy or make available to third parties, regardless in which form, without prior written consent of **WEDECO**.

## 2 Safety

The safety measures and safety devices are described in this chapter. Do read this chapter carefully prior to operating the system to ensure its safe use.

### 2.1 Pictographs

In these operating instructions the following designations and pictographs are used to indicate danger:

**Non-observance of these instructions may have serious, harmful effects and may even result in life threatening injuries!**



**Warning: Injuries or danger to life and limb of personnel**



**Warning: Property and/or environmental damage**



**Important information**



**Warning: Dangerous electrical voltage**



**Warning: Poisonous/toxic substances  
This may lead to serious injuries or death**



**Warning: Electromagnetic field**



**Warning: Environmental damage**



**Information**



**Prohibited for persons wearing pacemakers**



**No fire, naked flame and/or smoking**



**Splashing with water is prohibited**



**Use breathing protection apparatus/mask**



**Use ear protection**

## 2.2 General Safety Requirements



The system meets the fundamental EU health and safety requirements. Nevertheless, dangerous situations can still occur.

1. In order to guarantee safety, ensure that all persons coming in contact with the system are familiar with the content of these operating instructions. Only in this manner can the pending risks be reduced to a minimum.
2. Never use the system for a purpose other than that intended by **WEDECO**. Misuse of the system may result in unforeseeable risks.
3. Always observe the local operating and safety regulations and laws. The same applies to the environmental regulations.
4. If the personnel detects errors/faults or danger, the operator or his representative must be informed immediately.
5. If several persons work on the system at the same time, excellent cooperation and precise coordination of the activities are required.
6. Technical knowledge and the sense of responsibility of the employer and employee are necessary to ensure the safe and effective use of the system.
7. Never remove or by-pass safety devices such as cover hoods/protective circuits during normal operation of the system.

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8. If it is necessary to remove the safety devices during set-up, maintenance and repair, ensure that the safety devices are refitted and checked immediately upon completion of the maintenance and repair work.
9. In order to guarantee safety, it is important that only personnel required for the specific activity are within the immediate danger zone of the system.
10. Restrict work on technical equipment (e.g. pneumatics, electric) to the respective qualified personnel.
11. When handling oil, grease and other chemical substances, always observe the safety regulations relevant for the particular product! Never come in contact with the chemicals. Always read and adhere to the user instructions on the package prior to working with these substances. This applies to all chemicals as well as cleaning agents.
12. Ensure that personnel in training only work on/with the system under strict supervision of an experienced person.
13. Always keep all safety and danger signs/information on the system in a condition that allows them to be read easily.
14. Do not allow hot parts to come in contact with explosive or highly flammable chemicals.

## 2.3 Safety Devices and Regulations



All existing safety devices or those to be provided by the system owner/user are described in this section.

Ensure that all safety devices are maintained in perfect condition.

### 2.3.1 Emergency Stop

The system owner/user must ensure that ozone production can be switched off by means of an EMERGENCY command device (EMERGENCY STOP switch). Ensure that the EMERGENCY command device is located and identified at an easily accessible, safe location near the door of the ozone generator room.

An EMERGENCY STOP switch is of a red/yellow color.

The electric circuit is designed such as to allow the system to be integrated in an EMERGENCY STOP circuit. For this purpose, connect the unit to a socket which is isolated from the supply voltage in the event of an EMERGENCY STOP.



Only use EMERGENCY STOP switches in the event of danger to person or system.

In all other cases, ensure that the system is switched off in its normal manner.

Reset the EMERGENCY STOP switch to allow restarting of the system.

In case of EMERGENCY, use the EMERGENCY STOP switch near the door of the ozone generator room or the power switch on the system. Once activated, the power supply and the feed gas flow will be stopped immediately.

#### **Resetting following an EMERGENCY STOP of the system:**

- Start the system (Refer to chapter "Operation")

### **2.3.2 Protection Devices**

Ensure that protection devices are only removed/deactivated by persons authorized for this purpose, and only if absolutely necessary to perform certain work. Ensure that the protection devices are reattached/activated immediately upon completion of this work.

Only use original fastening hardware for the protection devices.

#### Lockable covers

All system parts such as the complete electrical equipment, ozone generators, etc., are permanently installed in a sheet metal cabinet, secured by a lockable door. This prevents contact with these parts and protects against serious injuries.

### **2.3.3 Requirements for the Installation Place**



Ensure that ozone systems are installed in closed, lockable rooms. Do not allow permanent workplaces or work stations in rooms with ozone systems.

If the installation site of the system cannot be separated from the workplace for technical processing reasons, reliably monitor the ozone concentration in the room air.

**The maximum workplace concentration value of  $0.2 \text{ mg/m}^3$  ( $\approx 0,1 \text{ ppm}_v$ ) applies .**

Ensure that rooms in which ozone leaks may occur are effectively monitored by means of gas detectors with visual and acoustic indicators.

These rooms are, for example: rooms containing ozone systems, rooms crossed with ozone supplying pipelines.

Ensure that the monitoring device (measuring sensor) is attached at a location where the highest ozone concentration can be expected in the event of a hazardous incident.

**If this concept is taken into account, the alarm value may be set to  $1.0 \text{ mg/m}^3$  ( $\approx 0,5 \text{ ppm}_v$ ).**

**Ensure that rooms accommodating ozone systems are identified with the following warning symbols:**





Warning: Poisonous substances

Ozone system! Access only for trained persons



No fire, naked flame and/or smoking



Prohibited for persons with pacemakers

The symbols must meet the accident prevention regulations "Safety identification at the workplace" (VBG 125).

### 2.3.4 Personal Protection Equipment (PPE)



The owner/user must ensure that an ozone proof breathing protection apparatus in form of a full mask with effective filter is available for and identified with the name of each respective person working on/with the ozone system.

Furthermore, he must ensure that the employees are familiar with the use of the breathing protection apparatus by having at least one exercise/practice per year, and that they are properly used.



Suitable ear protection must be provided

## 2.4 Guidelines for the Handling of Ozone and Oxygen

### 2.4.1 Safety Instructions for Ozone



Ozone consists of three oxygen atoms with a modular mass of  $\approx 48$  kg/kmol. At normal conditions ( $0^\circ\text{C}$  and 1.013 bar (abs)), the density of ozone is  $2.15 \text{ kg/m}^3$ . The chemical symbol is  $\text{O}_3$ .

Ozone is heavier than air!

At normal pressure, ozone is a colorless to blue gas. The boiling point of ozone is approx.  $-112^\circ\text{C}$ . Ozone condenses to form a blue fluid.

Depending on the concentration ozone produces an odor similar to carnations, hay or chlorine.

The smelling threshold is approx.  $\approx 0.02 \text{ mg/m}^3$  ( $\approx 0.01 \text{ ppm}_v$ ), the maximum workplace concentration value is  $0.2 \text{ mg/m}^3$  ( $\approx 0.1 \text{ ppm}_v$ ,  $\approx 0.1 \text{ ml/m}^3$ ).

Ozone is non-combustible; however, it does promote combustion processes, so that even spontaneous explosive reactions are possible.



Ozone oxidizes almost all metals, inorganic and organic substances (except for example gold, platinum, stainless steel, glass and ceramic).



The intensive oxidation characteristics of the ozone are used for disinfecting purposes (extremely damaging effect on low organisms, e.g., bacteria, fungi), and for the partial and complete oxidation of organic and inorganic substances (e.g., COD degradation, AOX degradation). Organic compounds are oxidized through ozone. They can be degraded to carbon dioxide and water.

## 2.4.2 Health Risks of Ozone



Physiologically, ozone acts as an irritant. Particular targets are mucous membranes of the eyes, nose and lungs. Ozone can result in poisoning when inhaled.

Physical strain and a rise in the ambient temperature increase the toxicity of ozone, so that otherwise harmless concentrations could have a toxic effect. An increase of the room temperature by 8°C doubles the toxicity.



Irritation of the throat (urge to cough) occurs in the event of prolonged exposure to an atmosphere with ozone concentrations exceeding 0.2 mg/m<sup>3</sup> (≈ 0.1 ppm<sub>v</sub>).

Concentrations from 1.0 mg/m<sup>3</sup> (≈ 0.5 ppm<sub>v</sub>) cause extreme irritation of the eyes and the mucous membranes of the respiratory tract. Several minutes of exposure cause extreme irritation of the throat and/or coughing and deadening of the sense of smell. Difficulty of breathing occurs, indicating toxic pulmonary edema.

From 2.0 mg/m<sup>3</sup> (≈ 1.0 ppm<sub>v</sub>) tightening of the chest, dizziness and headaches can be felt, higher concentrations result in circulatory disorders and salivation.

Persons who are exposed to low ozone concentrations frequently or for a prolonged period of time may fall ill with chronic bronchial ailments.



Prolonged exposure to ozone concentrations exceeding 20 mg/m<sup>3</sup> (≈ 10 ppm<sub>v</sub>) will result in unconsciousness, pulmonary hemorrhaging and death. Inhaling ozone in concentrations exceeding 10000 mg/m<sup>3</sup> (≈ 5000 ppm<sub>v</sub>) will lead to death in several minutes.

### 2.4.3 Recommended Protection Methods for Ozone



High performance ozone generators can generate ozone concentrations up to 13 wt% and above. These values by far exceed the deadly limit. Minor leaks can result in an ozone concentration in the surrounding area of the system which is life threatening to people. Therefore, it is vital to ensure that ozone gas detectors are installed in this area.



Ensure that rooms housing ozone systems are equipped with a technical ventilation system guaranteeing an air exchange of at least three times per hour. An extraction type ventilation must exist with the intake opening located directly above the floor. The ventilation system must turn on automatically when a gas detector responds to the potential danger.

Only enter rooms in which an ozone accumulation exists or can be expected when wearing a breathing protection apparatus to rescue an injured person or to avert acute danger.

Never keep breathing protection apparatus in rooms containing any equipment of the ozone system.

An ozone-proof full mask with an effective filter may be used as a breathing protection apparatus. Due to the fact that masks are intended for individual persons, ensure that a mask identified by the person's name is provided for each operator.



Ensure that ozone systems are only serviced by specialized personnel. Specialized personnel are persons who, due to their technical training and experience have adequate knowledge with the handling of ozone systems, and are sufficiently familiar with the relevant, public work protection regulations, accident prevention regulations, DIN norms, and other rules and regulations to correctly assess an operationally safe condition of ozone systems.



**Ensure that all parts coming in contact with the ozone are free of oil and grease.**



Ensure that off-gas containing ozone is lead to the outside via an effective residual ozone destruction system.

Prior to opening systems with gas containing ozone, rinse them until no more ozone can be detected. Remove the gas safely (refer to chapter "Rinsing the system for drying").



**In general, we would like to point out that the owner/user is responsible for posting operating instructions "Handling ozone" in the operating room, these instructions should be legible and accessible for all employees. Please refer to the chapter "Appendix" for a draft text.**

## 2.5 Guidelines for the Handling of Oxygen

### 2.5.1 Safety Instructions for Oxygen



Oxygen consists of two oxygen atoms with a molar mass of  $\approx 32$  kg/kmol. At normal conditions ( $0^\circ\text{C}$  and 1.013 bar (abs)), oxygen has a density of  $1.43 \text{ kg/m}^3$ . The chemical symbol is  $\text{O}_2$ . Oxygen is heavier than air.

At normal pressure, oxygen is a colorless and odorless gas. At  $-183^\circ\text{C}$  and normal pressure, oxygen condenses to form a blue liquid. Below  $-219^\circ\text{C}$  it crystallizes to form a blue solid matter.

Oxygen is non-combustible, however it enables and promotes combustion processes. No combustion is possible in an oxygen-free environment. That means that any flame will extinguish in the event of an oxygen deficiency.

The oxygen content in the air is  $\approx 21 \text{ Vol\%}$ .



A risk to health for humans exists when the oxygen content of respiratory air drops below 17 Vol%.

An increased oxygen concentration causes a considerable increase in the combustion speed. Furthermore, technical safety characteristics such as pressure increase speeds, ignition and glow temperatures, explosion pressures and flame temperatures also change.



Oxygen can cause spontaneous ignition of oil and grease. This also applies to clothing soiled by oil and grease.

Oxygen bonds with almost all elements. Most substances react so violently with oxygen that they either burn following ignition or even self-ignite.

### 2.5.2 Health Risks of Oxygen



At normal pressure, oxygen concentrations below  $\approx 50 \text{ Vol\%}$  can be regarded as harmless even at prolonged exposure.



When pure oxygen is inhaled for a prolonged period of time, lung damage and functional disturbances of the autonomic nervous system may occur.

Inhaling pure oxygen for even a short time will lead to symptoms of poisoning such as dizziness, nausea, vision disorders, defective hearing and disequilibrium, cramps/convulsions, unconsciousness and even death.



Minor difficulty in breathing following acute inhalation of high oxygen concentrations will usually disappear after exposure to fresh air. Liquid oxygen may cause serious frostbite.

**Operating instructions**
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An increased risk of fire exists when clothing is contaminated with oxygen.

The danger of oxygen accumulation is high, particularly because an increased oxygen concentration is imperceptible for people.

**Therefore, ensure that:**



- no oxygen penetrates the clothing
- no combustion is induced through an excess of oxygen
- no ignition is triggered.

**Therefore, never:**

- use oxygen for ventilation
- blow dust or dirt out of clothing using oxygen
- wear clothing soiled with oil and/or grease
- never handle lines carrying oxygen with hands soiled by oil or grease
- smoke where oxygen is suspected

### 2.5.3 Recommended Protective Methods (Oxygen)



Due to the danger of ignition, ensure that all system parts coming in contact with oxygen have been cleaned; i.e., they must be free of particles that are loose or can be released during operation, such as slag, welding residue and machining swarf, as well as oil, grease and solvents. This requirement can be fulfilled by pickling stainless steel following the welding process.



Only use fittings, seals and measuring devices that are approved for oxygen and kept free of oil and grease.

Never touch with oil-saturated cleaning cloths or greasy fingers. Never wear clothing soiled with oil and/or grease.



Ensure that only specialized personnel, with lots of experience in the handling of oxygen, check the system for leaks.

For heat insulation, only use materials which do not react dangerously with oxygen, e.g., glass wool or polyurethane sheeting.

Ensure that lines carrying oxygen are identified by a coat of paint, inscription or signs.

Ensure that rooms where oxygen leaks can occur are ventilated in such a way that the air cannot be enriched with oxygen. In the event that natural ventilation is not sufficient, technical ventilation is required.

Ensure that floor covering only consists of non-combustible materials in areas where liquid oxygen can escape. Therefore, asphalt (bitumen) is not admissible.



Never store combustible or self-igniting materials within a safety area of 5 m surrounding possible outlet points of liquid oxygen.

**Operating instructions****Series GSO**

The oxygen tank must be suitable protected against collisions/bumping from vehicles or other equipment.

Ensure that the employees have been made aware of the possible dangers when working with oxygen, and are instructed regarding the safety measures to be taken.



**In general, we would like to point out that the owner/user is responsible for posting operating instructions "Handling oxygen" in the operating room, in a condition that allows them to be read easily by all employees. Please refer to the chapter "Appendix" for a sample.**

## **2.6 Instruction**

The owner/user of the system is obligated to instruct each person, who works with or on this system over the mode of operation, use and the preventive measures which are to be adhered to. The observance of the operating instructions to the inspection and maintenance conditions form an integral part of use.

The instructed persons have to confirm by signature that they have read and have understood all the points in the operating instructions (see form in the appendix). The owner/user is liable for damage that is caused by personnel who have not been instructed.

## 3 Technical Data

### 3.1 Description of the System

Ozone generators are systems for the generation of ozone up to 13 %wt. The feed gas is either air or oxygen. Main components are the water cooled ozone generator and the electric power supply unit.

### 3.2 System Identification

These operating instructions are part of the **WEDECO** ozone generator series GSO. There is a machine plate on the GSO series ozone generators. An exemplar is shown here for the system type GSO 30

# WEDECO

Type / Typ	: GSO 30		
Const. year / Baujahr	: 2003		
Manufacturer no. / Herstellnr.	: 997092		
Process gas / Einsatzgas	: Air / Oxygen Luft / Sauerstoff		
Operation pressure / Betriebsüberdruck	: 1,5 / 0,5	bar g	
Gas flow / Gasstrom	: 2,0 / 1,0	m <sup>3</sup> /h	
Rated capacity / Nennleistung	: 40 / 100	g/h	
Connected load / elektrische Anschlußwerte	:		
<div><div>230 V</div><div>5,0 A</div><div>1,1 kVA</div><div>48...62 Hz</div></div> <div>CE</div>			
WEDECO GmbH D - 32051 Herford / Germany			
Made in Germany			

**Fig 3-1: Machine plate**

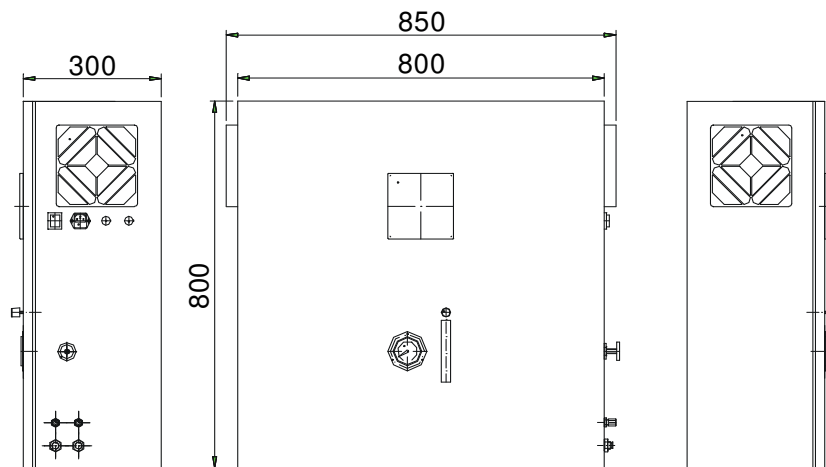
A machine plate has been attached on the ozone generator of the GSO series, containing the most important data.

### 3.3 System Dimensions and Weight

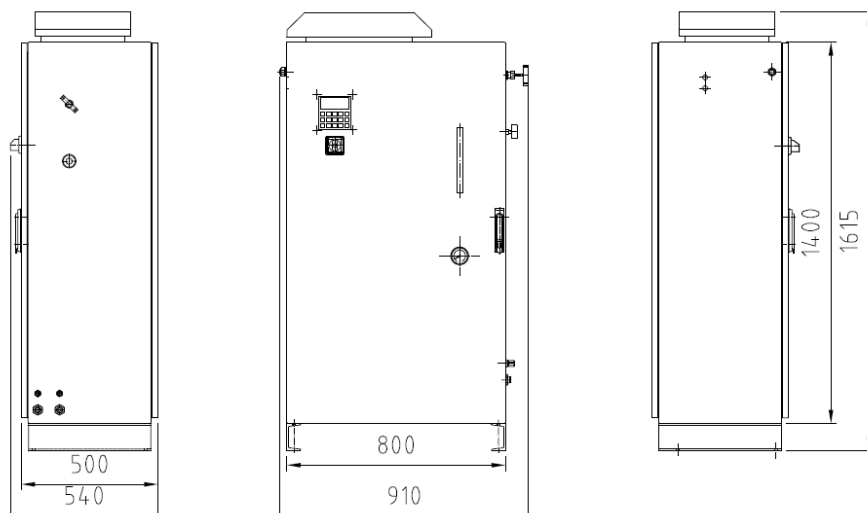
The following tables show the system dimensions and weight of the GSO series.

Type	GSO 10	GSO 20	GSO 30	GSO 40-06	GSO 50	
Width	850			910		mm
Depth	350			540		mm
Height	800			1615		mm
Weight	80	85	85	185	290	kg

**Table 3-1: System dimensions and Weight**



**Fig 3-2: View of GSO 10 to 30**



**Fig 3-3: View of GSO 40-06 and 50**



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### 3.4 Nominal Capacity

**Nominal capacity** (with a cooling water temperature of 15 °C at the input)

**Feed gas:** Air or oxygen

Typ	GSO 10		GSO 20		GSO 30		GSO 40-06		GSO 50		
Feed gas	Air	O <sub>2</sub>	Air	O <sub>2</sub>	Air	O <sub>2</sub>	Air	O <sub>2</sub>	Air	O <sub>2</sub>	
Nominal production	15	30	25	50	46	100	80	200	203	400	g/h
Nominal ozone concentration	20	100	30	100	23	100	20	100	26	100	g/m <sup>3</sup> (NPT)
Nominal ozone concentration	≈1,5	≈7	≈2,3	≈7	≈1,7	≈7	≈1,5	≈7	≈2,0	≈7	wt %
Feed gas requirement	0,75	0,3	0,9	0,51	2,02	1,02	4,0	2,0	7,8	4,0	m <sup>3</sup> /h (NPT)
Setting range, ozone production	15...100				10...100		10...100				%
Coolant requirement	0,08				0,17		0,35		0,7		m <sup>3</sup> /h
Mains voltage	230 ±10%, 1-phase						230 ±10%, 1-phase		400 ±10%, 3-phase		V <sub>AC</sub>
Mains frequency	48-62						48-62				Hz
Mains power consumption	1,5		2,5		5		10,5		6,5		A <sub>AC</sub>
Electric power consumption	0,35		0,6		1,15		2,4		4,5		KVA
Mains performance factor	0,99						0,99		0,95		cosφ

**Table 3-2: Nominal capacity data**

### 3.5 Connection to Electrical Power Supply

The power connection is ensured by a Unit plug (L1/N/PE) or a Unit plug GSO 50 (L1/L2/L3/N/PE). The series fuse must meet the local regulations and the specified performance values.

The power set point value can be set externally by using a signal from 0 to 20 mA (see electrical connection diagram).

It is possible to start the operating system by using an external voltage source (+15 ...+24V direct voltage), if this type of setting has been selected on the control terminal.

Potentially free relay contacts are available for Multi-input warning and Set point int/ext.

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### 3.6 Ambient Conditions

**Specifications of the Ambient conditions to be used at the EFFIZON® - GSO - ozone generators:**

Type	GSO 10	GSO 20	GSO 30	GSO 40-06	GSO 50	
Ambient temperature for operation	5 - 35			5 - 35		°C
Ambient relative humidity for operation	< 70			< 70		% rel H.
Ambient temperature for Transport and storage	-20 bis 60			-20 bis 60		°C
Ambient relative humidity for Transport and storage	< 70			< 70		% rel H.
Protection type for installation	IP 32			IP 32		
Power dissipation to the environment	100	200	200	400	700	W

**Table 3-3: Ambient conditions**

### 3.7 Specification of Feed Gas and Cooling Water

**Specifications of the gases to be used in the EFFIZON® - GSO - ozone generators:**

	Oxygen from liquid tanks	Oxygen from air separation plants	Air	
Oxygen concentration	99.5...99.9	85...95 (93 standard)	21	Vol%
Water content	<4	<4	<4	ppm
Atmospheric dew point	<-70	<-70	<-70	°C
Content of hydrocarbons	<20	<20	<20	ppm
Nitrogen content	>1000 after consultation	>1000 after consultation		ppm
Solids content	particle free (filter 0.1µm)	particle free (filter 0.1µm)	particle free (filter 0.1µm)	

**Table 3-4: Requirements placed on the feed gas**

**Specifications of the coolants to be used in the EFFIZON® - GSO - ozone generators**

Drinking water can be used as coolant. When other fluids are used, at least the following values must be observed:



No rust or iron particles

**Operating instructions**
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No indissoluble or corrosive components

Iron < 0.3 mg/l

Manganese < 0.05 mg/l

Chloride < 100 mg/l

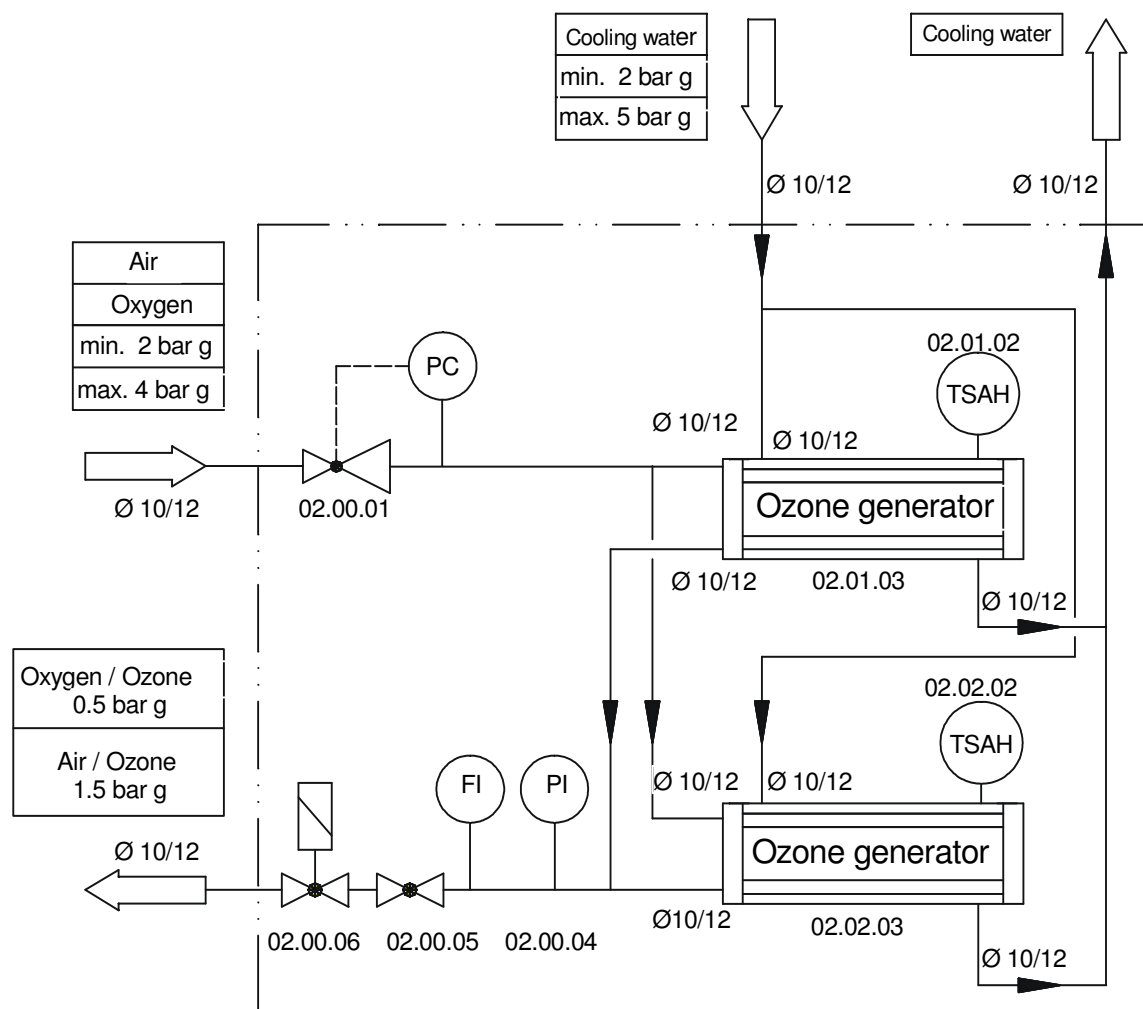
### 3.8 Operating Data of the Ozone Generator

**Feed gas: Air and oxygen**

Type		GSO 10		GSO 20		GSO 30		GSO 40-06		GSO 50	
Feed gas		Air	O <sub>2</sub>	Air	O <sub>2</sub>	Air	O <sub>2</sub>	Air	O <sub>2</sub>	Air	O <sub>2</sub>
Inlet pressure	bar g	2.5 - 5						2.5 – 5			
Outlet pressure	bar g	1.5	0.5	1.5	0.5	1.5	0.5	1.5	0.5	1.5	0.5
Temperature	°C	5 - 35						5 – 35			
Gas flow range	Nm <sup>3</sup> /h	0.08. -0.9	0.06 -0.65	0.08 -0.9	0.06 -0.65	0.3 -2.1	0.2 -1.5	0.4 -4.9	0.35 -3.5	1.0 -7.8	0.45 -5.7
Ozone concentration range	wt % g/Nm <sup>3</sup>	Air: up to 4.5 Air: up to 60 O <sub>2</sub> up to 13 O <sub>2</sub> up to 195						Air: up to 4.5 O <sub>2</sub> : up to 13 Air: up to 60 O <sub>2</sub> : up to 195			
cooling water pressure max	bar g	5						5			
Cooling water pressure min	bar g	2						2			

**Table 3-5: Operating parameters, feed gas**

### 3.9 P&I Diagram



----- **WEDECO** scope of delivery ends here

**Fig 3-4: P&I Diagram**

## 4 Description and Function of the System

### 4.1 System Function

This section gives you an overview of the system's operation and components.

### 4.2 System Components

#### Ozone generator with ozone generating elements

The ozone generator is designed as a water-cooled tubular heat exchanger, to allow the effective elimination of heat resulting from the production of ozone.

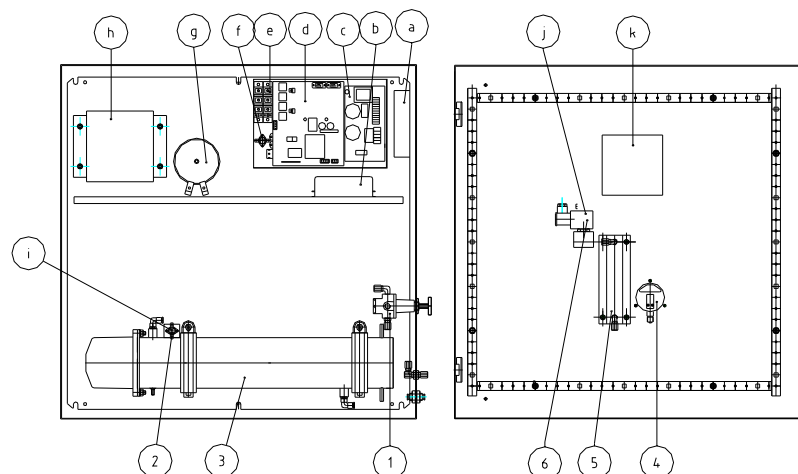
The pipes in the ozone generator serve as gas discharge pipes, in which the ozone generation takes place in accordance with the "silent electrical discharge" principle. Electrodes are arranged in the gas discharge pipes which are separated from the pipes by a dielectric made of glass. A middle frequency high voltage, adjustable in order to adapt to the ozone production desired, is applied to these electrodes.

#### Energy supply

The converter is part of the energy supply of an ozone system. Its task is to adapt the ozone production to the respective requirements through variable adjustment of the electrical output voltage. The converter supplies a single phase, middle frequency output voltage, which is transformed by the high voltage transformer to the high voltage of approx. max 8 kV required for ozone production.

#### Fittings

The fittings and monitoring instruments, included in the delivery scope as standard, allow safe handling of the ozone system and protect it against damage or destruction.



**Fig 4-1: Inside view of the system GSO 10 to GSO 30**

# Operating instructions

# Series GSO

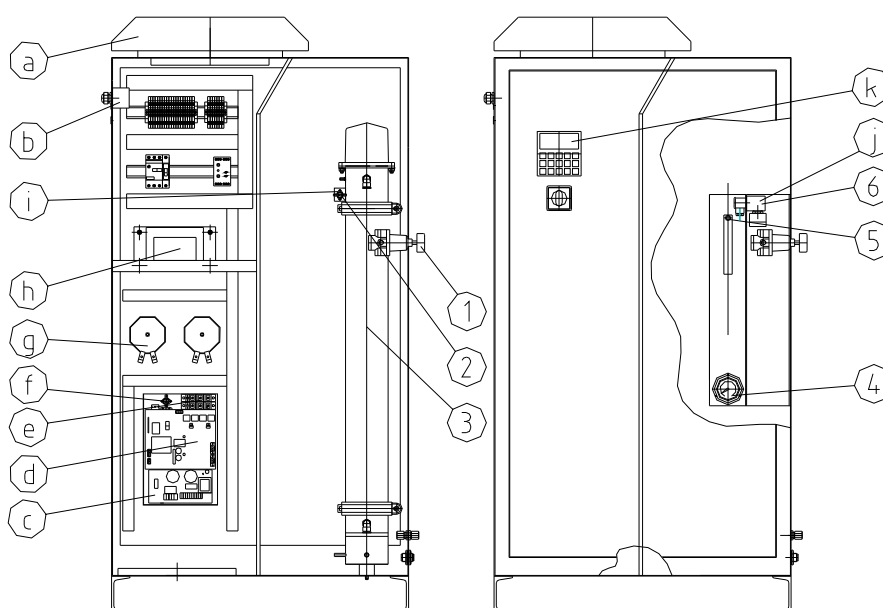
## Legend, mechanical

Pos. No.:	RI-No.:	Designation
1	02.00.01	Pressure reducer
2	02.00.02	Temperature monitor
3	02.00.03	Ozone generator
4	02.00.04	Pressure gauge
5	02.00.05	Flow meter with needle valve
6	02.00.06	Solenoid valve

## Legend, electrical

Pos.:	Designation	Pos.:	Designation
a.	Axial fan	g.	Intermediate circuit throttle
b.	Net filter	h.	High voltage transformer with temperature switch
c.	Module converter A	i.	Temperature switch
d.	Module converter B	j.	Solenoid valve
e.	Module converter C	k.	Module display
f.	Module converter D		

**Table 4-1: System legend mechanical/electrical GSO 10 to GSO 30**



**Fig 4-2: Inside view of the system GSO 40-06**

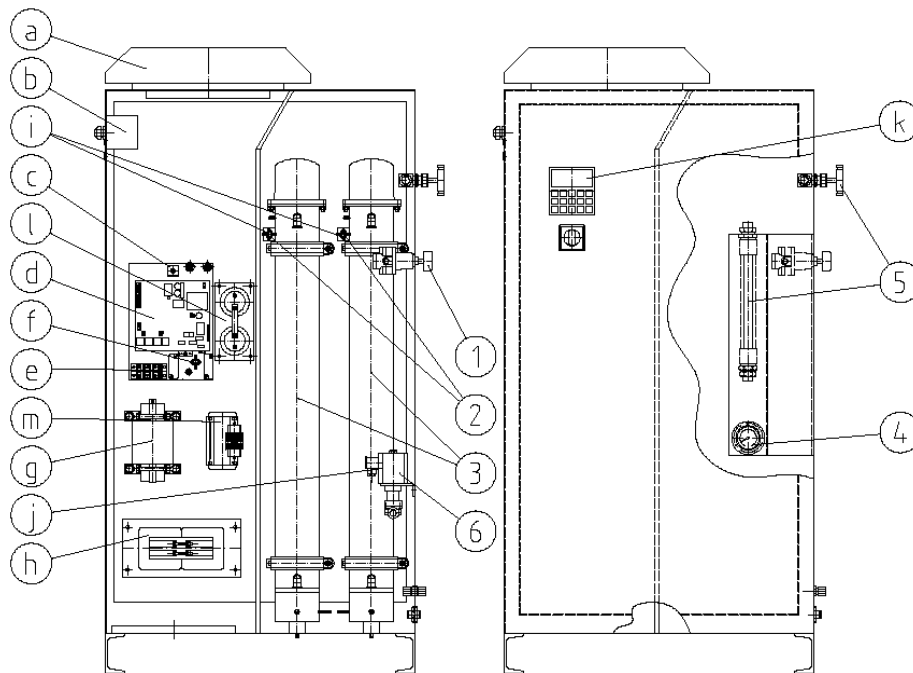
## Legend, mechanical

Pos. No.:	RI-No.:	Designation
1	02.00.01	Pressure reducer
2	02.00.02	Temperature monitor
3	02.00.03	Ozone generator
4	02.00.04	Pressure gauge
5	02.00.05	Flow meter with needle valve
6	02.00.06	Solenoid valve

## Legend, electrical

Pos.:	Designation	Pos.:	Designation
a.	Axial fan	g.	Intermediate circuit throttle
b.	Net filter	h.	High voltage transformer with temperature switch
c.	Module converter A	i.	Temperature switch
d.	Module converter B	j.	Solenoid valve
e.	Module converter C	k.	Module display
f.	Module converter D		

**Table 4-2: System legend mechanical/electrical GSO 40-06**

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**Fig 4-3: Inside view of the system GSO 50**
**Legend, mechanical**

Pos. No.:	RI-No.:	Designation
1	02.00.01	Pressure reducer
2	02.00.02	Temperature monitor
3	02.00.03	Ozone generator
4	02.00.04	Pressure gauge
5	02.00.05	Flow meter with needle valve
6	02.00.06	Solenoid valve

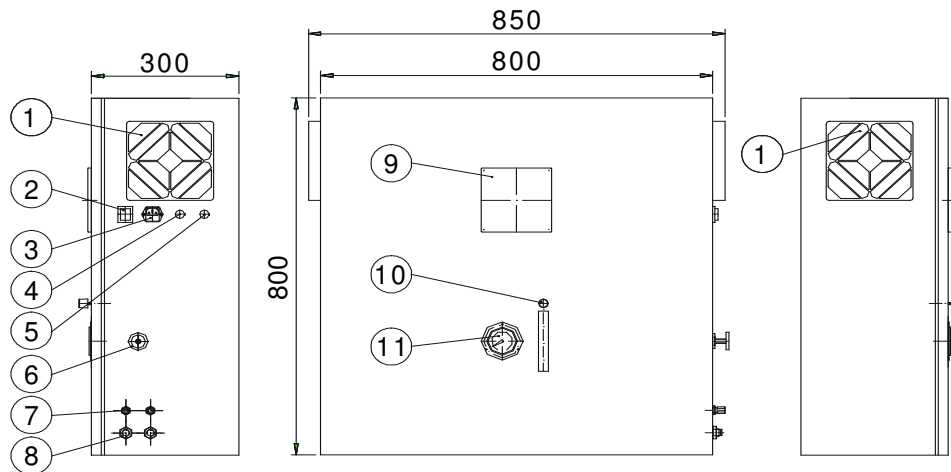
**Legend, electrical**

Pos.:	Designation
a.	Axial fan
b.	Net filter
c.	Module converter A
d.	Module converter B
e.	Module converter C
f.	Module converter D

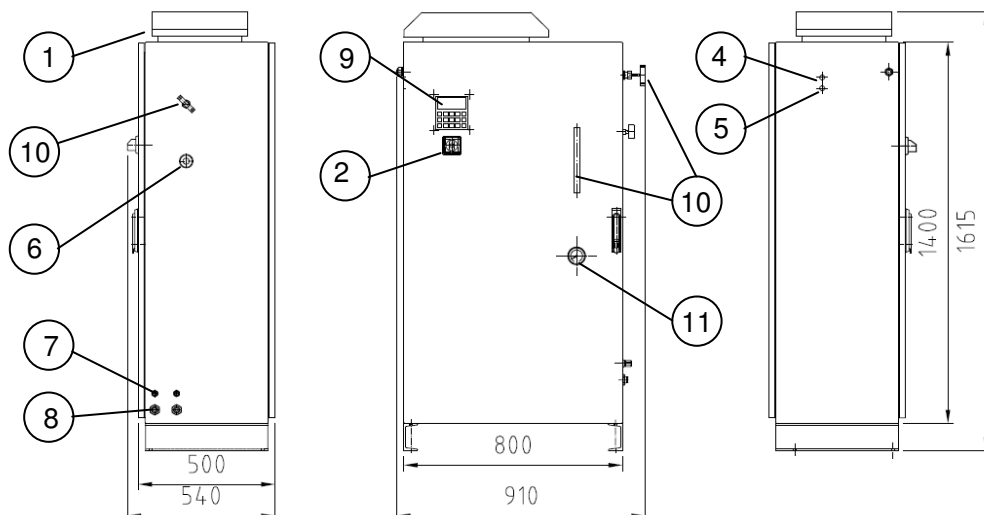
Pos.:	Designation
g.	Intermediate circuit throttle
h.	High voltage transformer with temperature switch
i.	Temperature switch
j.	Solenoid valve
k.	Module display
l.	DC capacitors
m.	net choke

**Table 4-3: System legend mechanical/electrical GSO 50**

### 4.3 Overall View



**Fig 4-4: Overall view of the system GSO 10 to 30**



**Fig 4-5: Overall view of the system GSO 40-06 to 50**

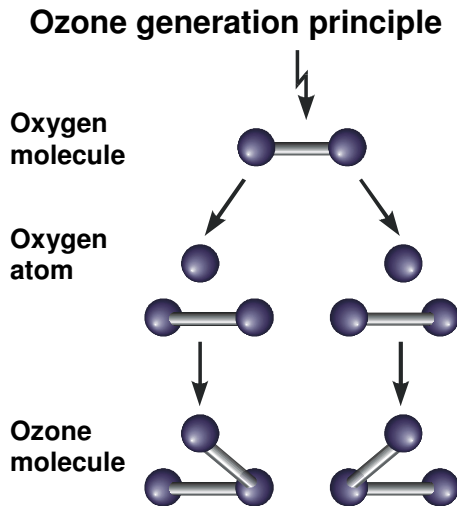
Legend:

- |                                 |                                       |
|---------------------------------|---------------------------------------|
| 1. Input / output of ventilator | 6. Pressure reducer                   |
| 2. Power switch                 | 7. Inlet feed gas /outlet process gas |
| 3. Power supply socket          | 8. Inlet/outlet cooling water         |
| 4. Ext. set point value (X11)   | 9. Display (operation panel)          |
| 5. Ext. interface (X12)         | 10. Flow meter with needle valve      |
|                                 | 11. Pressure gauge                    |

**Table 4-4: System legend Overall view GSO 10 to GSO 50**



## 4.4 Ozone Generation

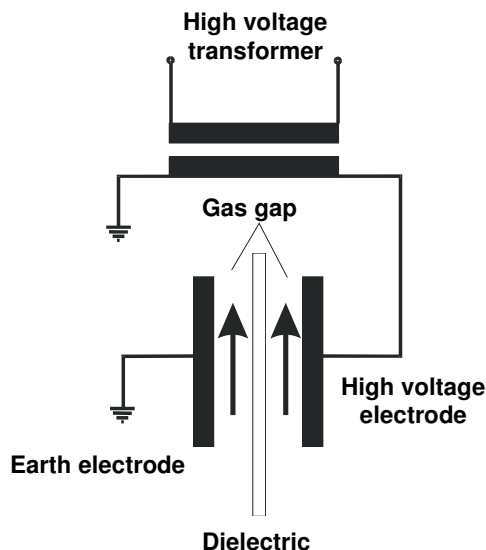


Next to fluorine, ozone is the strongest oxidizing agent, and when correctly applied, able to contribute enormously to improve the condition of our life and environment. When compared to other oxidizing agents, the advantage of ozone is that, aside from the reaction products, only oxygen develops - no toxic residue must be disposed. Ozone has been known for more than 100 years, and has proven itself as an environmentally friendly oxidizing agent in many areas of application.

Ozone is produced technically through silent electrical discharge from oxygenous feed gases, typically air or oxygen, by special ozone generators.

**Fig 4-6: Ozone generation principle**

### Schematic presentation of the discharge in an ozone generator



During the ozone synthesis process at first oxygen molecules are split through the supply of energy. The resulting oxygen atoms react with oxygen molecules to form ozone, whereby heat is released which has to be dissipated by cooling.

Ozone formation takes place between two electrodes, which are isolated from each other by a dielectric made of glass or ceramic and by a small gap. A high voltage, middle frequency, unilaterally grounded alternating current is applied to the electrodes. The oxygenous gas flows through the gap, resulting in ozone generation in the electrical field.

**Fig 4-7: Ozone generator principle**

## 5 Transport and Storage

### 5.1 General

It is advisable to check the total scope of delivery for completeness and possible damage immediately upon arrival. This is possible using the enclosed delivery note and accompanying documentation. Generally, claims are only taken into consideration if they are reported to the hauler and/or WEDECO on the day the system arrives.

Transport and storage include the following activities:

- Packing or unpacking
- Storage
- Transport

### 5.2 Packing

In order to prevent damage, pack and unpack the different system parts according to their function, taking the following protective measures into account:

- Protect against rain during transport
- Protect against damage due to contact with other objects
- Protect against frost, if various parts of the system contain water
- Protect against excessive air humidity (risk of corrosion due to condensation!)
- The gas inlets and outlets should be plugged and sealed so that the system is in a condition similar to the initial delivery

Ensure that the system is sealed in plastic and provided with a silica gel additive to protect against moisture.



If possible, the packing material should be used several times or disposed of in accordance with the local regulations.

Dispose of insulation and packaging properly and compatible with the environment.



The system requires an acclimatization time of 24 hours, to exclude malfunctions due to condensation. Remove any condensation which may have formed during transit. Check the delivery condition of the system (refer to the beginning of this chapter).

**IMPORTANT:** Do not remove the desiccant bag from the unit prior to operation.

### 5.3 Storage

Ensure that the following steps are taken if the system is to be stored:



- Switch off the system (refer to chapter "Operation")
- Disassemble/disconnect (refer to chapter "Shut-down and disposal")
- Transport (see chapter "Transport")
- Protect the corrosion susceptible parts
- Only store the system in dry rooms

- The gas inlets and outlets should be plugged and sealed so that the system is in a condition similar to the initial delivery

Store the system in such a way, that any possible damage is prevented. Store the system lying on its back.

Store the system complete including all individual parts, otherwise important parts may be missing when the system is commissioned again.



Completely remove the coolant from the ozone generators when the storage temperatures drop below 0 °C.

## 5.4 Transport

Transport the system using standard transporting devices.



Only use transporting devices and tools suitable for the load. For example, when lifting a system, only use appropriately dimensioned and undamaged cables. The weight of the system is indicated in the chapter "Technical data".

Secure the load reliably.

Fasten the system and transport it in a suitable crate.



Only have experienced persons attach the loads. Ensure that the loads are carefully fastened and secured on the hoists.

Furthermore, ensure that the system is subjected to no vibrations, rattling etc.

Prior to moving the system, ensure that the necessary ambient conditions are created at the new installation site (refer to "Technical data").

## 6 Commissioning/Start-up

### 6.1 General

The procedures during installation and commissioning/start-up of the system are described in this section. Information is provided describing how the required work is to be performed and where particular attention is required. Appropriate technical knowledge is required by the personnel performing this work.

Commissioning/start-up is an activity requiring qualified personnel.

#### 6.1.1 Lighting

Only operate the system in an environment with sufficient lighting in accordance with the local work place regulations.

#### 6.1.2 Noise

Due to the noise caused during system operation, we recommend using the following to reduce the sound effects:



ear plugs or  
ear muffs.

### 6.2 Workplaces and Installation Rules



Ensure that the ozone generating system is installed on a sturdy, vibration free foundation in a dry, frost-free and aerated room or fastened to a sturdy, vibration free frame or to a wall using 4 screws.



Ensure that the installation area is dimensioned such, that operation, maintenance and repair can be done without hindrances. Observe the technical data.



In order to ensure good ventilation of the system, provide a free area around the unit.

Ensure sufficient room ventilation during normal operation and in case of a malfunction/hazardous incident.

Ensure that no inadmissible heating-up of the operating room can occur due to the dissipated heat of the generator. In addition, ensure that the installation site meets all safety regulations, as described in chapter "Safety", for rooms in which oxygen or ozone may escape.

**Operating instructions**
**Series GSO**

Ensure that the air humidity does not exceed 70% during continuous operation, higher values are possible for brief periods (<1h). Also ensure that no condensation resulting from moisture (dew) occurs in or on the unit.



The pressure gauge used in the generator indicates the pressure of the system in relation to the barometric air pressure at the installation site. If the unit is installed at altitudes of more than 1000 meters above sea level, the operating pressure must be corrected depending on the ambient pressure in order to prevent a loss in capacity.

Ensure that ozone systems are installed in closed, lockable rooms. These rooms should include service passage ways i.e. around swimming pools. When oxygen is used, also refer to the accident prevention regulations for "Oxygen".



Do not allow permanent workplaces in rooms accommodating ozone systems.

If this requirement cannot be met for technical processing reasons, ensure that the ozone concentration in the room air at the workplace does not exceed the maximum workplace concentration value of 0.2 mg/m<sup>3</sup>.

Ensure that rooms in which ozone may escape in case of a hazardous incident are effectively monitored by means of gas detectors with visual and acoustic indicator. These rooms are, for example: rooms housing ozone system, rooms crossed by ozone supplying pipelines. Effective monitoring means that the measuring encoders (sensors) of the gas detectors are attached at the point where the highest ozone concentration can be expected in the event of a hazardous incident, e.g., for over-pressure systems, in close vicinity of the ozone production system, and always close to the floor, as ozone is heavier than air. Such a measuring encoder arrangement allows the alarm threshold of the gas detector to be set to an ozone concentration of 1.0 mg/m<sup>3</sup>.



**Ensure that rooms housing ozone systems are identified with the following warning symbols:**

Warning: Poisonous substances  
Ozone system! Access only for trained persons



No fire, naked flame and/or smoking



No entry, for people with pacemakers



Ensure that lines carrying gas containing ozone are identified

### Location of the system:



With regard to interference emission, the system meets the protection requirements for the industrial sector without restrictions. When operated in residential, office, business and small scale industrial sectors, special structural engineering shielding measures may have to be taken in order to prevent radio interference. Please contact WEDECO to this effect.

## 6.3 Installation

Ensure that the mechanical installation of the system is performed in accordance with chapters "Workplaces" and "Installation rules". Please refer to the chapters "Technical data" and "Appendix" for information and detailed data such as the connection plans. Ensure that all connections coincide with the data.

Once the installation has been completed, check that:

- the system is in horizontal position
- all supporting points support equally to avoid stress on the system

### 6.3.1 Mounting and Fastening



Prior to connecting the system, ensure that the main electrical switch is switched off. Please refer to chapter "Operation" for information on the switch-off procedure.

Perform the following work prior to operating the system:

- Mount the system on the wall or safely install on a firm foundation
- Assemble/connect the system parts
- Connect the supply lines
- Connect the lines for the media (gas, cooling water)
- Connect the electrical lines
- Establish the electrical connection in accordance with the local regulations.

The unit has been provided with a socket (DIN 49457). An appropriate power connection cable (earthing contact plug with coupling) is part of the delivery scope. The appropriate adapters for connection to the supply power of other standards must be provided by the customer.

**Operating instructions**
**Series GSO**

Ensure that no dirt particles ingress into the system during installation.



Ensure that all pipelines, carrying gas containing oxygen or ozone, are free of oil and grease.

Ensure that no leaks occur once the connections have been installed. Finally, check for leaks. During this process, subject all lines to operating pressure and subsequently, check the lines carrying ozone for leaks using a leakage spray.



Repeat the leakage check until no more leaks can be detected.

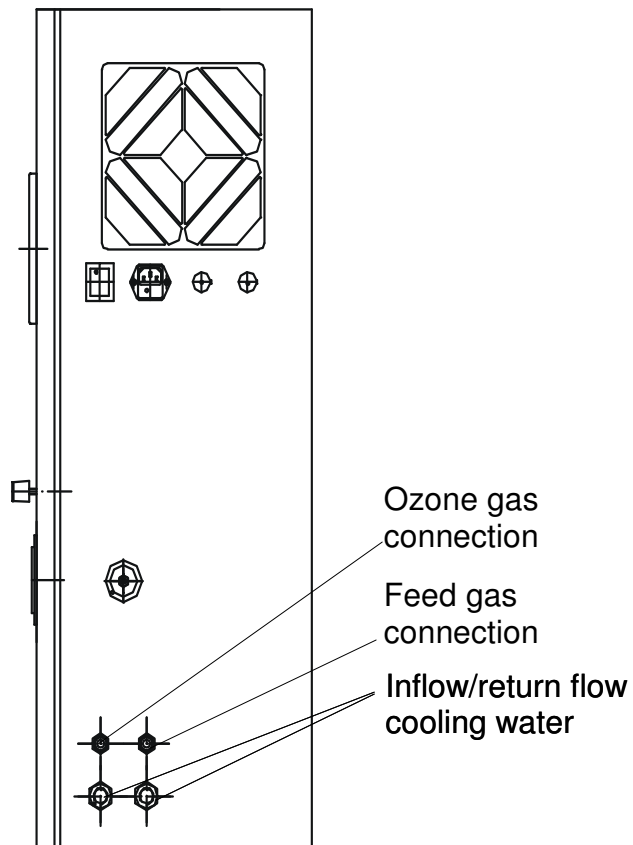
For the ozone generator connections and the process piping only ozone resistant pipe, seal and fitting materials must be used. All lines have to be labeled. The ozone application system must be designed to prevent fluid back flow into the ozone generator. Water or moist gas must never be allowed to enter the gas side of the ozone generator.



Ozone can only be fed into the mixing appliance if the minimum flow quantity of the cooling medium, as described in the user information part, has been reached or exceeded and the ozone destructor is operational.

Protect all lines against damage or tearing off.

Start the ozone room air monitoring unit. Ozone containing gas must never be vented to the atmosphere but instead be fed to an ozone destruct system. This applies to ozone process off gas, too.

**Gas and cooling water connections**


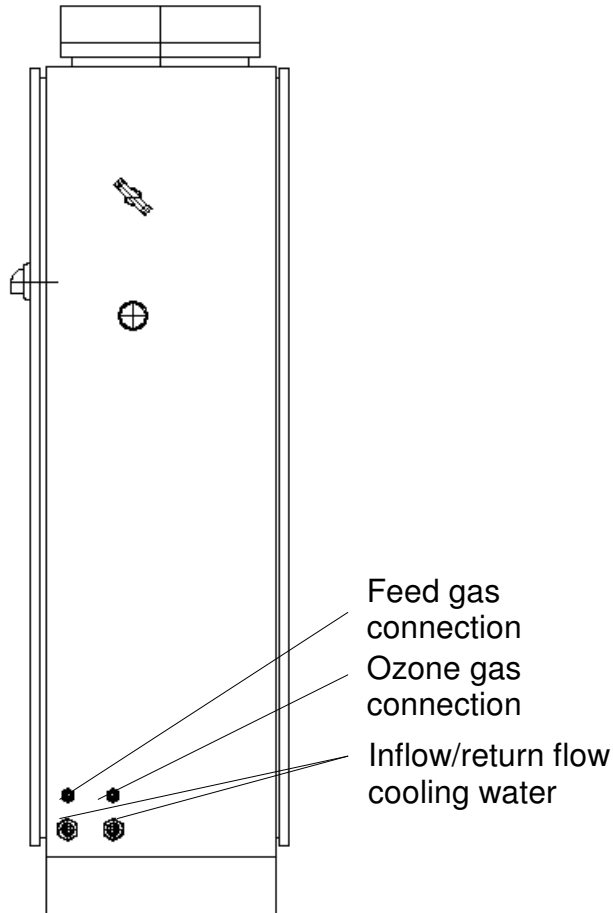
Ozone gas connection:  
Bulkhead fitting SERTO  
stainless steel, SO 51521-10  
for hose and pipe lines, Ø 10x1 mm  
(With adapter to 1/4" NPT for US vers.)

Feed gas connection:  
Angled bulkhead fitting SERTO  
brass, SO 42721-10  
for hose and pipe lines, Ø 10x1 mm  
(With adapter to 1/4" NPT for US vers.)

Coolant IN / OUT:  
Bulkhead plug-in connection Landefeld  
IQSS-100, for hose line, Ø 10x1 mm  
(With adapter to 1/4" NPT for US vers.)

**Fig 6-1: Gas and cooling water connections GSO 10 to GSO 30**



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Ozone gas connection GSO 40-06:  
Bulkhead fitting SERTO  
stainless steel, SO 51521-10  
for hose and pipe lines, Ø 10x1 mm  
(With adapter to 1/4" NPT for US vers.)

Feed gas connection GSO 40-06:  
Angled bulkhead fitting SERTO  
brass, SO 42721-10  
for hose and pipe lines, Ø 10x1 mm  
(With adapter to 1/4" NPT for US vers.)

Coolant IN / OUT GSO 40-06:  
Bulkhead plug-in connection Landefeld  
IQSS-100, for hose line, Ø 10x1 mm  
(With adapter to 1/4" NPT for US vers.)

Ozone gas connection GSO 50:  
Bulkhead fitting SERTO  
stainless steel, SO 51521-12  
for hose and pipe lines, Ø 12x1 mm  
(With adapter to 1/2" NPT for US vers.)

Feed gas connection GSO 50:  
Angled bulkhead fitting SERTO  
brass, SO 42721-12  
for hose and pipe lines, Ø 12x1 mm  
(With adapter to 1/2" NPT for US vers.)

Coolant IN / OUT GSO 50:  
Bulkhead plug-in connection Landefeld  
IQSS-120, for hose line, Ø 12x1 mm  
(With adapter to 1/2" NPT for US vers.)

**Fig 6-2: Gas and cooling water connections GSO 40-06 and 50**

**We recommend the following materials for the external connections:**

Ozone	Fluorinated plastics (PTFE, PVDF) Stainless steel (1.4571, 1.4404, 1.4435)
Oxygen	Fluorinated plastics (PTFE, PVDF) stainless steel (1.4571, 1.4404, 1.4435), copper
Air	Fluorinated plastics (PTFE, PVDF) stainless steel (1.4571, 1.4404, 1.4435) copper, brass, galvanized steel
Water	Plastics (PVC, PTFE, PVDF, PE, PA) copper, brass, galvanised steel

Please refer to the chapter "Appendix" for SERTO installation instructions for external connections.

### 6.3.2 Purging the system for drying



Prior to commissioning the ozone generator for the first time, or after changes to the connection lines have been done, ensure that all moisture is removed from the gas lines. To do this purge the gas flow circuit for **a minimum of 4 hours** for drying using the dry feed gas. Proceed as follows:



The power switch is located beneath the cooling-air-flow inlet on the front surface of the unit's housing. This power switch is illuminated by a lamp when the electric circuit is closed. Illumination of the lamp indicates that the system is switched on. For GSO 40-06 and GSO 50 you will find the power switch below the operating terminal.

After switching on the unit the following is shown on the display unit.

EOZ-S-0022-2
SYSTEM TEST
SYSTEM TEST O.K.

Once the system test has been successfully completed, decide which feed gas is to be used.

GAS TYPE:	
OXYGEN:	1
AIR:	2

Subsequently, the main menu is accessed.

SETUPMENU	9
AUTOMATIC MODE	1
MANUAL MODE	ENTER
SERVICE MODE	XXXX

In the main menu, press the "ENT key" to select the manual mode.

DRY MODE		
YES	-->	2
NO	-->	ENTER

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PRESSURE OK ?		
YES	-->	3
NO	-->	2

Press "key 2" followed by "key 3" to start the dry mode.

DRY MODE		
END	-->	4
DRY TIME	hh.mm.	

Press "key 4" to end the dry mode and return to the main menu. The system can be switched off again, and now it is prepared for initial commissioning/start-up.

## 6.4 Initial Commission / Start up



During the course of the initial commissioning/start-up ozone is already being produced. Should an ozone odor be noticed, switch off the power switch immediately, and leave the operating room while observing the safety measures.



Initial commissioning/start-up always takes place in manual mode. The unit must be given enough time to adapt to the climatic conditions of the location before it is activated for the first time.



The power switch is located beneath the cooling-air-flow inlet on the front surface of the unit's housing. This power switch is illuminated by a lamp when the electric circuit is closed. Illumination of the lamp indicates that the system is switched on. For GSO 40-06 and GSO 50 you will find the power switch below the display unit.

After switching on the unit the following is shown on the display unit.

EOZ-S-0022-2		
SYSTEM TEST		
SYSTEM TEST O.K.		

Once the system test has been successfully completed, decide which feed gas is to be used.

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GAS TYPE:	
OXYGEN:	1
AIR:	2

Subsequently, the main menu is accessed.

SETUP MENU	9
AUTOMATIC MODE	1
MANUAL MODE	ENTER
SERVICE-MODE	XXXX

Press "key 9" in the main menu to access the set-up menu, then press „key 3“ to select the set point value.

SET VALUE :	
LOCAL :	1
REMOTE:	2
SET= 0%	

Once the set point value (LCL [local]) has been selected, set it to 0% using the „arrow keys“ on the operating terminal.

Press the „ENT key“ to return to the main menu.

Select manual mode by pressing the "ENT key" in the main menu.

Press the „ENT key“ repeatedly to access the different menus in which the respective feed gas and coolant can be set.

When gas pressure and cooling water are OK, press the "ENT key" to access the following menu:

CONVERTER ON :	5
----------------	---

After pressing "key 5" the ozone production will start after 10 sec.

CONVERTER IS STARTING ADJUST GAS FLOW !
--

Subsequently, the ozone production is indicated on the display.

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MANUAL	SET : int
CONVERTER OFF	-- > 6
PROD. HOURS :	
SET POINT= %	P= W

Press the *"arrow keys"* to increase or reduce the set point value.



It is advisable to increase the set point value slowly, and to recheck all lines for leaks. Also watch out for any ozone odour in the room.

If everything is in order, you may increase the set point value to 100% and observe the function of the system.

At the end of the initial commissioning/start-up set the set point value back to 0%. Switch off the converter by pressing *"key 6"*, and following an automatic purge mode of 60 seconds, the system returns to the main menu.

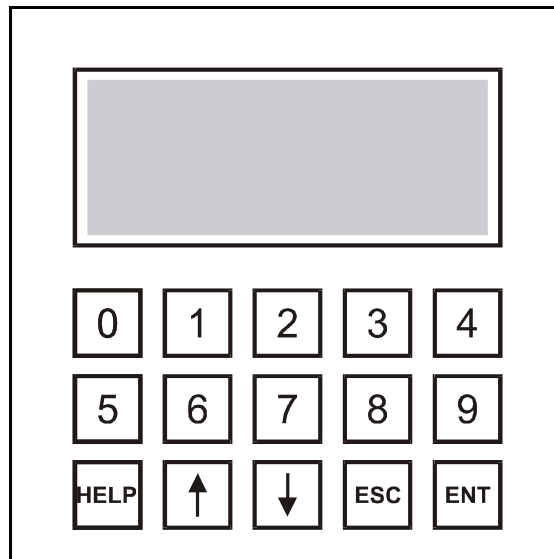
This concludes the initial commissioning/start-up.

If the system is not to be used further, switch off the power switch, pull out the power connection cable, shut off the gas and cooling water.

## 7 Operation

### 7.1 Operating and Control Elements

An operating terminal has been provided for system control and operation.



**Fig 7-1: Operating panel**

The keypad containing the numbers from 0-9 is intended for selecting the various operating modes as well as setting the date and time.

If a fault message is displayed, press the "HELP key" to obtain more information regarding the cause and instructions for fault rectification.

The "arrow keys" serve to set the set point value. In the set-up menu, select a specific point in the display with the aid of the arrows.

Return to the main menu from the various sub-menus at any time by pressing the "ESC key".

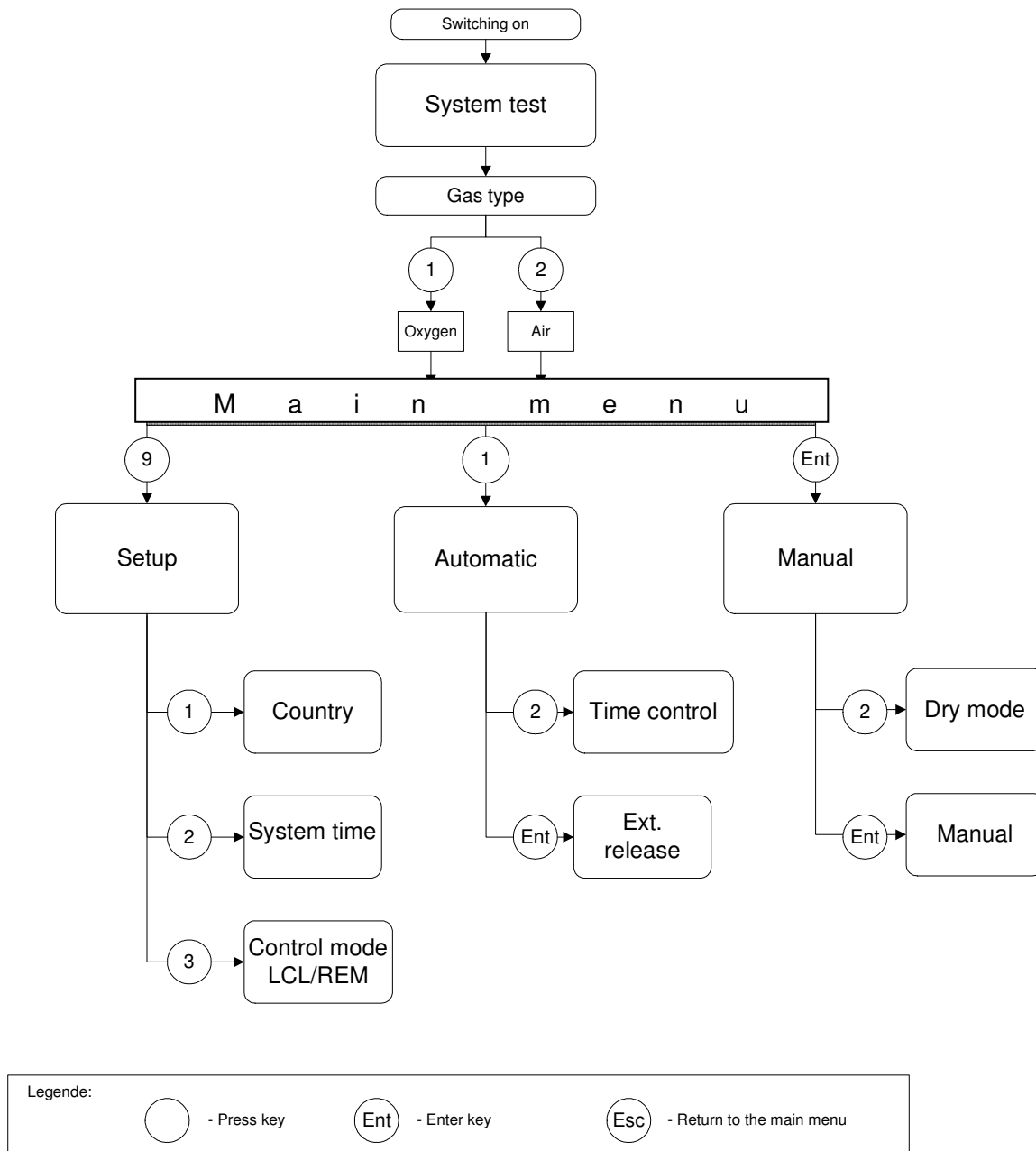
Press the "ENT key" to save and activate the entered values.



The entered values remain saved even in the event of a power failure.

## 7.2 Operating Menu Structure

The following figure shows the operating structure.



**Fig 7-2: Operating Menu Structure**

## 7.3 Setting the System

### 7.3.1 General

The procedure during setting and conversion work on the system is described in this chapter. Only entrust this work to the respective qualified personnel.

The interior of the system does not contain any elements to be set by the operator! Should it become necessary to change the setting on the interior of the machine, do not undertake any changes until this is authorized in writing by **WEDECO**. Ensure that previously authorized changes are performed by the respective qualified personnel.

### 7.3.2 Setting the Operating Parameters

In order to allow the produced ozone quantity and concentration to be determined as precisely as possible, it is important to observe the operating parameters. The setting curves contained in the appendix apply to the respectively indicated feed gases, a cooling water inlet temperature of 15°C and an operating pressure of 1.5 bar abs (oxygen operation) or 2.5 bar abs (air operation). Deviations from these values will result in changes to the ozone quantity and concentration.

This also applies when the unit is installed at altitudes above 1000 m from sea level. The built-in pressure gauge indicates the relative system pressure in relation to the respective ambient pressure. Adapt the setting accordingly in these cases.

### 7.3.3 Setting the Ozone Production and Quantity

Ensure that the ozone production system is only operated by trained qualified personnel. Prerequisite being, that the personnel have read and understood the operating instructions, particularly the chapter "Fundamental Safety Instructions".

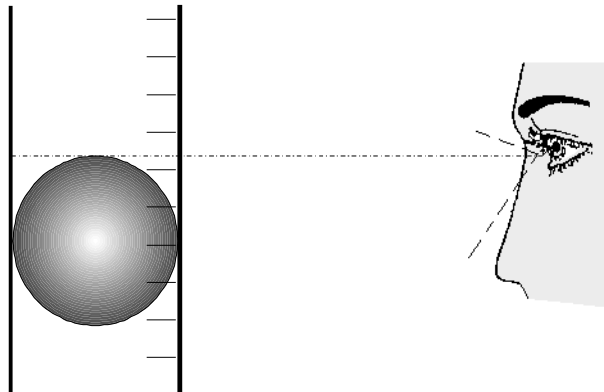


Observe the performance curves and flow meter calibration curves in chapter "Appendix".

### 7.3.4 Setting the Ozone Production Quantity and Concentration

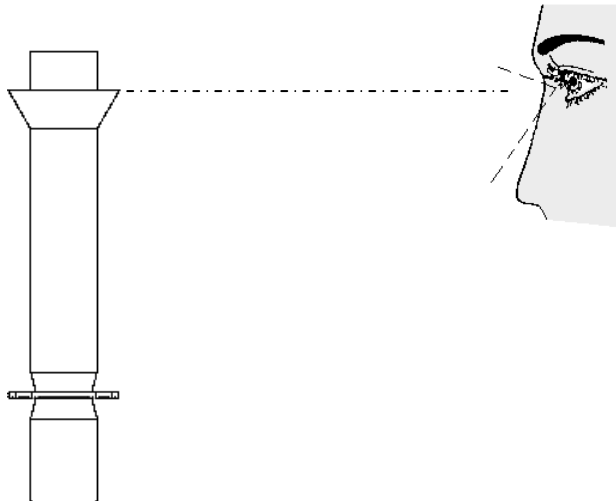
The gas volume flow is measured with volume flow meters. Read the volume flow meter of GSO 10 to GSO 40-06 at the top horizontal tangent of the ball.





**Fig 7-3: Regarding the gas volume flow GSO 10 to GSO 40-06**

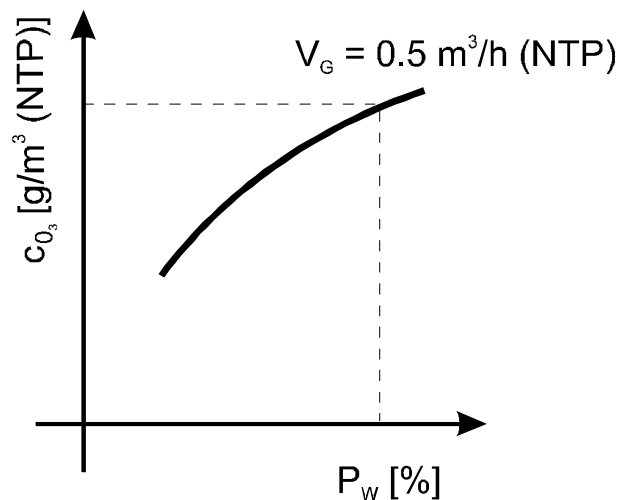
The gas volume flow of GSO 50 is read at the upper edge of the rotameter.



**Fig 7-4: Reading the gas volume flow of GSO 50**

In order to set a specific ozone production quantity and concentration the characteristic curves in the appendix are needed. The characteristic curve fields for oxygen and for air indicate the ozone concentration as a function of the set point value of the converter capacity in percent. A variable parameter is the gas volume flow in standard cubic meters. Multiplying this gas volume flow value by the ozone concentration yields the produced ozone quantity.

The electric output shown in the diagram virtually corresponds with the setting of the set point value on the operator terminal.



**Fig. 7-5: Relative power and ozone concentration**

Calculation of ozone production quantity:

$$m_{O_3} = c_{O_3} \cdot V_G$$

$m_{O_3}$  : Ozone quantity [g/h]

$c_{O_3}$  : Ozone concentration [g/m<sup>3</sup> (NTP)]

$V_G$  : Gas volume flow [m<sup>3</sup>/h (NTP)]

If the gas volume flow does not coincide with one of the curves for the selected ozone concentration and the desired ozone quantity, interpolate between the lines.

To set the previously determined gas volume flow on the unit, the setting curves for volume flow meter are needed. These diagrams show the flow meter % - value as a function of the gas flow. Now set a percentage value coinciding with the gas flow determined previously.

### 7.3.5 Measuring Processes Using an Ozone Concentration Measuring Device

If you use an ozone concentration measuring device (optionally available) for your measurements, and/or the operating conditions deviate from the values indicated above, a correction of the gas flow may be indicated by the flow meter. Proceed by using the following equation:

$$V_{G,k} = V_{G,a} \cdot \sqrt{\frac{p}{p_E} \cdot \frac{T_E}{T} \cdot \frac{\rho_E}{\rho}}$$

- $V_{G,k}$  : Corrected gas volume flow [m<sup>3</sup>/h (NTP)]
- $V_{G,a}$  : Read-off volume flow [m<sup>3</sup>/h]
- $p$  : Operating pressure [bar abs]
- $p_E$  : Calibration pressure [= 1.5 bar abs]
- $T_E$  : Calibration temperature [= 293.15 K]
- $T$  : Operating temperature [K]
- $\rho_E$  : Calibration density [= 1.48 kg/m<sup>3</sup>]
- $\rho$  : Density of the operating gas mixture under standardized conditions  
[0 °C; 1013 mbar abs]

The indicated volume flow in [m<sup>3</sup>/h] is a result of the flow meter maximum value and the display in percent:

$$V_{G,a} = \frac{A \cdot V_{\max}}{100}$$

$A$  : Display in [%]  
 $V_{\max}$  : 100%-value of the flow meter (values based on feed gas Oxygen)

[GSO 10/20	: 0.65 m <sup>3</sup> /h]
[GSO 30	: 1.5 m <sup>3</sup> /h]
[GSO 40-06	: 3.5 m <sup>3</sup> /h]
[GSO 50	: 5.7 m <sup>3</sup> /h]

The corrected gas volume flow multiplied by the value of the ozone concentration [g/m<sup>3</sup>(NTP)] yields the produced ozone quantity.

### 7.3.6 Conversion

Conversion means adapting the system when the feed gas is changed between oxygen and air.

Change between air and oxygen as desired is possible without a reduction in performance.



Observe the following points when changing from oxygen to air or from air to oxygen as the feed gas:

You must use the setting curves for the respective feed gas indicated in chapter "Appendix".

- Select the feed gas at the operating terminal.
- The system operates at an optimum outlet pressure of 2.5 bar (abs), with air and at 1.5 bar (abs) with oxygen.
- Set the flow rate according to the setting curves.

## 7.4 Starting

Starting of the system is divided into the following steps:

- Switching on the system;
- Starting the system.



Inform yourself about the stopping process prior to starting the system; i.e., please finish reading this chapter prior to switching on the system. Only then will you be qualified to operate the system for a normal operating sequence.

"Switching on" indicates preparing the system for production at the beginning of work.

"Starting" refers to the actual ozone production of the system e.g., following switch-on or after a brief stop (break).



Visually inspect the system for defects prior to starting.

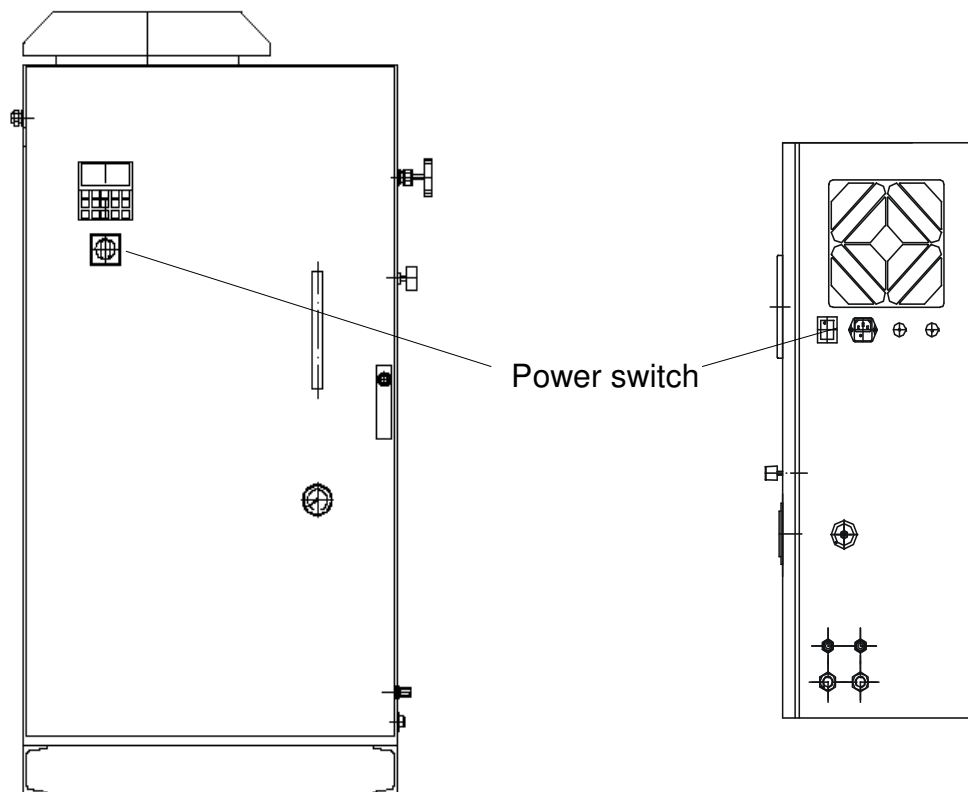
### 7.4.1 Switching on the System



The power switch of GSO 10 to GSO 30 is located beneath the cooling air flow inlet on the side of the unit's housing.

The power switch of GSO 40-06 and GSO 50 is located at the front below the operation panel.

The power switch is illuminated when the electrical circuit is closed. The illumination of the lamp indicates that the system has been switched on.



**Fig. 7-6: Position of power switch**

After switching on the unit the following is shown on the display

EOZ-S-0022-2
SYSTEM TEST
SYSTEM TEST O.K.

Once the system test has been successfully completed, decide which feed gas is to be used.

GAS TYPE:	
OXYGEN:	1
AIR:	2

Subsequently, the main menu is accessed.

Select between 4 different operating modes by means of the terminal.

SETUP MENU	9
AUTOMATIC	1
MANUAL	ENTER
SERVICE-MODE	XXXX

The operating modes read as follows:

**Set-up Menu**  
**Automatic mode**  
**Manual mode**  
**Service- Mode**

## 7.4.2 Starting the System (Set-up Menu)

Press "key 9" in the main menu to access the set-up menu.

LANGUAGE	-->	1
SYSTEM TIME	-->	2
SET VALUE	-->	3
ACCEPT	-->	ENTER

Once "key 1" has been pressed in the set-up menu, the operator can choose among 4 languages.

GERMAN	-->	1
ENGLISH	-->	2
FRENCH	-->	3
SPANISH	-->	4

The subsequent text containing information regarding operation of the system will now appear in the language selected.

Now press "Key 2" in the set-up menu to set the date and time.

00 – 00	00:00:00
DD – MM	hh:mm:ss



Enter the desired values for day, month, hour, minute and second each followed by pressing the "ENTER" key. If the date needs to be checked and not changed you can return to the main menu by pressing the

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“ESC” button. If no entry is made for more than one minute the display returns to the previous screen.

Press “key 3” in the set-up menu to select the control mode and adjust the set point.

CONTROL MODE ::	1
REM :	2
SET=	%

In this menu, choose between LCL (local) (from the operating terminal) or REM (remote) (0-20 mA from an external unit). The current setting is indicated by a “\*” symbol.

In addition, the unit allows setting the set point value to the desired value with the aid of the “arrow keys”. Press the “ENT key” to take over and save the settings.

## 7.5 System Operation in Automatic mode

Press “key 1” in the main menu to select automatic mode.



In automatic mode, the function sequence of the system can be controlled automatically. Please note that the gas quantity and the pressure at the unit (ozone generator) must be manually set beforehand.

Two versions are available in automatic mode:

- a) External release
- b) Time control

EXT. RELEASE :	
ENTER	
TIME CONTROL - - >	2

### 7.5.1 Automatic mode - External release

Press the “ENT key” in automatic mode to access the “External release” mode.

EXT. RELEASE
PRODUCTION END:
ESC



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If no more ozone production is desired, press the "ESC" button to leave the menu "EXTERNAL RELEASE" and return to the main menu.

External release means that the converter (ozone production) is switched on and off through an **external** signal (supplied by customer, direct voltage: +15...+24V). This signal may be supplied by a higher ranking system or a process computer. Once the signal is received, ozone production starts.

AUTOMATIC	SET : int
CONVERTER OFF -->	6
PROD: HOURS :	
SET POINT= % P=	W

Terminate the ozone production with the external signal 0V. The ozone in the system is removed by purging and the unit waits for a new external release.

If an error occurs during ozone production, the converter is switched off and an error message appears on the display.

ERROR .....		
MORE INFO	→	HELP
START MENU	→	ESC

Press the "HELP key" to obtain additional information concerning the error. Press the "ENT key" and subsequently the "ESC key" to return to the main menu.

## 7.5.2 Time control

Press "key 2" in automatic mode to access the "time control" mode. In this operating mode, the system is automatically controlled over a specified time span. The unit first inquires about the gas and cooling water .

PRESSURE; WATER		
O.K. ?		
YES	-->	ENTER
NO	-->	2

Once the gas and coolant have been set, type in the starting time,

START TIME:
hh:mm
ACCEPT WITH ENTER

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and subsequently type in the stopping time.

STOP TIME  
                   hh:mm  
 ACCEPT WITH ENTER



Confirm each time block **individually** by pressing the "ENT key".

Now press the "ENT key" to start the time controlled ozone production.

A 60 sec. purging mode takes place first. During this time the gas flow and the operating pressure can be checked and adjusted.

PURGE MODE  
 ADJUST GAS VOLUMINA

The display then shows the selected times

START TIME  
                   hh.mm  
 STOPPING TIME  
                   hh.mm

Once the internal system time reaches the saved starting time (hh.mm.), ozone production is automatically switched on.

AUTO MATIC	SET : int
STOPPING TIME	hh.mm.
PROD. HOURS :	
SET POINT=    %	P=        W

Once the saved stopping time is reached, the converter is switched off and the system returns to the start menu following the rinsing cycle.

The system will produce ozone between the two entered time points every day unless the entries for the starting and stopping time are changed. In this manner a repeated daily operation is achieved. Press the "ESC key" to interrupt the time controlled ozone production at any time and to return to the main menu.

If an error occurs during ozone production, the converter is switched off and an error message appears on the display.

ERROR .....	
MORE INFO →	HELP
START-MENU →	ESC



Press the *"HELP key"* to obtain additional information concerning the error. Press the *"ENT key"* and after that the *"ESC key"* to return to the main menu.

In order to return to the time control mode, select the time control in automatic mode, then enter and check the starting and stopping time **once again**.

The system will not automatically return to the time control mode following an error.

## 7.6 System Operation in Manual mode

Press the *"ENT key"* in the main menu to access manual mode.

In manual mode, the system is set and controlled by the operator directly at the operating terminal. Submenus in which different operating sequences can be activated can be accessed by pressing various keys.

Two options are available in **manual mode**:

- a) **Dry mode**
- b) **Manual mode**

### 7.6.1 Manual mode - Dry mode



The dry mode is required for initial commissioning/start-up, trouble shooting as well as following extended down times or disassembly, in order to remove ozone and moisture from the lines.

In the manual mode the unit checks for the drying mode.

DRY MODE	
YES	--> 2
NO	--> ENTER

This is followed by an inquiry regarding the gas pressure and the cooling water.

PRESSURE, WATER		
OK?		
YES	-->	ENTER
NO	->	2

If no gas pressure and cooling water exists, press "key 2" to return to the main menu.

Press the "ENT key" to start the rinsing mode.

DRY MODE		
END	-->	4
hh:mm		

The time in dry mode is shown.

Press "key 4" to terminate the rinsing mode and to return to the main menu.

## 7.6.2 Manual mode

Once the manual mode has been selected, the system asks you for the gas pressure and the cooling water.

PRESSURE, WATER		
OK?		
YES	-->	ENTER
NO	-->	2

If both mediums flow regularly, press the "ENT key" to confirm, and the control valve will be opened. The gas quantity and gas pressure can be set and checked. After 60 seconds of continuous rinsing, the following will appear in the display:

CONVERTER ON :	5
----------------	---

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Press "key 5" to start the ozone production.

MANUAL	SET : int
CONVERTER OFF -- >	6
PROD. HOUR :	
SET = %	P= W

The level of ozone production can be set by using the "arrow keys" on the operator terminal. The arrow keys can also be used to change the set point value according to the desired ozone production level.

During ozone production, the set point value and the electrical capacity and the service hours are displayed. Ozone production can be ended by pressing "key 6". After that the system goes into rinsing mode for 60 seconds and returns to the main menu.

If an error occurs during ozone production, the converter is switched off and an error message appears on the display.

ERROR .....	
MORE INFO →	HELP
START-MENU →	ESC

Press the "HELP key" to obtain additional information concerning the error. Press the "ENT key" and after that the "ESC key" to return to the main menu.

## 7.7 System Operation in Service mode

The service mode allows a complete control of the GSO system. The difference between this operation and operation in the automatic mode (remote mode) is the saving of the settings if the connection to the controlling device is broken.

Remote mode does not store these presetting so that the operator has to re-enter his settings again. The settings designate the feed gas, the confirmation of the existing gas and cooling water flow remain unchanged. In the service mode the unit gets the start/stop signal from the main PLC or any other control devices that issue the applicable signals.

To get access to this mode press four times "5" on the operating panel. The following screen appears:

REMOTE ACTIVE:	9
REMOTE INACTIVE:	1

In order to activate the remote status, press 9 and the following screen appears.

STATUS REMOTE	XXXX
AGGREGAT:	OFF
PROD. HOUR:	90
SET=	% P = W

This screen is present the entire time while operating PLC control mode. To change to a different mode press four times "5" and you will see the last screen. The parameter status, operating time, power pre-selection and power are displayed.



The service mode should be chosen only in accordance with the safety requirements. Before each stop, reduce the set point to 0 % and purge the system for a duration of at least 3 minutes.

## 7.8 Stopping

The system can be stopped in two different ways:

### Switching off

**EMERGENCY STOP** in connection with an EMERGENCY STOP circuit

### 7.8.1 Switching off the System

Proceed as follows:

- Terminate the ozone production by actuating the respective key on the operating terminal.
- Wait until the purge cycle has been completed.
- Press the power switch to switch off the system.
- Close the stop valves for all media (feed gas and cooling water).



The power switch is located beneath the cooling-air-flow inlet at the front surface of the unit housing. This power switch is illuminated by a lamp when the electric circuit is closed. Illumination of the lamp indicates that the system is switched on. Attention the power switch for GSO 40-06 and GSO 50 has no illumination. Visualization is realized by the display.



If the system is temporarily not required, shut off the gas flow and close the valve on the processing side. This will save gas and also prevents water ingress into the system or the ozone generator.

Then close the stop valves of the cooling water supply line.

## 7.8.2 Emergency stop



In the event of danger for man or system, the system can be immediately stopped by using the EMERGENCY STOP switch. In this manner, the system is placed in a "safe status".

Please refer to chapter "Safety" for a description of the EMERGENCY STOP switch, its position and function.

Should a dangerous situation occur, such as ozone escaping or electrical accident, switch off the power switch of the system or press the EMERGENCY STOP button installed by the operator/owner. The electric power supply and the feed gas flow will be interrupted **instantaneously**.

## 7.9 Cleaning

### 7.9.1 General

Cleaning of the system is divided into two categories:



Cleaning during operation  
Cleaning during a stop



Restrict cleaning work to trained personnel

Under normal circumstances the system may be cleaned according to your own assessment. However, read the cleaning regulations prior to cleaning anything. Read the instructions and applications areas the packaging prior to using cleaning agents.



Prevent voltage carrying parts from coming into contact with liquids, as this could lead to "short circuits".

Avoid contact with chemicals. For example, should your hands come in direct contact with chemicals, wash them immediately.

Use a vacuum cleaner to clean the system.

Avoid the use of compressed air to clean the system. If you use compressed air the dirt particles will be blown away. However, there is a danger that the dirt particles will damage the system by, for example,

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landing on the circuit boards. This could lead to interference / malfunctions and short circuits.

### 7.9.2 Cleaning during Operation

Always keep the system clean during operation.

That means:

- Keep the exterior of the system clean (do not open it)
- Keep the floor clean
- Tidy up packaging material, chemicals, etc.
- Avoid leaving tools lying around

### 7.9.3 Cleaning during a Stop

Prior to opening system parts carrying gas containing ozone, continue rinsing them until no more ozone can be detected. Remove the gas in a safe manner.



Prior to starting work on ozone production elements, electrically discharge them in a safe manner.

Never spray water in rooms accommodating ozone production systems.



In order to prevent injuries, never reach into the running system. Clean parts within the protection device only while the system is not running.



In order to ensure safety while the protection device is open, always switch off the power switch when the system is standing still. Pull out the power cable and wait 30 minutes prior to opening the system. In order to prevent the system from starting accidentally, always secure it against unintentional switch on. Once the cleaning has been completed, check all lines for loose connections, chafe marks and damage! Rectify any detected defects immediately!

Use a soft brush in combination with a vacuum cleaner to remove dust. A cloth moistened with alcohol may also be used.

The filter mats should be changed if necessary, at least once a year.

#### Unless explicitly specified:

- avoid corrosive cleaning agents
- never use a steel brush or other hard tools or implements

Always use lint-free / non fibrous cleaning cloths for cleaning the system!

Prior to maintenance and repair work, remove oil, grease or care products, in particular from the connections, nuts and bolts.



**General procedure:**

Before the system can be cleaned with a cleaning agent, ensure that all openings in which no cleaning agent is allowed to penetrate for safety or functional reasons are covered or locked. Electrical components are particularly at risk. Never use water and/or steam cleaners for cleaning purposes.

Following cleaning, remove the protective covers or closures from the openings previously covered for cleaning purposes.

## **7.10 Malfunctions**

### **7.10.1 General**

The ozone generator is equipped with a control system which displays in clear words malfunction messages. These messages facilitate localizing simple malfunctions and enable their quick rectification. A certain number of malfunctions will not be reported by the control system or they are not immediately apparent from the message. These are complex malfunctions. The remedy is described below.

Ensure that only respective qualified personnel rectifies the malfunctions.

### **7.10.2 Procedure for the Elimination of Malfunctions**

Before opening parts of the system which hold gas containing ozone, rinse them continuously until no ozone can be detected.



Prior to starting work on ozone production elements, electrically discharge them in a safe manner.

Looking for errors or rectifying malfunctions in the unit, ensure that the work is only performed after the power cables have been pulled out and a waiting time of 30 minutes has elapsed.



Malfunction remedy:

Ozone production is stopped when an error message appears.

Read the malfunction message from the control system

Immediately rectify simple malfunctions

Prior to rectifying a complex malfunction first read the relevant technical documentation in chapter "Safety"

Press the "ESC key"

Start the system (refer to chapter "Operation")

### 7.10.3 Error Rectification

#### Error, excess current

The display indicates

CURRENT OVERLOAD	
MORE INFO →	HELP
START-MENU →	ESC

Once the "HELP key" has been pressed, the following will appear

FOR HELP
MANUAL
CHAPT. ERROR RECTIFICATION

#### Possible causes for these error messages are:

1. Short circuit in the ozone generator (glass break)
2. Short circuit in the high voltage transformer
3. Leakage in the ozone generator
4. Defective converter electronics

In order to rectify the error, switch the unit off and then on again.

If the error message appears again once the system has been switched on, notify the customer service at **WEDECO**.

#### Temperature of the electronics

The display indicates

TEMP. ELECTRONIC	
MORE INFO →	HELP
START-MENU →	ESC

Once the "HELP key" has been pressed, the following will appear

CHECK FAN
AND
AIR FILTER

**Operating instructions****Series GSO**

This error message indicates excessive temperature of the cooling body or high voltage transformer.

**Possible causes for this error message are:**

Defective ventilator/fan  
Dirty filter mat  
Excessive ambient temperature (above 40 °C)

Once the error has been localized and rectified, the unit may be switched on again.

If the error message appears again, notify the customer service at **WEDECO**.

**Temperature of ozone generator**

The display indicates

TEMP. OZONE PRODUCER	
MORE INFO →	HELP
START-MENU →	ESC

Once the "HELP key" has been pressed, the following will appear

CHECK COOLING CYCLE AND WATER TEMPERATURE
---

This error message will appear when the temperature monitor at the cooling body of the ozone generator responds.

**Possible causes for this error message are:**

1. Coolant flow switched off or interrupted
2. Insufficient flow rate (refer to chapter "Technical data")
3. Excessive temperature (above 30 °C)

Once the error has been localized and rectified, and after the ozone generator has cooled down (approx. 10 min.) the unit may be switched on again.

If the error message appears again, notify the customer service at **WEDECO**.

## Error of converter communication

The display indicates

ERROR CONVERTER	
MORE INFO →	HELP
START-MENU →	ESC

Once the "HELP key" has been pressed, the following will appear

NO COMMUNICATION TO THE CONVERTER
--------------------------------------

This error message indicates a malfunction in the communication between the converter PCB and operating terminal.

### Possible cause for this error message is:

Insufficient contact of the 9 pole plug-in connection. Check the plug-in connection, and if necessary, retighten the fastening screws. Then switch on the unit again.

If the error message appears again, notify the customer service at **WEDECO**.

## Error of converter

The display indicates

ERROR CONVERTER	
MORE INFO →	HELP
START-MENU →	ESC

Once the "HELP key" has been pressed, the following will appear

INVERTER MALFUNCTION
SEE USER MANUAL: CH. TROUBLESHOOTING

**Operating instructions****Series GSO****Possible cause for this error message is:**

This error message indicates a malfunction at the converter electronics.  
In order to rectify the error, switch the unit off and then on again.

If the error message appears again, notify the customer service at  
**WEDECO**.

**Error Link Voltage**

The display indicates

ERROR LINK VOLTAGE	
MORE INFO →	HELP
START-MENU →	ESC

Once the "HELP key" has been pressed, the following will appear

LINK VOLTAGE OUTSIDE RANGE SEE USER MANUAL: CH. TROUBLESHOOTING
--

**Possible cause for this error message is:**

This error message indicates a malfunction at the converter electronics.  
In order to rectify the error, switch the unit off and then on again.

If the error message appears again, notify the customer service at  
**WEDECO**.

**Error Mains Voltage**

The display indicates

ERROR MAINS VOLTAGE	
MORE INFO →	HELP
START-MENU →	ESC

Once the "HELP key" has been pressed, the following will appear

**Operating instructions****Series GSO**

MAINS VOLTAGE  
OUTSIDE TOLERANCE  
SEE USER MANUAL:  
CH. TROUBLESHOOTING

**Possible cause for this error message is:**

1. Main voltage supply of the customer is out of the allowed tolerance or shows higher fluctuations.
2. The voltage relay K1 is damaged

Once the error has been localized and rectified, the unit may be switched on again.

If the error message appears again, notify the customer service at **WEDECO**.

**Error Processor**

The display indicates

ERROR PROCESSOR  
MORE INFO →      HELP  
START-MENU →    ESC

Once the "HELP key" has been pressed, the following will appear

PROCESSOR  
MALFUNCTION

**Possible cause for this error message is:**

This error message indicates a malfunction of the processor.  
In order to rectify the error, switch the unit off and then on again.

If the error message appears again, notify the customer service at **WEDECO**.

**Operating instructions**
**Series GSO**
**Door switch and/or line monitor**

The display indicates

CABINET DOOR!	
LINE MONITOR	
MORE INFO →	HELP
START-MENU →	ESC

Once the "HELP key" has been pressed, the following will appear

DOOR OPEN DURING OP- ERATION OR INSUFFICIENT LINE CONDITIONS
--

This error message indicates a shut down of the unit because the cabinet door which was opened during regular operation, so that is possible to touch the power supply and to get electric shocks **or** strong fluctuations of the power line with duration of more than 100 ms (initial setup).

**Possible cause for this error message is:**

The purpose of the line monitor is to prevent the overall system against strong fluctuations of the power line. Referring on the schematics the initial setup is a voltage fluctuation of  $\pm 10\%$  of the nominal voltage of 230 V AC / 400 V AC and interruptions of more than 100 ms duration. However oversized semiconductors shall prevent the system against damages of electronics in a certain range.

If the error message appears again, notify the customer service at **WEDECO**. More frequent shut downs due to fluctuations of the power line should be indicated to the customer service as well in order to analyze the environmental conditions at site more carefully and/or to offer additional equipment so that the equipment is less sensitive on this noise coming from the power line.

Voltage drops of more than 60 % and for more than 150 ms of duration will damage the active power factor controller (PFC) in front of the frequency converter if the line monitor is not working properly.

**No display on the operating terminal**

If no display appears on the operating terminal when the system is switched on, this means that the safety fuse in the unit socket has tripped.

A POSSIBLE CAUSE COULD BE A SHORT CIRCUIT IN THE UNIT.

**Operating instructions****Series GSO**

Once the fuse has been replaced, the unit may be switched on again.

If the error appears again, notify the customer service at **WEDECO**.



## 8 Maintenance and Repair

### 8.1 General

The individual maintenance steps and repair work on the system are described in this chapter.



Ensure that maintenance and repair work is only performed by trained qualified personnel, prerequisite being that the personnel have read and understood the operating instructions, and, in particular, the chapter "Safety".



Maintenance and inspection of the system at regular intervals is of utmost importance. This will prevent malfunctions from occurring and increase the operational safety/reliability.

### 8.2 How to proceed

Prior to performing maintenance and repair work, observe the information provided in chapter "Cleaning".

When performing installation work overhead, use the provided or other approved safe climbing aids and operating platforms. Never climb up on system parts! Wear safety harnesses when performing maintenance work high up!

In order to ensure safety while the protection device is open, always switch off the power switch when the system is standing still. Pull out the power cable and wait 30 minutes prior to opening the system. Switch off the external voltage for an external signal and pull out the plug connection. In order to prevent the system from starting accidentally, always secure it against unintentionally switching on.

Never spray water in rooms accommodating ozone production systems.

Always retighten any screw connections loosened during the maintenance and repair work!

If it is necessary to remove the safety devices during set-up, maintenance and repair, ensure that these devices are refitted and checked immediately upon completion of the maintenance and repair work.

Ensure an environmentally compatible disposal of consumables and auxiliary materials as well as replacement parts!

Dispose of pollutants/contaminants in such a manner, that they imply no danger for people and the environment. Strictly observe the valid local regulations.

**Operating instructions****Series GSO**

Observe the accident prevention regulations!

Secure all systems upstream and downstream of the ozone system, and operating media, e.g. the feed gas, against unintentional start-up.

Prior to all maintenance, inspection and repair work, ensure that the system is isolated from the power and the power cable is pulled out.

Observe any existing national regulations when working in confined spaces!

When handling oil, grease and other chemical substances, always observe the safety regulations relevant for the particular product!

Immediately exchange the specified wear and safety parts in the event of damage.

Make sure that the power is switched off prior to connecting or disconnecting cables. Non-observance may result in an electric shock or malfunctions in the system.

If the system must be started during maintenance work (trial run), the responsible operating personnel must ensure that no persons or objects are within the hazardous area.

### 8.3 Maintenance Intervals



Various maintenance and control work is required during the service life of the machine. The respective intervals which must absolutely be observed are listed in this section.




Ensure that maintenance and repair work is only performed when the power switch is switched off and the power connection cable is pulled out.



When working on the ozone generator or high voltage transformer, ensure that the high voltage connections are grounded in accordance with the local regulations. When working on the ozone generator or gas lines, make sure that the parts are depressurized and free of ozone.

Procedure		Interval		
C = Check	R = Retension	d = daily	sa = semi-annually	
S = Set	L = Lubricate	w = twice a week	y = annually	
CL = Clean	E = Exchange	m = monthly		
Component	Check	Procedure	Interval	Remark
<b>Complete system</b>				
Medium supply   Danger	Check all lines and connections for leaks	C	m	It is advisable to check the system for leaks at regular intervals. For this purpose, pressurise the machine, close the external input and output valves and reduce the admission pressure to the ambient pressure. After approx. 10 minutes, record the initial pressure (pressure gauge) and after several hours the final pressure (pressure gauge). Take pressure changes resulting from a change in the ambient temperature into account.
<b>Safety elements</b>				
EMERGENCY STOP switches	Function check	C	d	Refer to chapter "Safety"
Warning signs and Warning pictographs	Check to ensure perfect condition	C	d	Replace if necessary, refer to chapter "Safety". The pictographs are listed there.
Breathing protection apparatus  	Check to ensure perfect function and completeness	C	-	Check the breathing protection apparatus at regular intervals. In addition, observe all local and national regulations and directives

**Operating instructions**
**Series GSO**

Procedure		Interval		
C = Check	R = Retension	d = daily	sa = semi-annually	
S = Set	L = Lubricate	w = twice a week	y = annual	
CL = Clean	E = Exchange	m = monthly		
Component	Check	Procedure	Interval	Remark
Ozone room air monitoring	Check to ensure perfect function and completeness	C	-	Check the ozone room air monitoring devices at regular intervals. Refer to the respective manufacturer's data for information on the time intervals.
<b>Filter mat (except GSO 40-06 and GSO 50)</b>				
	The exchange intervals depend on the installation site and ambient conditions.	E	y	Also exchange the filter mats at regular intervals.
<b>Complete system</b>				
Electrical component	Check	C	y	<p>Once a year, check all screws and plug-in connections of the electrical connections to ensure tight seating. Switch off the mains voltage and pull out the power plug. Do not open the door until a time of <b>30 minutes</b> has elapsed, as the condensers on the electronics need time to discharge. Prior to starting work on ozone generators, electrically discharge them safely and <b>individually</b> at the high voltage connections. Check the converter with a suitable measuring device to ensure that it does not carry voltage. Once the work has been completed, re-close the door.</p> <p></p> <p><b>Danger to life exists if the 30 minute time limit is not observed!</b></p>
General condition of the system	Visual check	C	y	Look for corrosion

**Table 8-1: Maintenance Intervals**

## 9 Spare parts

Only use original parts as listed in the **WEDECO** spare parts list.

We expressly point out that spare parts or accessories not supplied by us, have obviously not been tested and approved by us. Therefore, the installation and/or use of such products may possibly have a negative constructive effect on the specified characteristics of the system, thus impairing active and/or passive safety characteristics. Any damage caused by the use of parts other than the original spare parts and accessories will invalidate all liability and guarantee obligations on parts of **WEDECO**

If in doubt, contact **WEDECO** .

Please place all spare parts orders with our Customer Service Department.

In order to ensure problem-free and rapid processing of your spare parts order, we require the following data:

1. Customer
2. Identification data of the system.
3. Designation of the desired spare part
4. Desired quantity
5. Desired type of delivery

Please specify all data completely to ensure smooth and correct handling of your order.

## 10 System Shut-down and Disposal

### 10.1 General

The procedure for the storage and/or disposal of the system is described in this chapter.

Storage or disposal requires work which can only be performed by the respective qualified personnel.

### 10.2 Disposal

Disposal of the system requires the following to be performed:

- Switching off the system (refer to chapter "Operation")
- Disassembly/disconnection (refer to chapter "Commissioning/starting-up the system")
- Complete disassembly and disposal or recycling



The system is equipped with various parts which must be handled with the greatest of care. Therefore, please take the following remarks into account.

Disposal may also be executed by **WEDECO** against a small charge.

Please contact our Customer Service Department to this effect.

### 10.3 Environmental Compatibility

The materials primarily used and their characteristics are listed in order to enable proper disposal.

Steel  
 Stainless steel  
 Brass  
 Glass  
 PVC  
 PVDF (Attention: Hazardous waste)  
 PTFE  
 Electronic components

**Table 10-1: Materials used**

## 10.4 Disassembly and Disconnection

Complete the following work prior to transporting the system:



Prior to disconnecting the system from all utilities, turn off the power switch. Refer to chapter "Operation" for a description regarding switch-off.



Prior to final shut down of the system, thoroughly rinse all lines in order to lead any residual ozone into the process or to the residual ozone destruction system.

If the system is to be used at a different site, only rinse using dry gas (atmospheric dew point -60 °C or lower).

Following rinsing, bring the system pressure to ambient pressure, seal off the gas connection lines, and drain the coolant.

Disconnect the following parts from the utilities and mountings:

- Electrical connections
- Supply connection for the media
- System parts
- Fastening devices on the wall or floor



Disconnect the system from the power Supply prior to dismantling the electrical connection. Switch off the external voltage for an external signal, and pull the plug.



Oxygen or ozone may escape when the system is disassembled. This may result in an increased risk of fire and danger of gas enrichment, particularly in clothing. Therefore, it is urgently recommended to strictly observe all safety instructions when handling oxygen and ozone (chapter "Safety").



Place the system on a pallet using a suitable lifting device. Prior to loosening the fixing devices, protecting the system against tipping over, secure the Unit with the aid of the lifting device.

Ensure that no leaks occur when the connections are disconnected.



Store detached cabling such that the lines and plug-in connections cannot be damaged during transport. Exclude the danger of entanglement or tripping.

The same applies to the cabling which is only to be detached from one system part and remains connected to another system part.

The disconnected system parts may now be separately transported.



## 11 Appendix

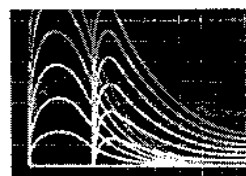
### 11.1 Confirmation of Being Instructed

I herewith confirm that I completely read and understood the user instruction.

Name, first name	place, date	signature



## 11.2 Certificate in Accordance with the EMC Directive



### Bescheinigung einer zuständigen Stelle

im Sinne des § 4 Abs. 2 EMVG bzw.  
des Artikels 10 Abs. 2 der EMV-Richtlinie 89/336/EWG

Zertifikat-Nr.:

Z990404

Hiermit wird bescheinigt, daß das nachfolgend genannte Produkt den grundlegenden Schutzanforderungen der Richtlinie des Rates vom 03. Mai 1989 zur Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit (89/336/EWG) entspricht.

Inhaber der Bescheinigung:	WEDECO Umwelttechnologie, Postfach 5114, 32051 Herford
Hersteller:	siehe Inhaber
Technischer Bericht, Datum:	990404 vom 29.04.1999
Produktbezeichnung:	Gerät für Ozonerzeugung aus Sauerstoff/Luft
Bestimmungsgemäße Verwendung des Produktes:	Industriebereich
Anlage(n):	1 Seite, Liste der Gerätebezeichnungen

Diese Bescheinigung bezieht sich nur auf das zur Konformitätsbewertung vorgestellte Produkt oder den technischen Bericht. Ihre Gültigkeit erstreckt sich auf den gesamten Europäischen Wirtschaftsraum.

Blomberg, 29.04.1999  
Ausstellungsort, Datum




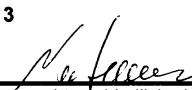
H. Altmaier  
Leiter der zuständigen Stelle  
Dr.-Ing. Holger Altmaier

PHOENIX TEST-LAB GmbH  
Königswinkel 10

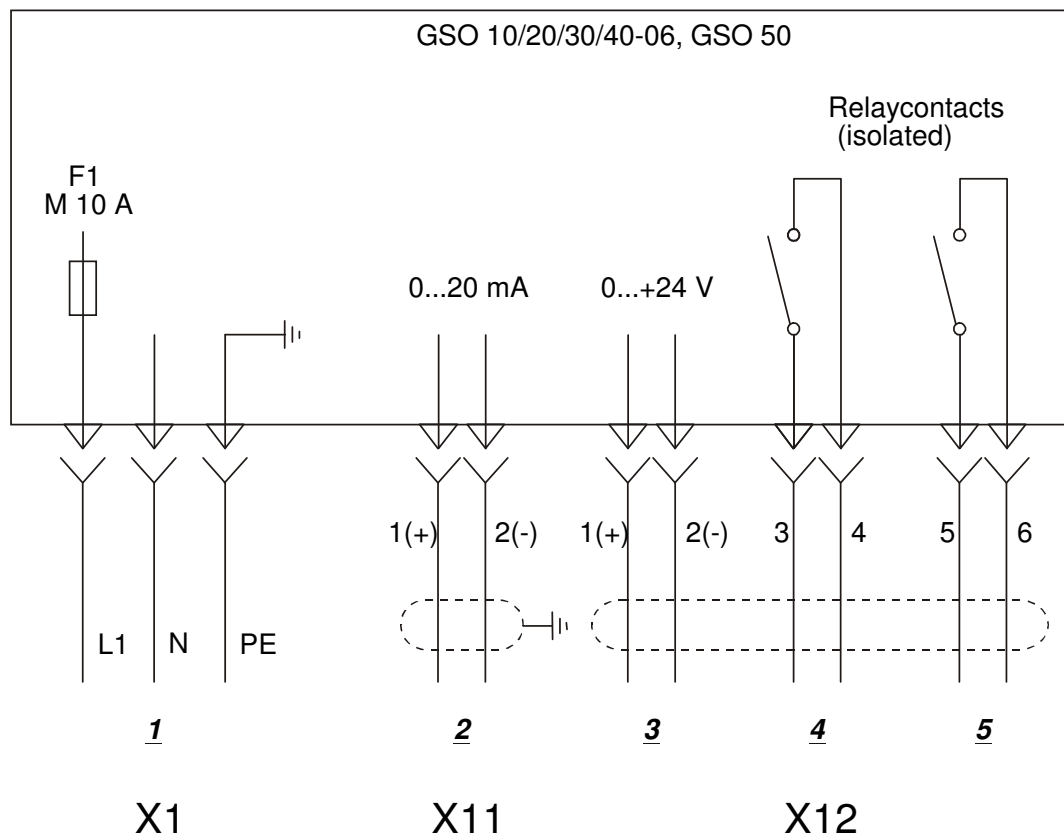
D-32825 Blomberg

akkreditiert von der Regulierungsbehörde für Telekommunikation und Post  
unter der DAR-Registriernummer BPT-ZE-018/95-00

## 11.3 EG-Declaration of Conformity

	  <i>Engineered for life</i>																
<h3>EG-Konformitätserklärung</h3> <p>gemäß Maschinenrichtlinie 98/37/EG Anhang IIA          Declaration of Conformity – subject to the Directive 98/37/EC Annex IIA</p>																	
<table border="0" style="width: 100%;"> <tr> <td style="width: 30%;">Hersteller:</td> <td colspan="3" style="text-align: center;"><b>WEDECO GmbH</b></td> </tr> <tr> <td>Manufacturer:</td> <td colspan="3" style="text-align: center;"><b>Boschstr. 6, 32051 Herford, Germany</b></td> </tr> </table>		Hersteller:	<b>WEDECO GmbH</b>			Manufacturer:	<b>Boschstr. 6, 32051 Herford, Germany</b>										
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Herstellernummer:	<b>Siehe</b>	Baujahr:	<b>Siehe</b>														
Factory-No.:	<b>Typenschild</b>	Year of Construction:	<b>Typenschild</b>														
<p>Wir erklären, dass das vorgenannte Projekt hinsichtlich seiner Konzeption, der Bauart und der Ausführungen den grundlegenden Sicherheits- und Gesundheitsanforderungen mit den nachfolgend aufgeführten Richtlinien konform ist:</p> <p>We herewith confirm that the Project (Pressure equipment) specified above is in accordance with the below mentioned directives of the European Community. Design, completion and applied test procedures followed the guiding rules / regulations as stated below in order to fulfill the general safety and health requirements stipulated by the EU.</p>																	
<b>Richtlinie 98/37/EG</b> <small>Directive 98/37/EC</small>	<b>des Europäischen Parlaments und des Rates vom 22. Juni 1998 zur Angleichung der Rechts- und Verwaltungsvorschriften der Mitgliedstaaten für Maschinen</b> <small>of the European Parliament and of the Council of 22 June 1998 on the approximation of the laws of the Member States relating to machinery</small>																
<b>Richtlinie 2006/95/EG</b> <small>Directive 2006/95/EC</small>	<b>des Rates vom 12. Dezember 2006 zur Angleichung der Rechtsvorschriften der Mitgliedstaaten betreffend elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen</b> <small>of 12 December 2006 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits</small>																
<b>Richtlinie 97/23/EG</b> <small>Directive 97/23/EC</small>	<b>des Europäischen Parlaments und des Rates vom 29. Mai 1997 zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über Druckgeräte</b> <b>(Modul A1 / für Rohrleitungen der Kat. II / CE0045)</b> <small>of the European Parliament and of the Council of 29 May 1997 on the approximation of the laws of the Member States concerning pressure equipment (Modul A1 / for pipings category II / CE 0045)</small>																
<b>Richtlinie 2004/108/EG</b> <small>Directive 2004/108/EC</small>	<b>des Rates vom 15. September 2004 zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über die elektromagnetische Verträglichkeit und zur Aufhebung der Richtlinie 89/336/EWG</b> <small>of 15 September 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC</small>																
<b>Harmonisierte Normen</b> <small>Harmonized Standards</small>		<b>Nationale Normen/Spezifikationen</b> <small>National Harmonized Standards</small>															
<b>EN ISO 12100-1</b>	<b>EN ISO 12100-2</b>	<b>VDI 4500</b>	<b>AD 2000</b>														
<b>EN ISO 14121-1</b>	<b>EN ISO 13849-1</b>	<b>VDE 0100</b>															
<b>EN 60204-1</b>	<b>EN 61000-6-2</b>	<b>VDE 0413</b>															
Herford, 15.12.2008		 rechtsverbindliche Unterschrift Herr Neitemeier															
<small>WEDECO GmbH, Boschstr. 6, 32051 Herford, Germany Telefon +49 (0) 5221/930-0, Fax +49 (0) 5221/930-222</small>																	

## 11.4 Electrical Connection Diagram



### Legend:

1... Power connection (X1), different for GSO, L1/L2/L3/N/PE directly connected to netfilter

2... External set point value (X11)

External interface (X12):

3... External release

4... External set point value  
(contact closed)

5... Multi-input warning  
(contact closed)

## 11.5 Spare Parts List for Model GSO 10 to 30

### 11.5.1 Electrical

Article	Art. No.	GSO 10	GSO 20	GSO 30
Mains filter, single phase	31693	1 pc.	1 pc.	1 pc.
Converter module GSO 10	502430	1 pc.	-	-
Converter module GSO 20	502432	-	1 pc.	-
Converter module GSO 30	502431	-	-	1 pc.
Axial ventilator	31690	1 pc.	1 pc.	1 pc.
3 poles receptacle	31687	1 pc.	1 pc.	1 pc.
6 poles receptacle	31688	1 pc.	1 pc.	1 pc.
3 pole plug	31685	1 pc.	1 pc.	1 pc.
6 pole plug	31686	1 pc.	1 pc.	1 pc.
HV transformer	34429	1 pc.	1 pc.	1 pc.
2 pole rocker switch, illuminated	31683	1 pc.	1 pc.	1 pc.
IEC socket	31684	1 pc.	1 pc.	1 pc.
Safety fuse, medium delay action	31708	1 pc.	1 pc.	1 pc.
Display module	31689	1 pc.	1 pc.	1 pc.
Intermediate circuit Throttle	34710	1 pc.	1 pc.	-
Intermediate circuit Throttle	34779	-	-	1 pc.

### 11.5.2 Mechanical

Article	Art. No.	GSO 10/20	GSO 30
Ozone generator module	502435	1 pc.	-
Ozone generator module	502429	-	1 pc.
Electrode module GSO 10-40	45371	12 pc.	22 pc.
Temperature monitor	17043	1 pc.	1 pc.
Pressure reducer	34579	1 pc.	1 pc.
Flow meter 0.06-0.65 m <sup>3</sup> /h	37245	1 pc.	-
Flow meter 0.15-1.5 m <sup>3</sup> /h	37246	-	1 pc.
Solenoid valve	34616	1 pc.	1 pc.
Pressure gauge	49691	1 pc.	1 pc.

### 11.5.3 Miscellaneous

Article	Art. No.	GSO 10/20	GSO 30
Hose PTFE ø10x1	12943	3 m	3 m
Hose PA ø10x1	38937	3 m	3 m
Teflon strip	15845	1 pc.	1 pc.
Filter mat	31691	2 pc.	2 pc.
Power connection cable	31853	1 pc.	1 pc.

## 11.6 Spare Parts List for Model GSO 40-06

### 11.6.1 Electrical

Article	Art. No.	GSO 40-06
Mains filter, single phase	31693	1 pc.
Converter module GSO 40-06	502433	1 pc.
3 poles receptacle	31687	1 pc.
6 poles receptacle	31688	1 pc.
3 pole plug	31685	1 pc.
6 pole plug	31686	1 pc.
HV transformer	34467	1 pc.
Display module	31689	1 pc.
Intermediate circuit Throttle	31682	1 pc.

### 11.6.2 Mechanical

Article	Art. No.	GSO 40-06
Ozonegen. module GSO 40-06 left s. or Ozonegen. module GSO 40-06 right s.	502436 502463	1 pc.
Electrode module GSO 40-06	45374	22 pc.
Temperature monitor	17043	1 pc.
Pressure reducer	34579	1 pc.
Flow meter 0.35 to 3.5 m³/h	37247	1 pc.
Solenoid valve	34616	1 pc.
Pressure gauge	49691	1 pc.

### 11.6.3 Miscellaneous

Article	Art. No.	GSO 40-06
Hose PTFE ø10x1	12943	3 m
Hose PA ø10x1	38937	3 m
Teflon strip	15845	1 pc.

## 11.7 Spare Parts List for Model GSO 50

### 11.7.1 Electrical

Article	Art. No.	GSO 50
Mains filter, 3 phase	34139	1 pc.
Converter module	502426	1 pc.
3 poles receptacle	31687	1 pc.
6 poles receptacle	31688	1 pc.
3 pole plug	31685	1 pc.
6 pole plug	31686	1 pc.
HV transformer	34120	1 pc.
Display module	31689	1 pc.
Intermediate Inductivity	34122	1 pc.
Net Choke	34121	1 pc.

### 11.7.2 Mechanical

Article	Art. No.	GSO 50
Ozone generator module left side	502436	1 pc.
Ozone generator module right s.	502463	1 pc.
Electrode module GSO 50	45374	44 pc.
Temperature monitor	17043	2 pc.
Pressure reducer	34579	1 pc.
Flow meter 0.6 to 5.7 m <sup>3</sup> /h	40610	1 pc.
Solenoid valve	34158	1 pc.
needle valve	34689	1 pc.
Pressure gauge	49691	1 pc.




### 11.7.3 Miscellaneous

Article	Art. No.	GSO 50
Hose PTFE ø12x1	12905	3 m
Hose PA ø12/10	34048	3 m
Teflon strip	15845	1 pc.





## 11.8 Directives

Directives must be issued by the responsible plant operator and must be attached well visible in the operation room. The following example shows the necessary content.

### 11.8.1 Directives for "Handling of Oxygen"

No.: 4		Directive	Prepared by:  Issued:  Date:
Validity range:		Handling oxygen Ozone systems	
Hazardous substance designation			
OXYGEN			
Danger to man and environment			
	<p>Danger symbols with danger designation</p> <p><b>Oxygen is highly fire promoting.</b> <b>Note that an increased risk of fire exists when wearing clothes contaminated with oxygen.</b> Prolonged inhalation of pure oxygen may lead to lung damage and functional disorders of the autonomic nervous system. Liquid oxygen may cause serious frostbite.</p>		
Fire promoting			
Protective measures and behavioral rules			
	<p><b>Ensure that all parts coming in contact with oxygen are kept free of oil and grease.</b> Fire, naked flame and smoking is prohibited. Keep clear of ignition sources. We refer to the company training offered by <b>WEDECO</b> for instructions concerning the handling of ozone and oxygen.</p>		
Mandatory and prohibiting signs			
Behavior in the event of dangerous incident			
	<p>Interrupt the oxygen supply. Observe the identified escape routes.</p>		
Additional measure in case of danger			
First aid:		EMERGENCY CALL: Initial assistance:	
<p>Leave the danger area. Rescue injured persons from the danger area while exercising self-protection measures. Keep injured person calm, protect against heat dissipation. Immediately remove all clothing (including underwear and shoes) contaminated with oxygen. Beware of fire danger. Cover frost-bitten areas using sterile materials, never move or rub frost. Use padding and carefully apply bandages. Immediately notify a physician or ophthalmologist. Inform the physician of the first aid measures taken.</p>			
Proper disposal			
Ensure adequate ventilation			

**Operating instructions**
**Series GSO**
**11.8.2 Directives for "Handling of Ozone"**

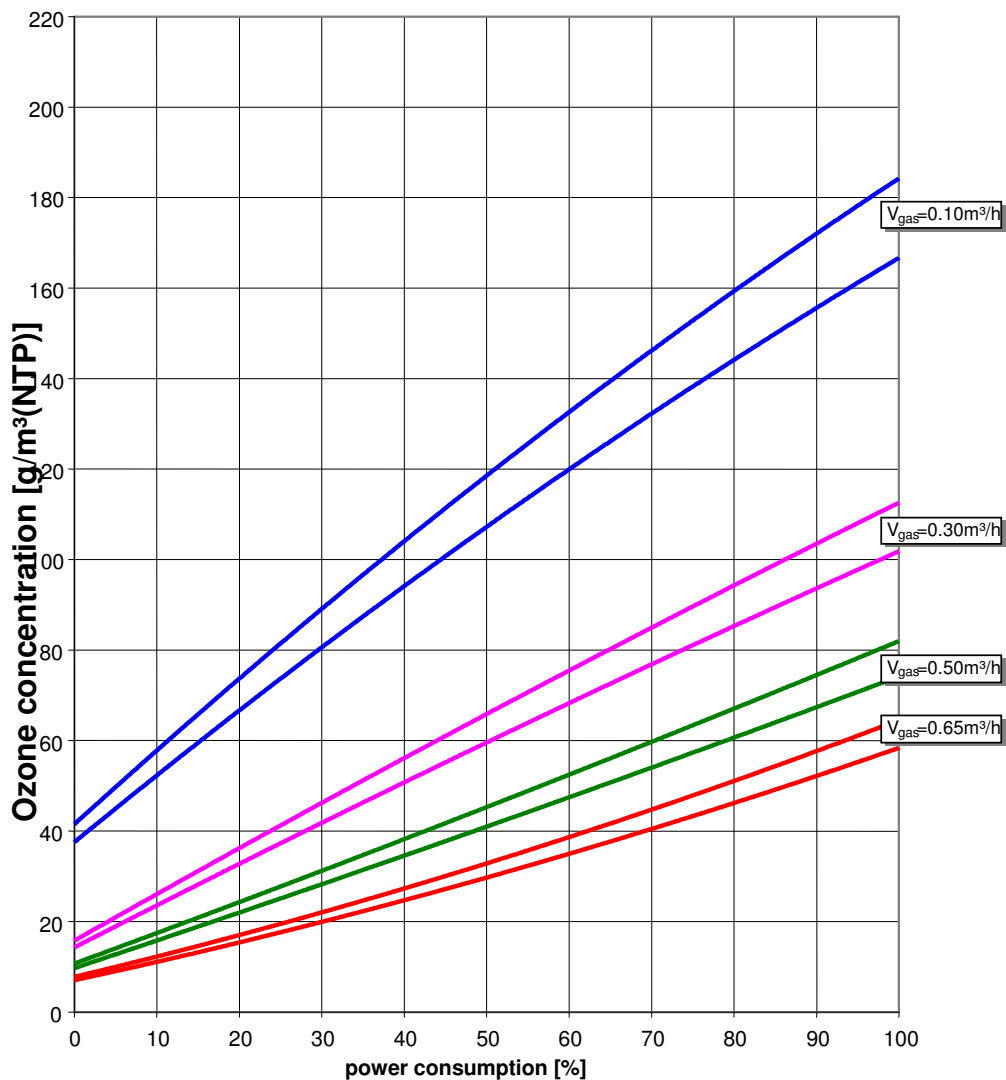
No.: 5		Directive	Prepared by:  Issued:  Date:
Validity range:		Handling ozone Ozone systems	
Hazardous substance designation			
OZONE			
Danger to man and environment			
Danger symbols with danger designation		<b>Oxygen is highly fire promoting.</b> <b>Note that an increased risk of fire exists when wearing clothes contaminated with ozone.</b> Ozone may result in poisoning when inhaled. Irritation of the eyes and mucous membranes, deadening of the sense of smell. Difficulty in breathing to pulmonary edema. Higher ozone contents (exceeding 10 ml/m <sup>3</sup> for a prolonged exposure) result in death.	
 Fire promoting		 Extremely toxic	
Protective measures and behavioral rules			
 Mandatory and prohibiting signs		Ozone has an intensive, unmistakable odour, clearly lying below the maximum workplace concentration value of 0.1 ml/m <sup>3</sup> . At the first sign of ozone odour: Switch off the ozone generator are kept free of oil and grease. Fire, naked flame and smoking is prohibited. Keep clear of ignition sources. We refer to the company training offered by <b>WEDECO</b> for instructions concerning the handling of ozone and oxygen.	
Behavior in the event of dangerous incident			
 Breathing protection apparatus ozone resistant full mask, gas filter DIN 3181-NO or DIN 3181-CO		Interrupt ozone production when the gas detectors respond. Observe the identified escape routes. Check the operatives of the venting system. Only enter rooms in which an ozone accumulation is suspected using breathing protection apparatus to rescue an injured person or to avert acute danger. Warn anyone within the vicinity.	
First aid:		EMERGENCY CALL: Initial assistance:	
Move the person out into the fresh air. Immediately remove clothing (including underwear and shoes) contaminated with ozone. Beware of fire danger. In the event of breathing difficulties, administer oxygen. Keep injured person absolutely calm, protect against heat dissipation. Check pulse, breathing, consciousness. If conscious → move into secure side position. If breathing stops → perform CPR. Immediately notify a physician. Inform the physician of the ozone exposure and the first aid measures taken.			
Proper disposal			
Residual ozone removal system (catalytic converter)			



## 11.9 Performance Curves

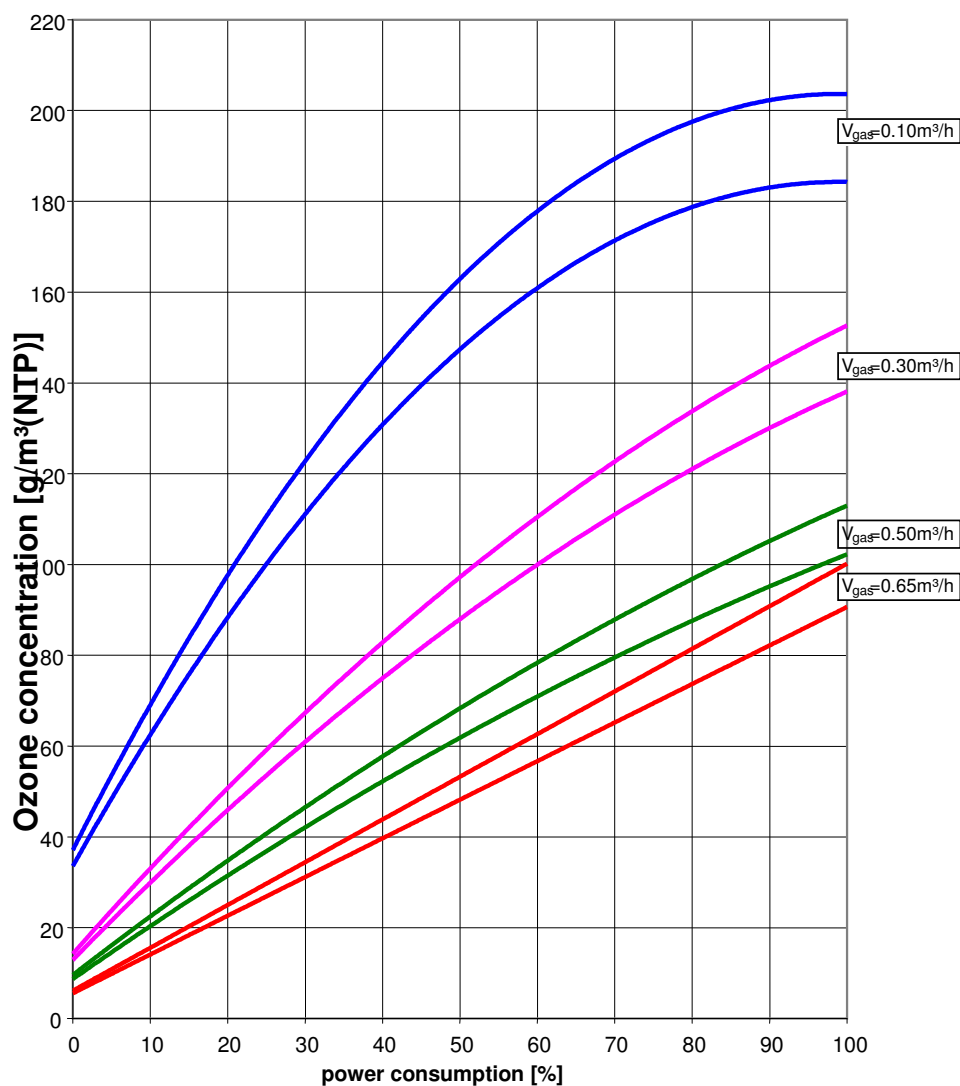
### 11.9.1 Performance Curves GSO 10 – Oxygen

**EFFIZON® Ozone generator**  
**GSO 10**  
 Performance data  
 Oxygen, T<sub>cw</sub> = 15 °C, p = 7 psi g

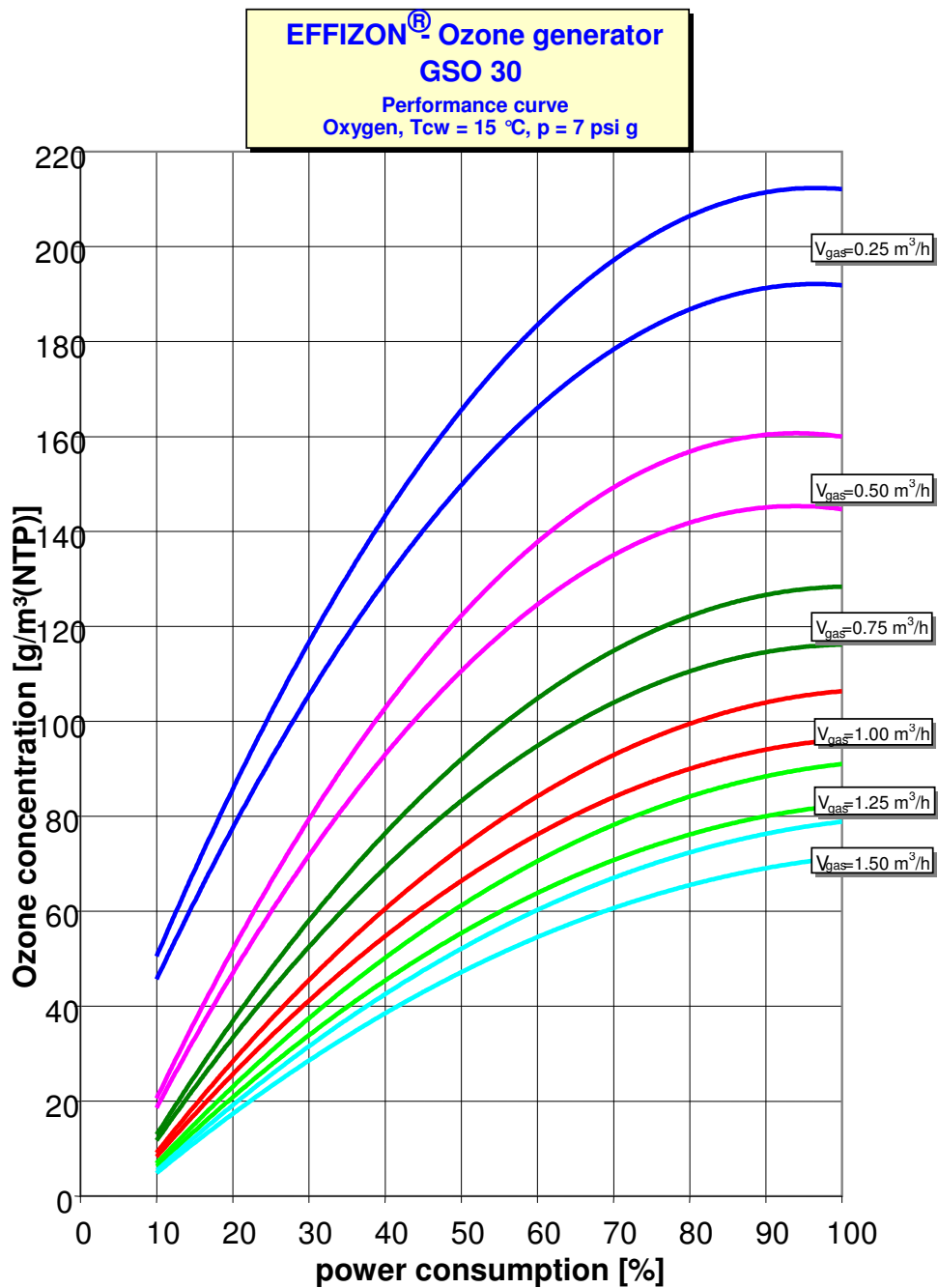


## 11.9.2 Performance GSO 20 – Oxygen

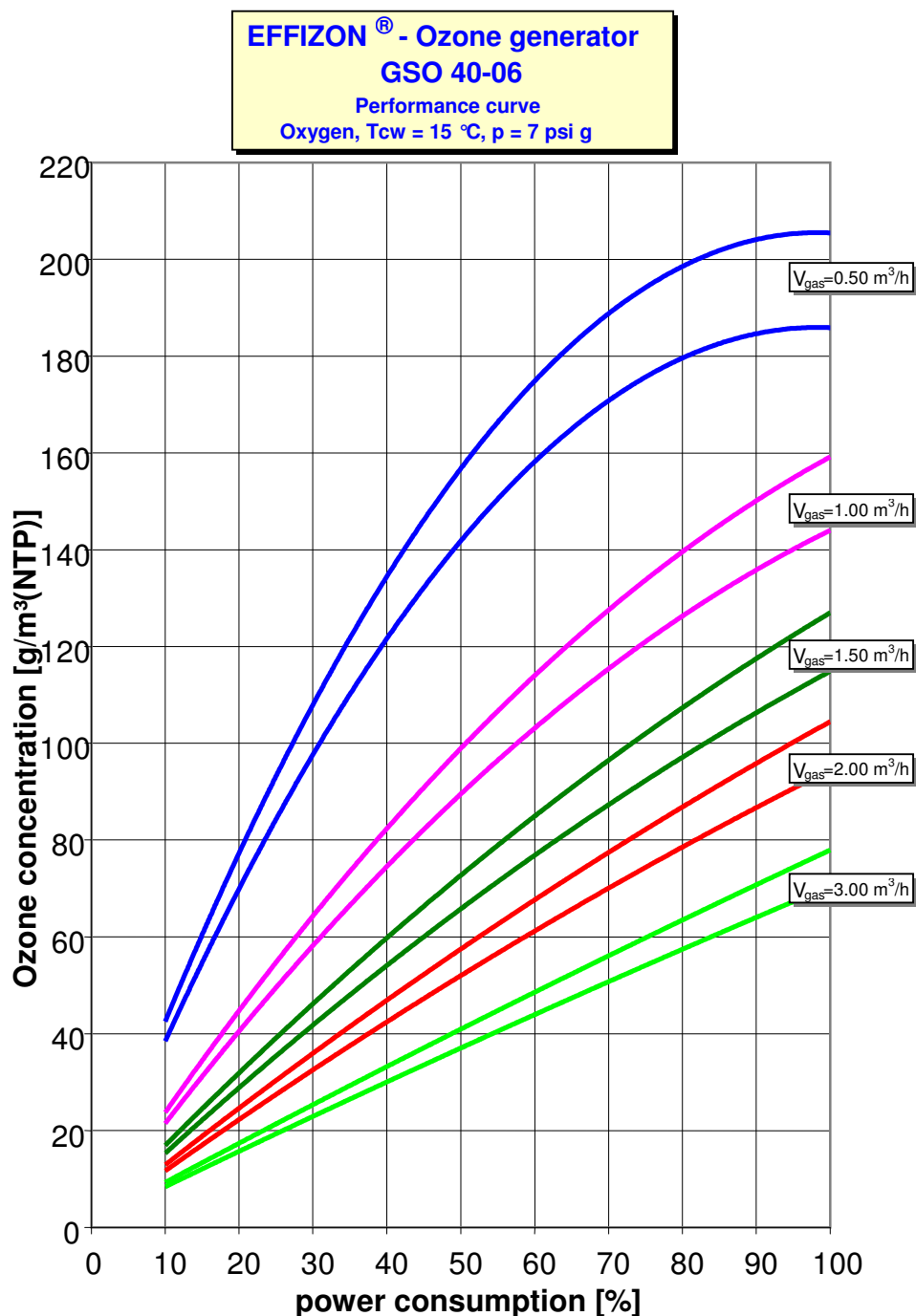
**EFFIZON® Ozone generator**  
**GSO 20**  
 Performance data  
 Oxygen, T<sub>cw</sub> = 15 °C, p = 7 psi g



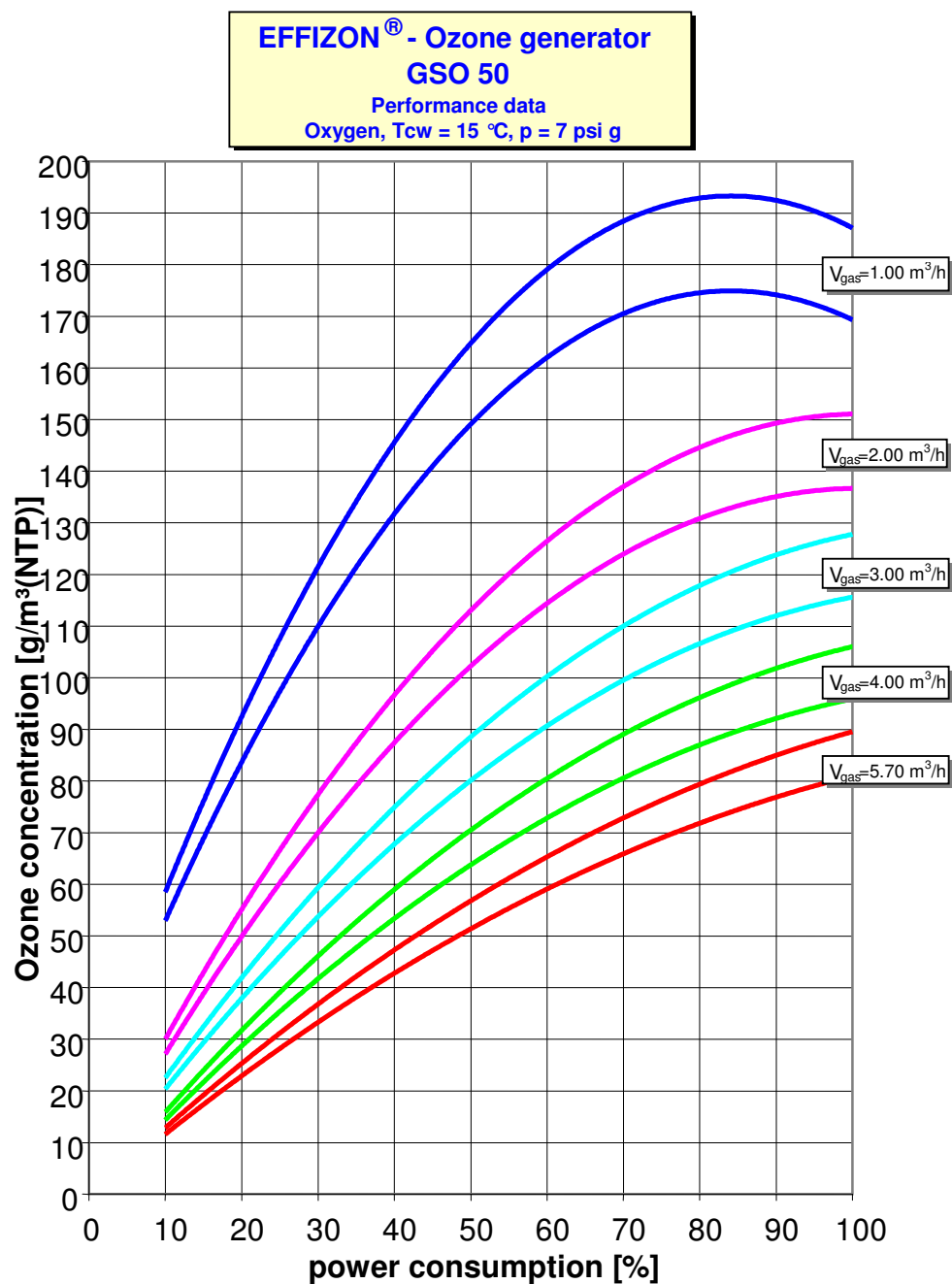
### 11.9.3 Performance GSO 30 - Oxygen



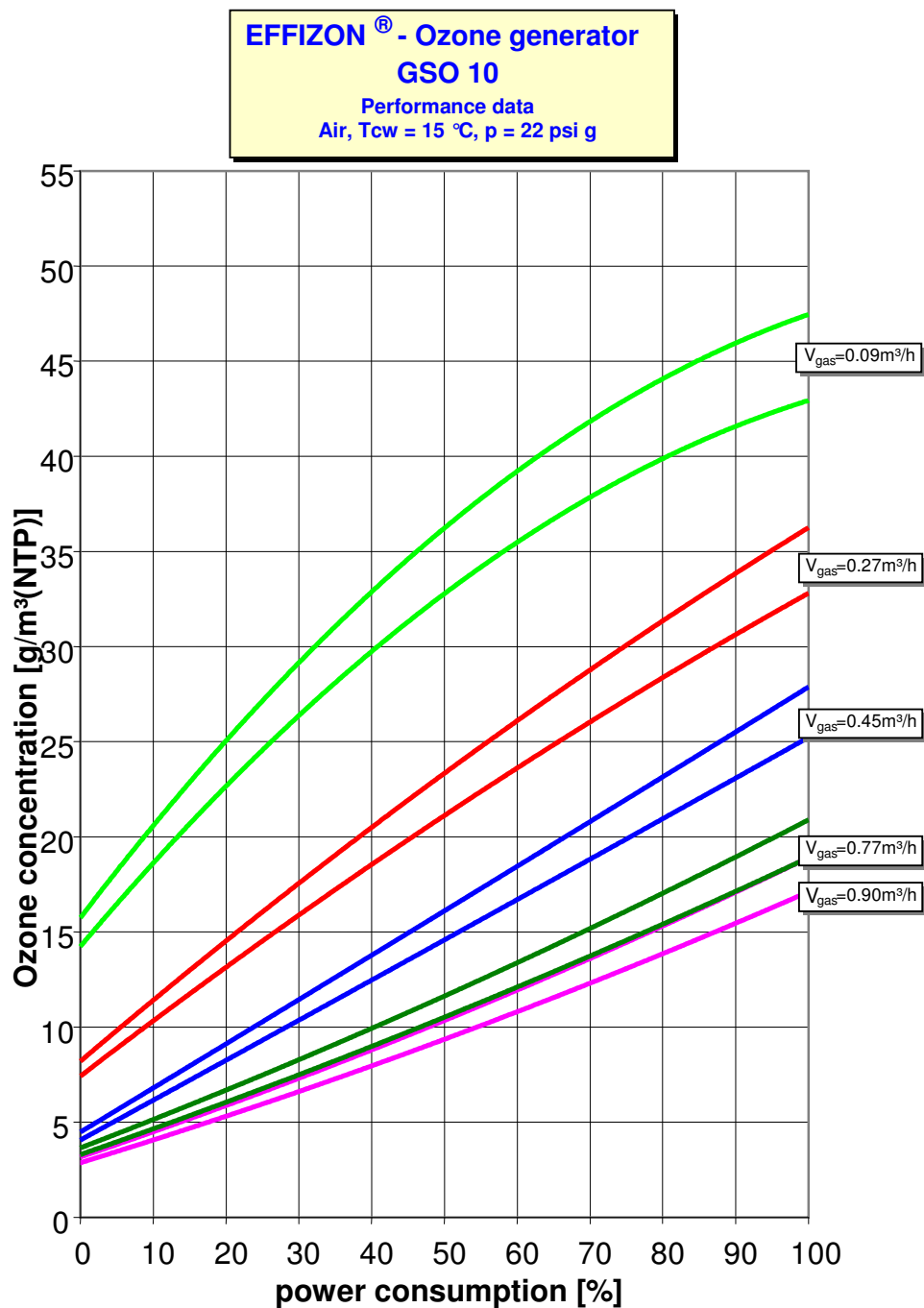
### 11.9.4 Performance GSO 40-06 - Oxygen



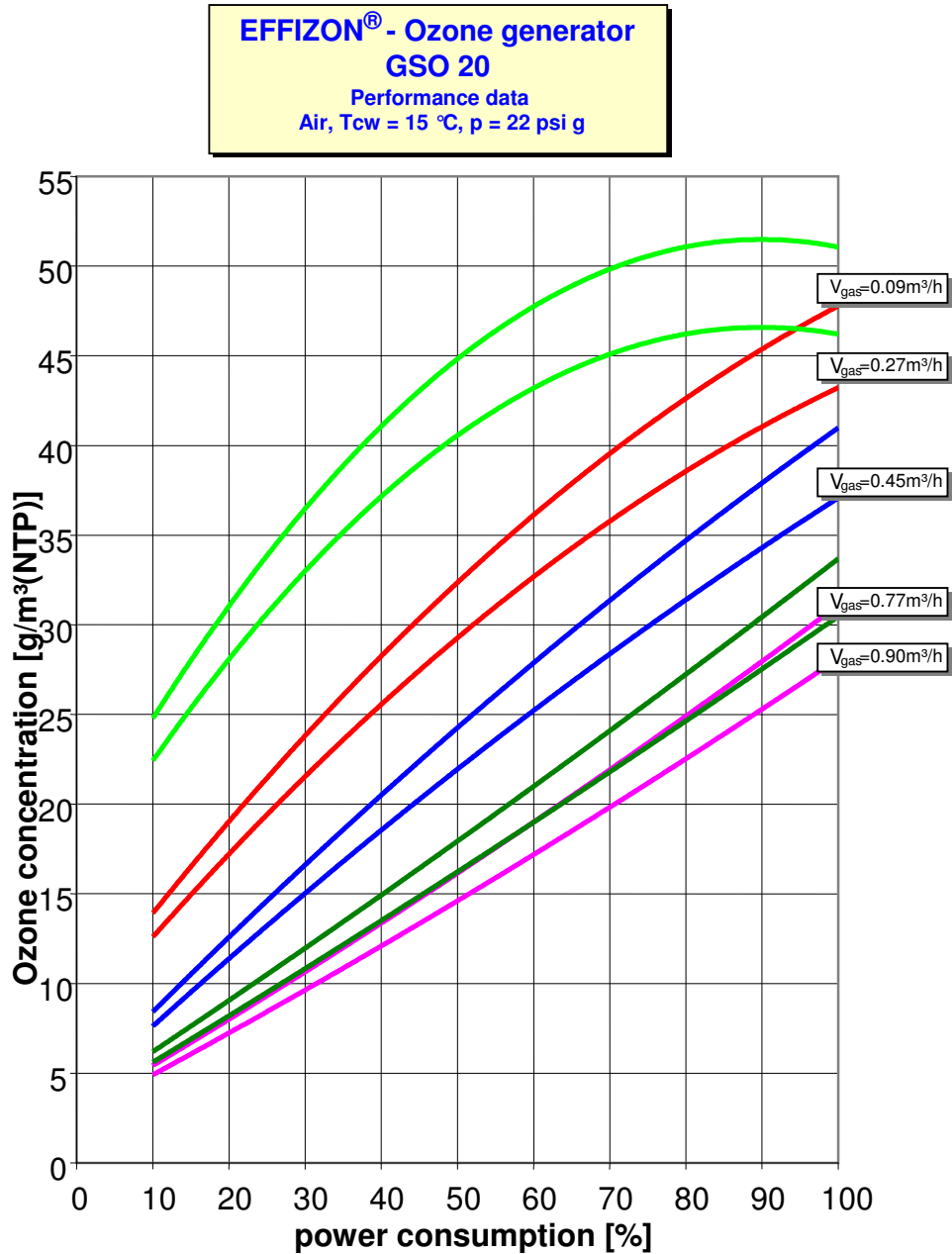
### 11.9.5 Performance GSO 50 - Oxygen



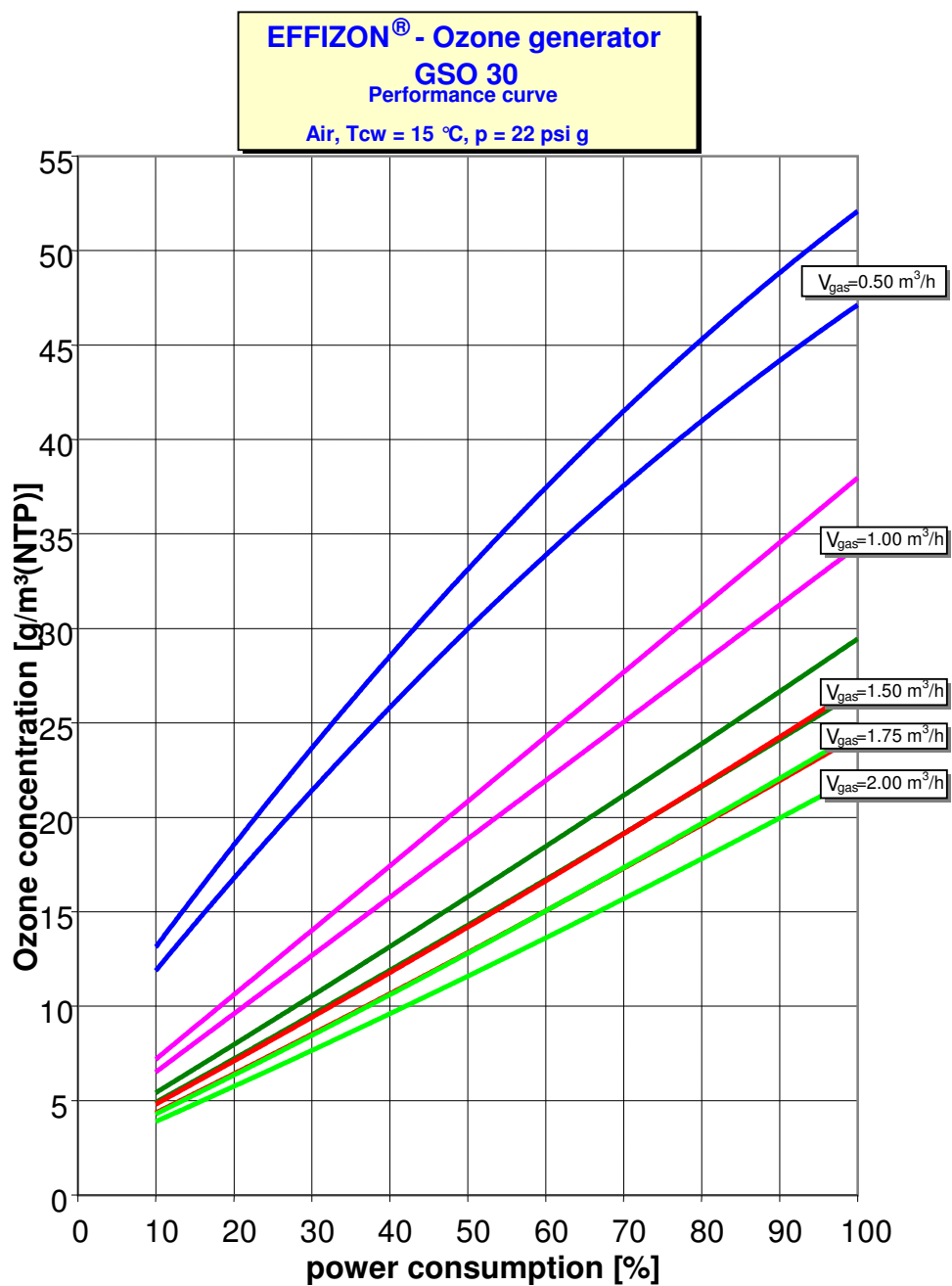
## 11.9.6 Performance GSO 10 – Air



### 11.9.7 Performance GSO 20 – Air

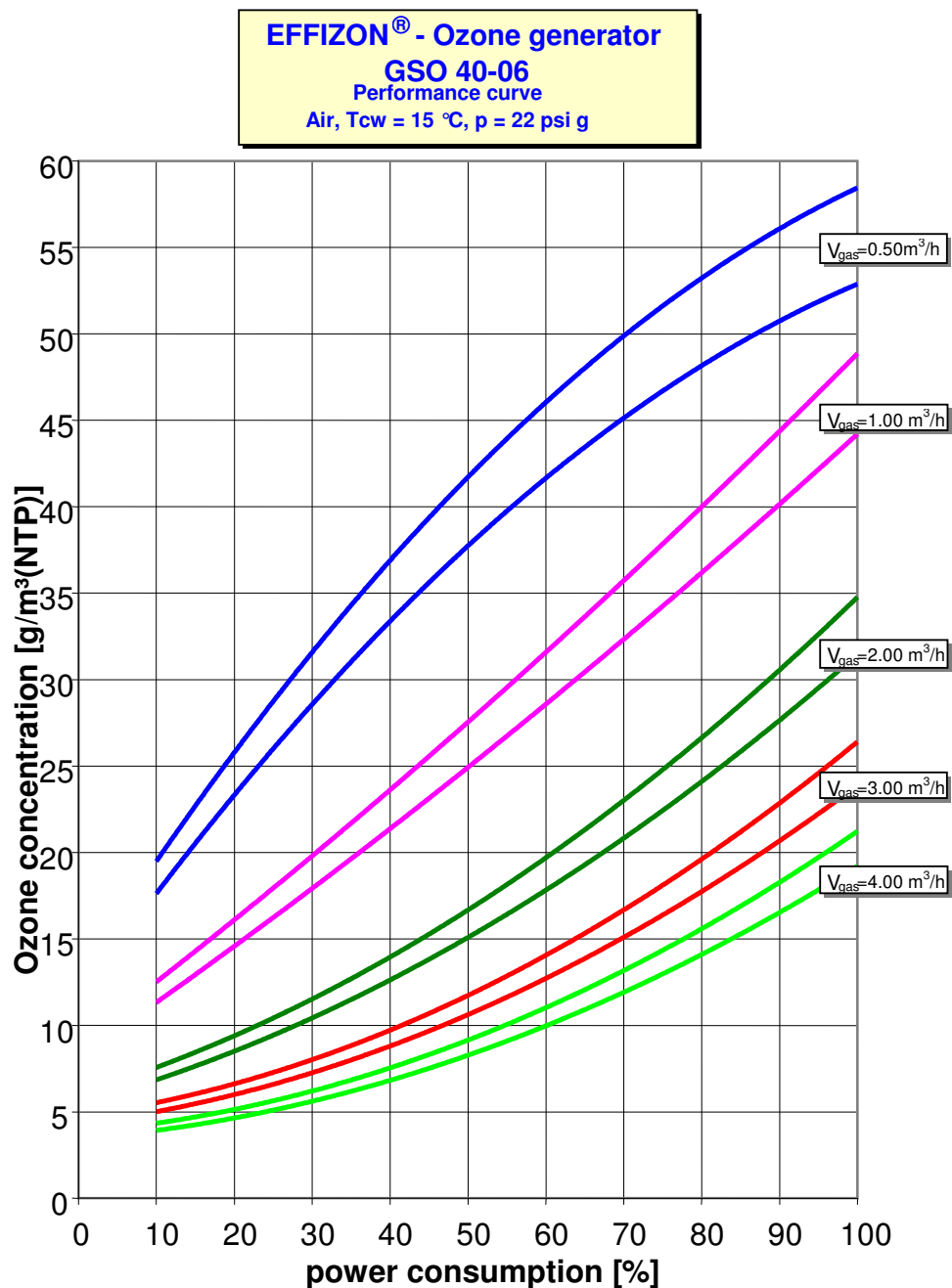


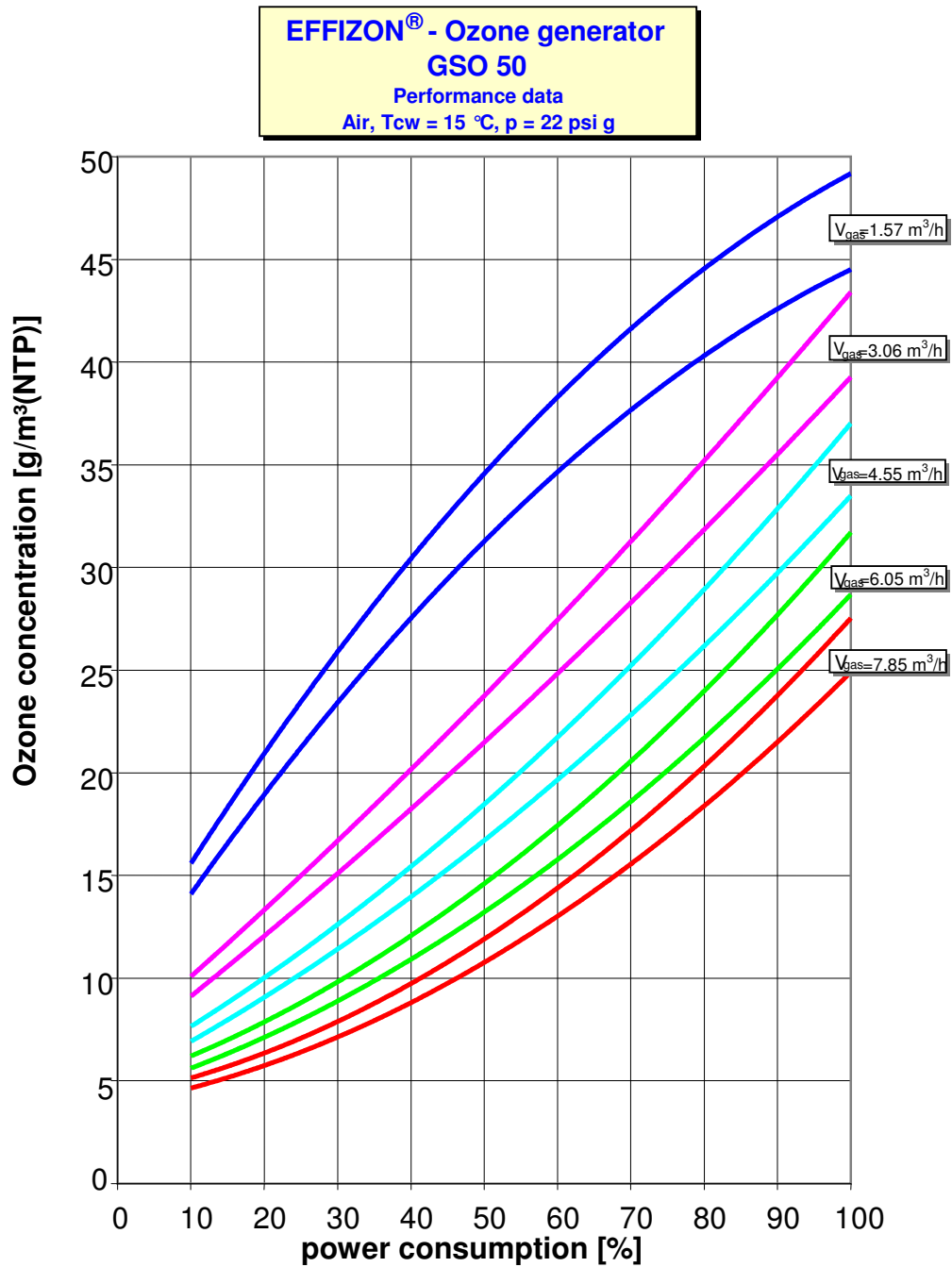
# 11.9.8 Performance GSO 30 - Air



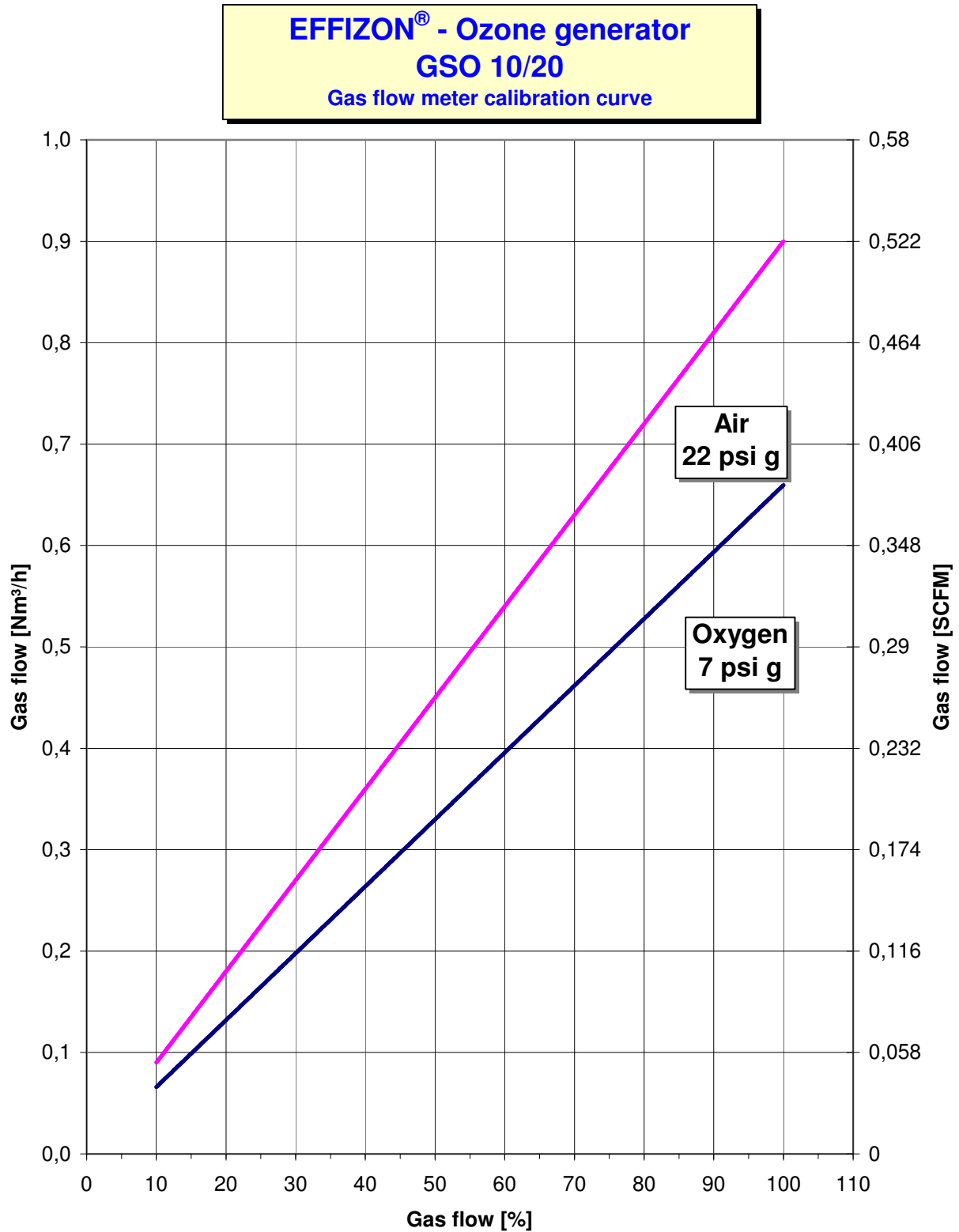


### 11.9.9 Performance GSO 40-06 - Air



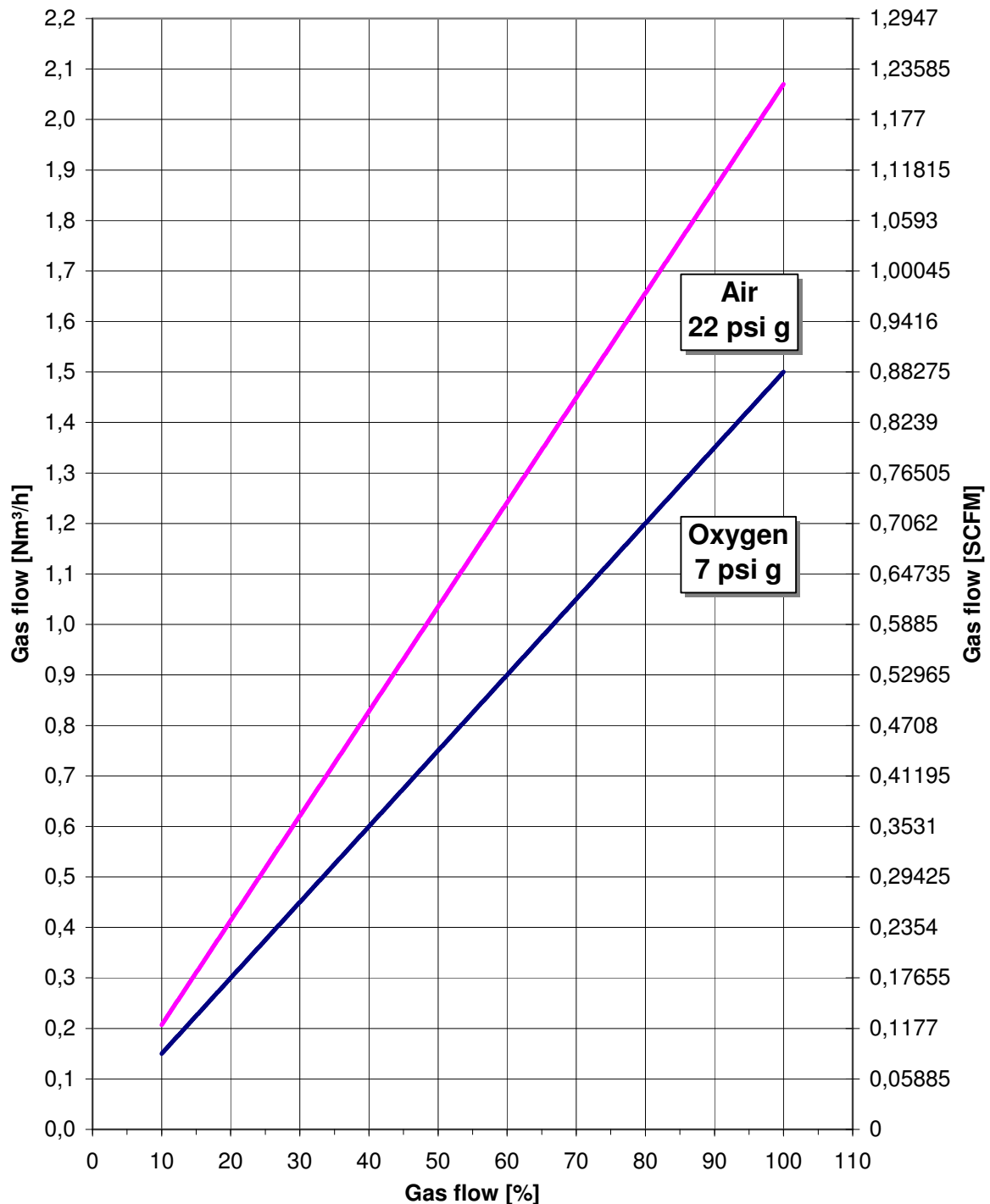
**11.9.10 Performance GSO 50 – Air**


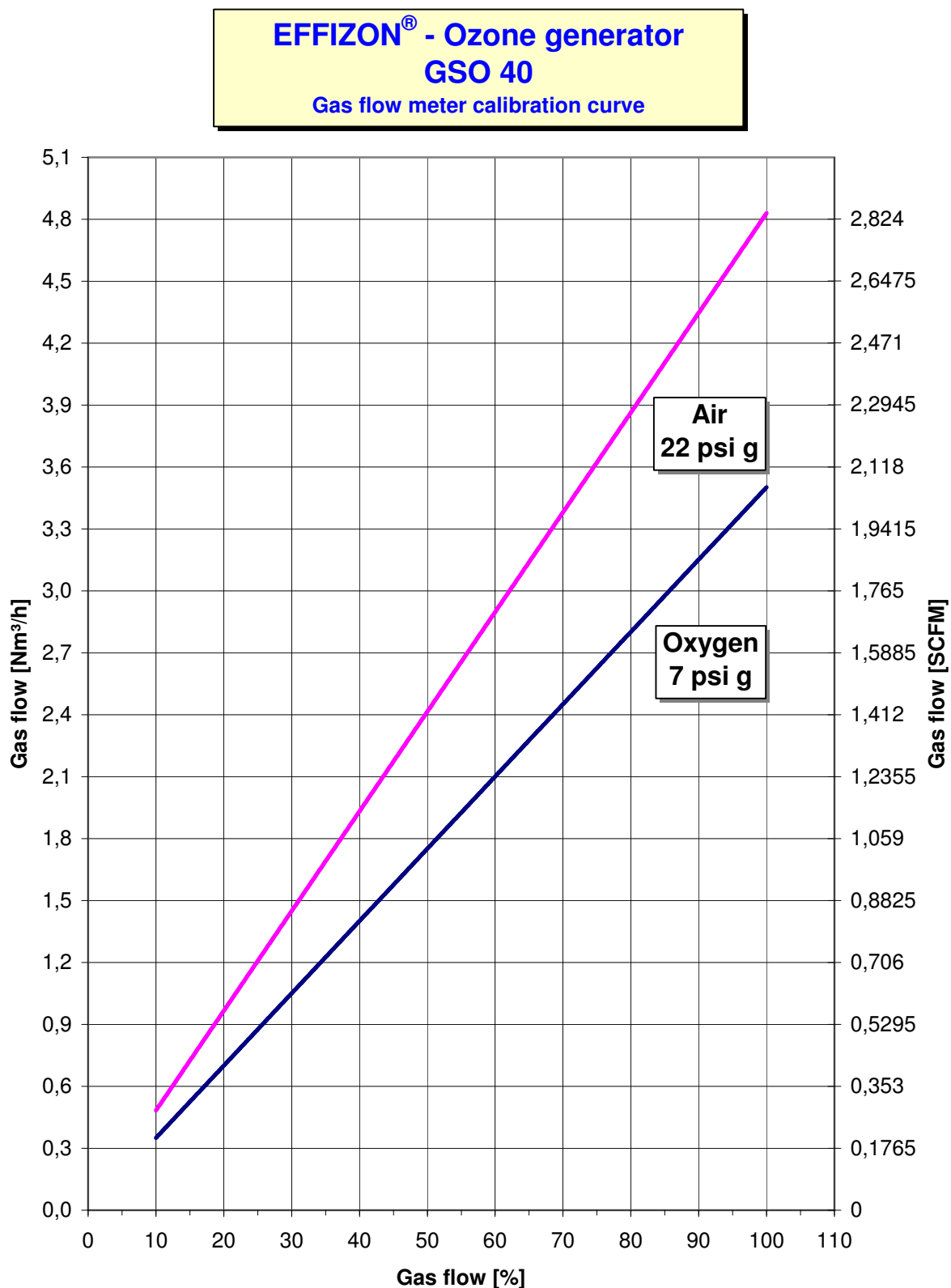
### 11.9.11 Gas Flow Meter Calibration Curve GSO 10/20

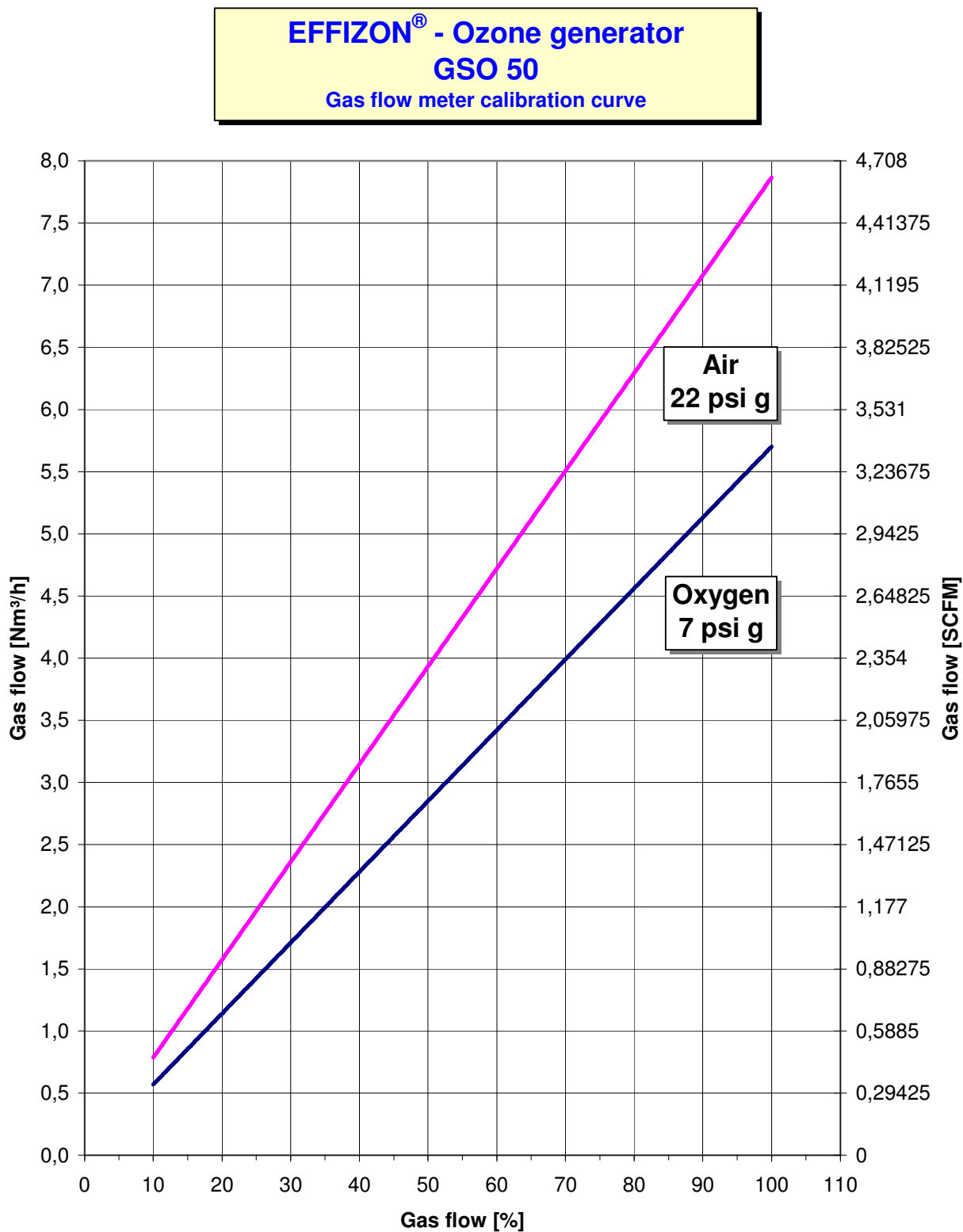


**11.9.12 Gas Flow Meter Calibration Curve GSO 30**

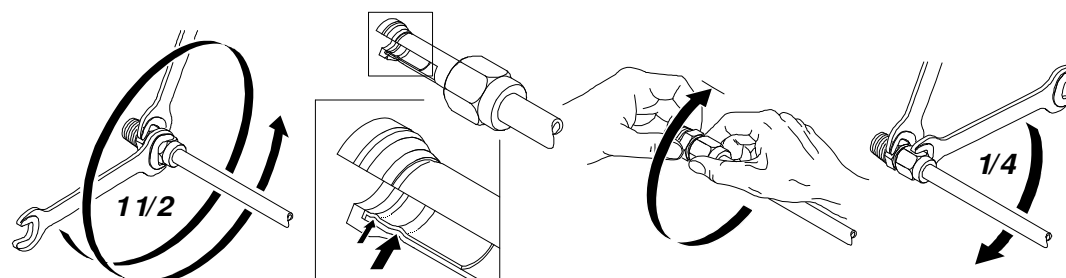
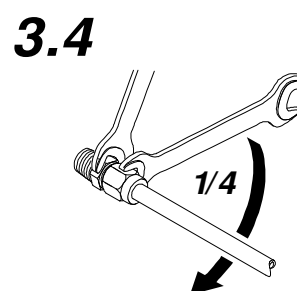
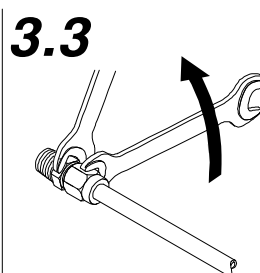
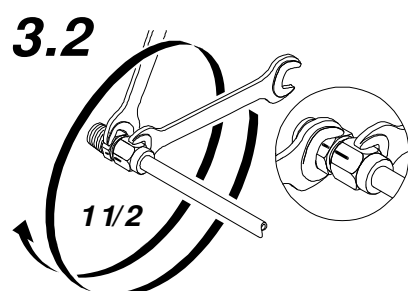
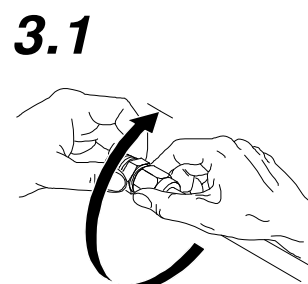
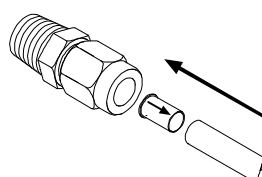
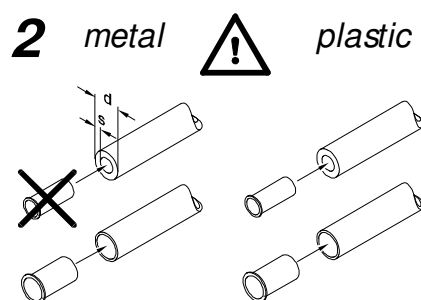
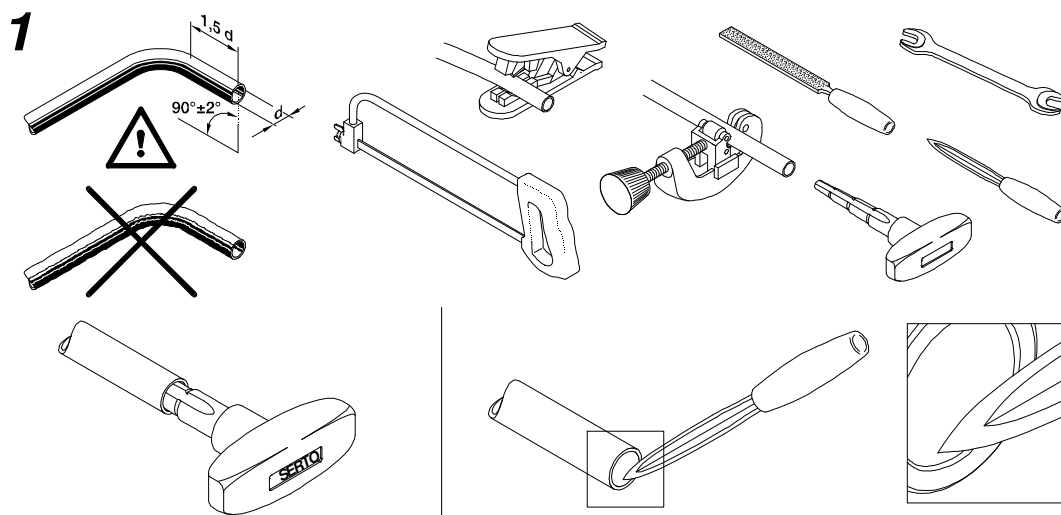
**EFFIZON® - Ozone generator**  
**GSO 30**  
 Gas flow meter calibration curve



**11.9.13 Gas Flow Meter Calibration Curve GSO 40-06**


**11.9.14 Gas Flow Meter Calibration Curve GSO 50**


## 11.10 SERTO - Assembly Instructions for External Connections



**Operating instructions**
**Series GSO**
**Assembly instructions for brass/stainless steel/steel**

Brass chem. nickel plated, refer to separate instructions.

**1. Preparation**

Cut the pipe at right angles and remove burrs. Ensure that the pipe end is straight for a length of approx. 1.5 and that its surface is undamaged. The screw connection is pre-lubricated.

**2. Reinforcing and inserting the pipe**

Provide a support sleeve for thin walled and/or soft pipes such as plastic pipes.

Copper from  $\varnothing = 10$  mm with  $s < 1.0$  mm

from  $\varnothing = 12$  mm with  $s < 1.5$  mm

Stainless steel from  $\varnothing = 6$  mm with  $s < 0.5$  mm

from  $\varnothing = 10$  mm with  $s < 1.5$  mm

Plastic all

Ensure that the pipe and screw connection are perfectly aligned. Insert up to the stop.

**3. Deforming, relieving**

3.1 Manually screw on the connection nut up to a tangible stop, while pressing the pipe against the base section.

3.2 Tighten the connection nut by 1 1/2 revolutions using a work wrench. (Marking will simplify checking the specified number of revolutions.)

3.3 Now slightly loosen the connection nut to relieve the pipe.

3.4 Then fit the connection nut again up to the tangible stop, and tighten for the final assembly by another 1/4 revolution using the wrench. (Steady the nipple using a second wrench.)

**4. Checking the assembly**

Loosen the connection completely. Check the deformation. A distinct bead must be visible on the inside of the pipe.

**5. Re-assembly**

For re-assembly of the same screw connection, fit the connection nut again up to the distinctively tangible stop, and tighten by a 1/4 turn using the wrench.

Lubricate the parts prior to re-assembly.

**Pipes**

Only use pipes having a clean, smooth surface, the outer diameter of which are within  $\pm 0.1$  mm.

**Turnable clamping ring**

The quality of the connection is not influenced if the clamping ring can be turned on the pipe or if the pipe can be turned in the connection nut following assembly.

Assembly sockets for pre-assembly

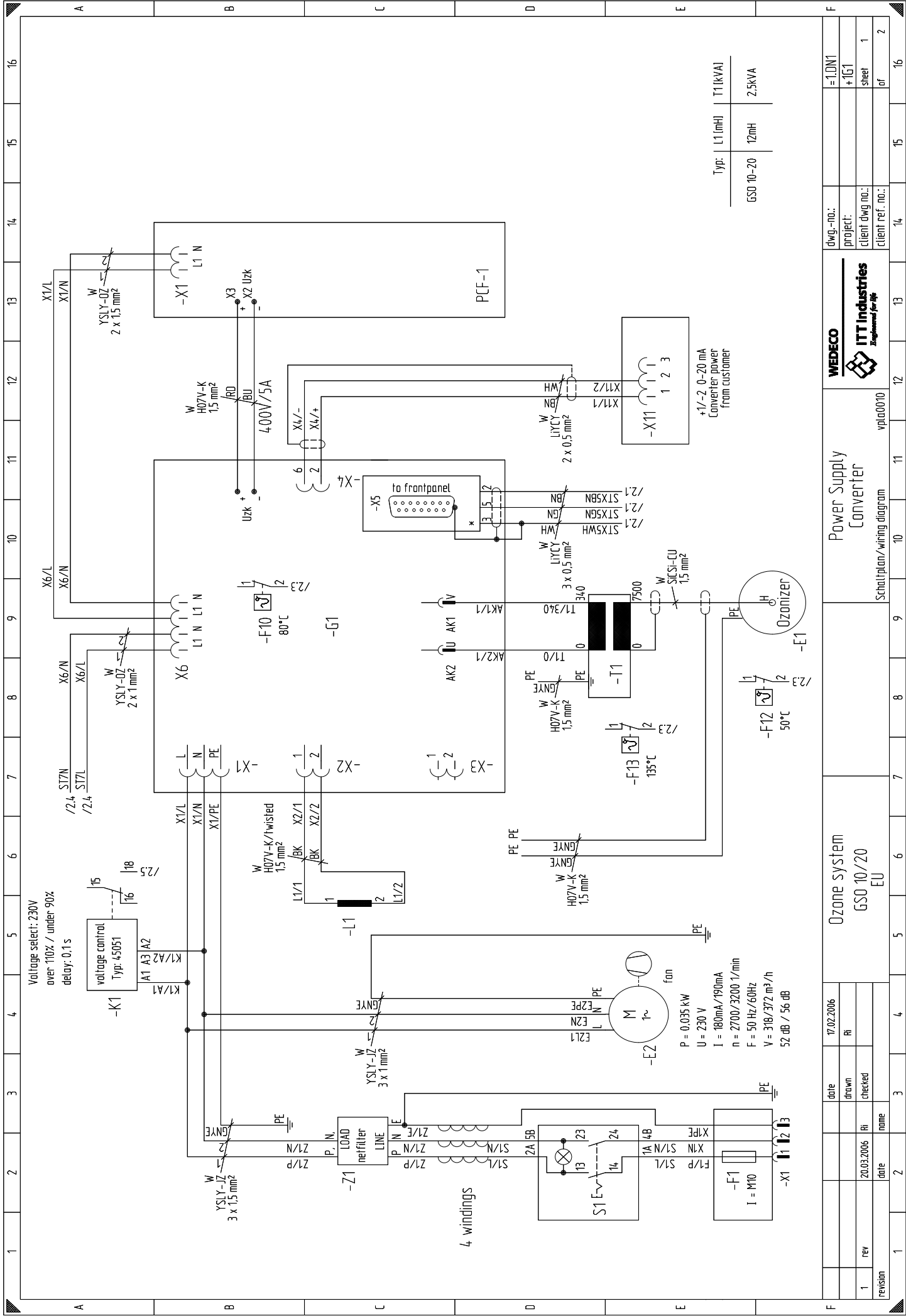
SO 56000, stainless steel, tendered for stainless steel and the brass M range.

SO 6000, CrNi steel, hardened for steel.

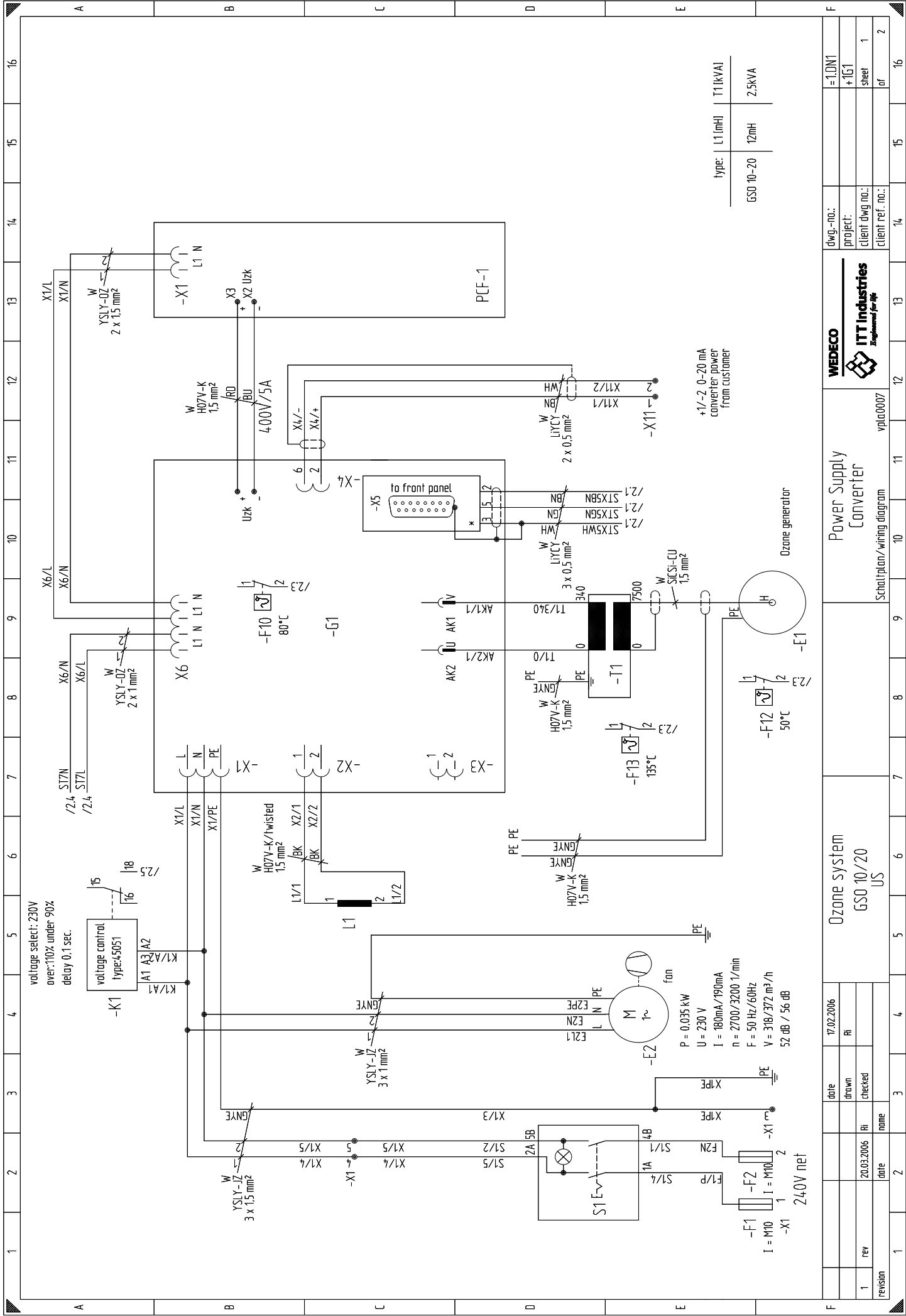


## **11.11 Circuit Diagrams**

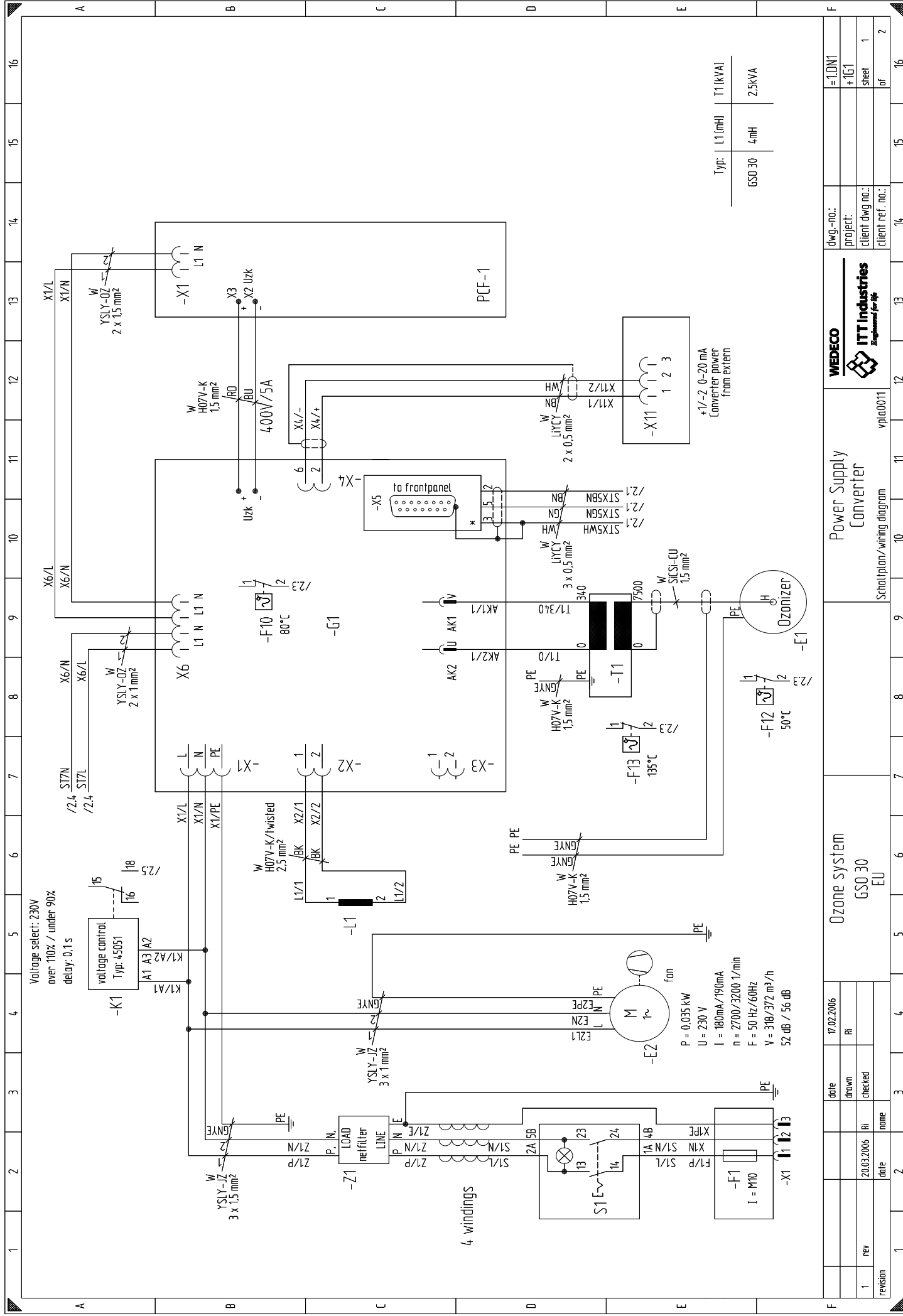
GSO 10/20, GSO 30, GSO 40-06, GSO 50

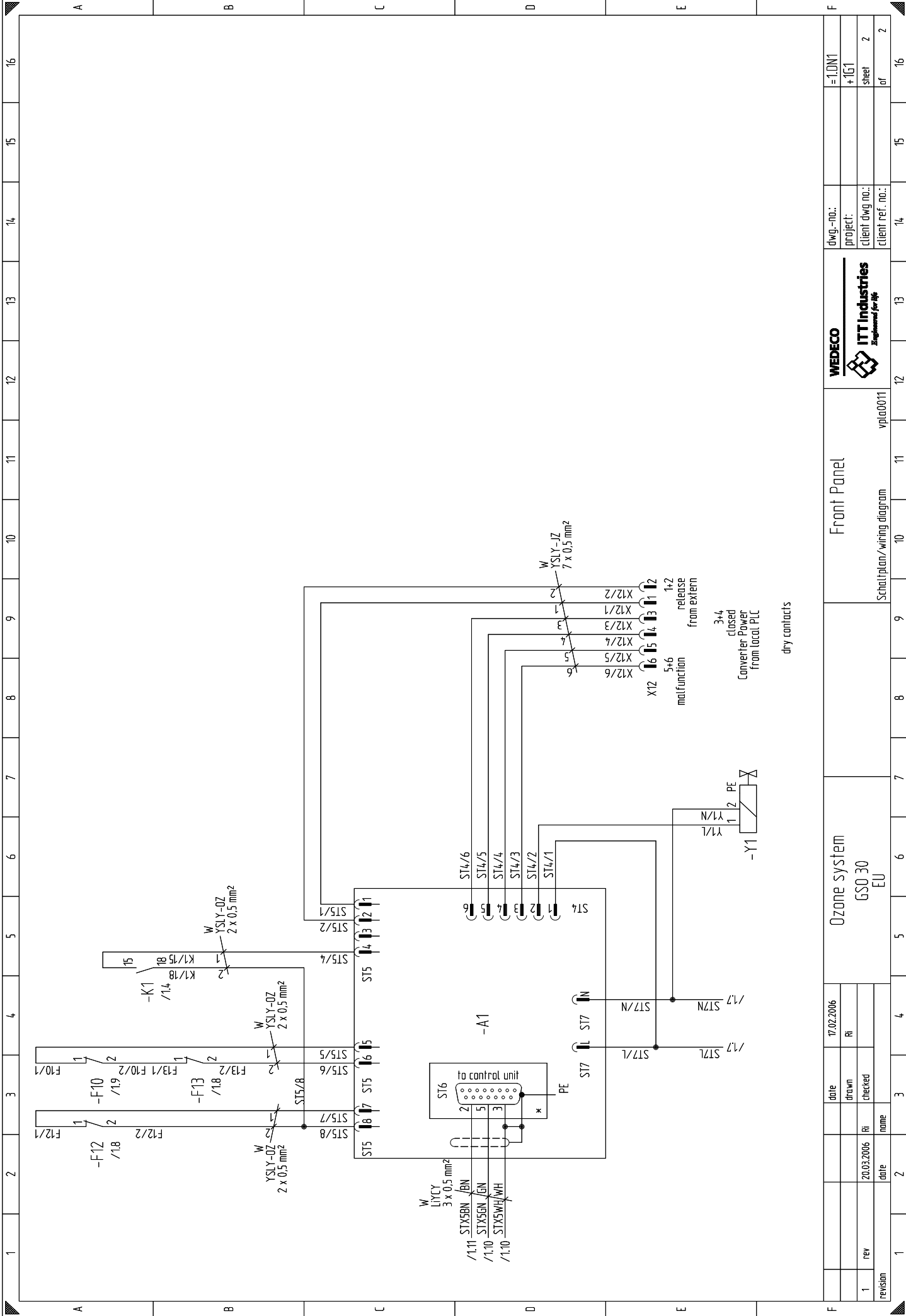




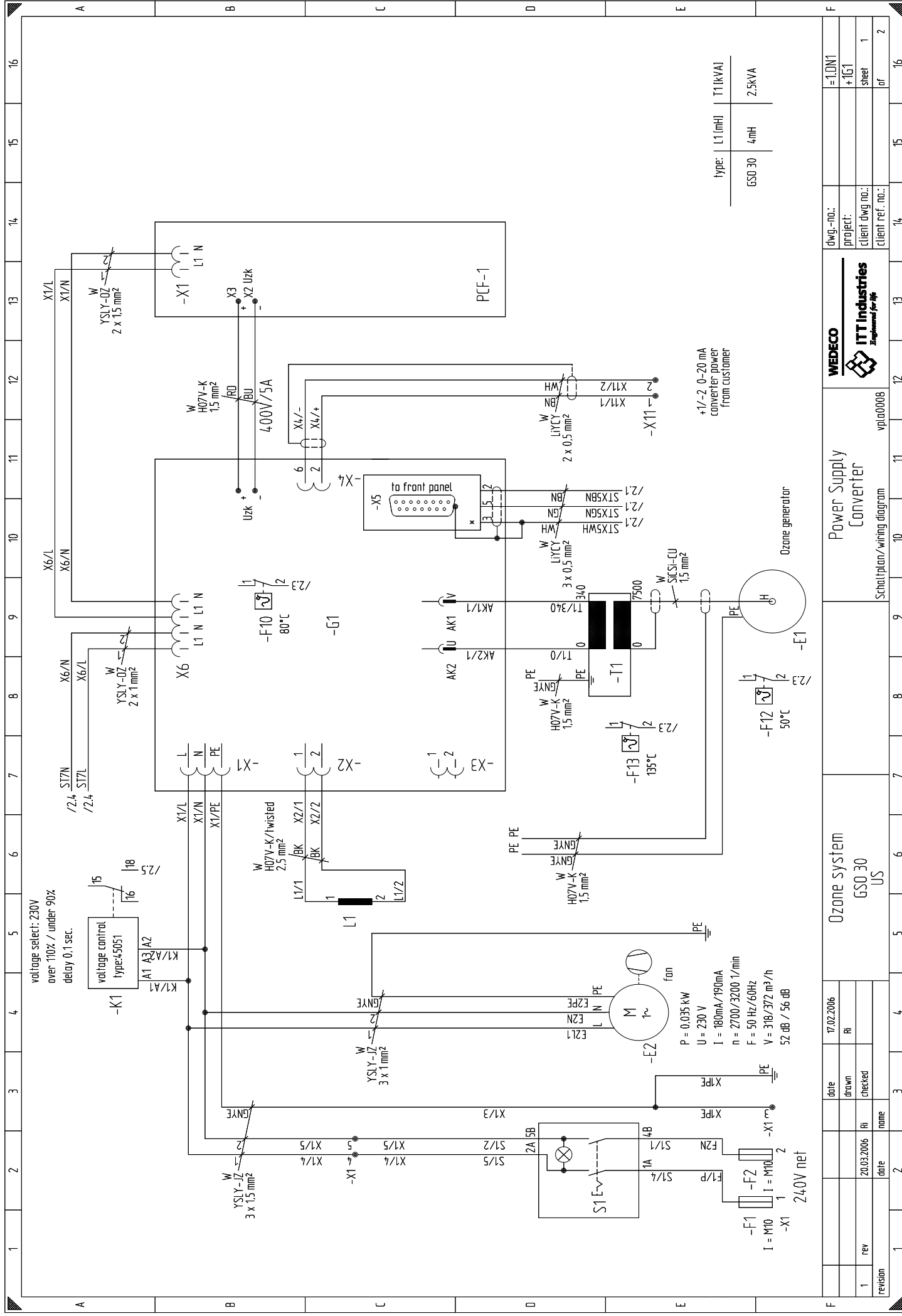




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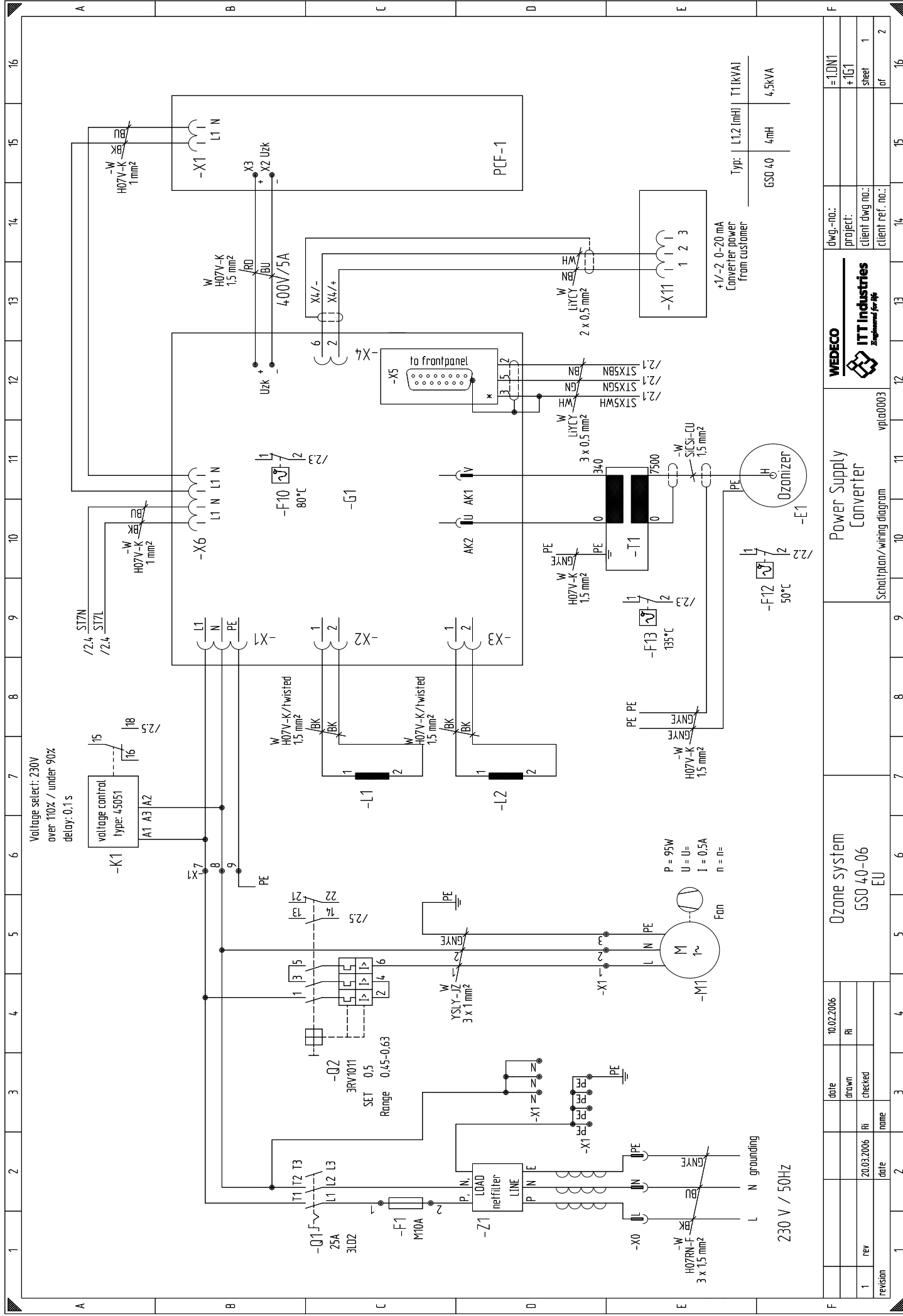


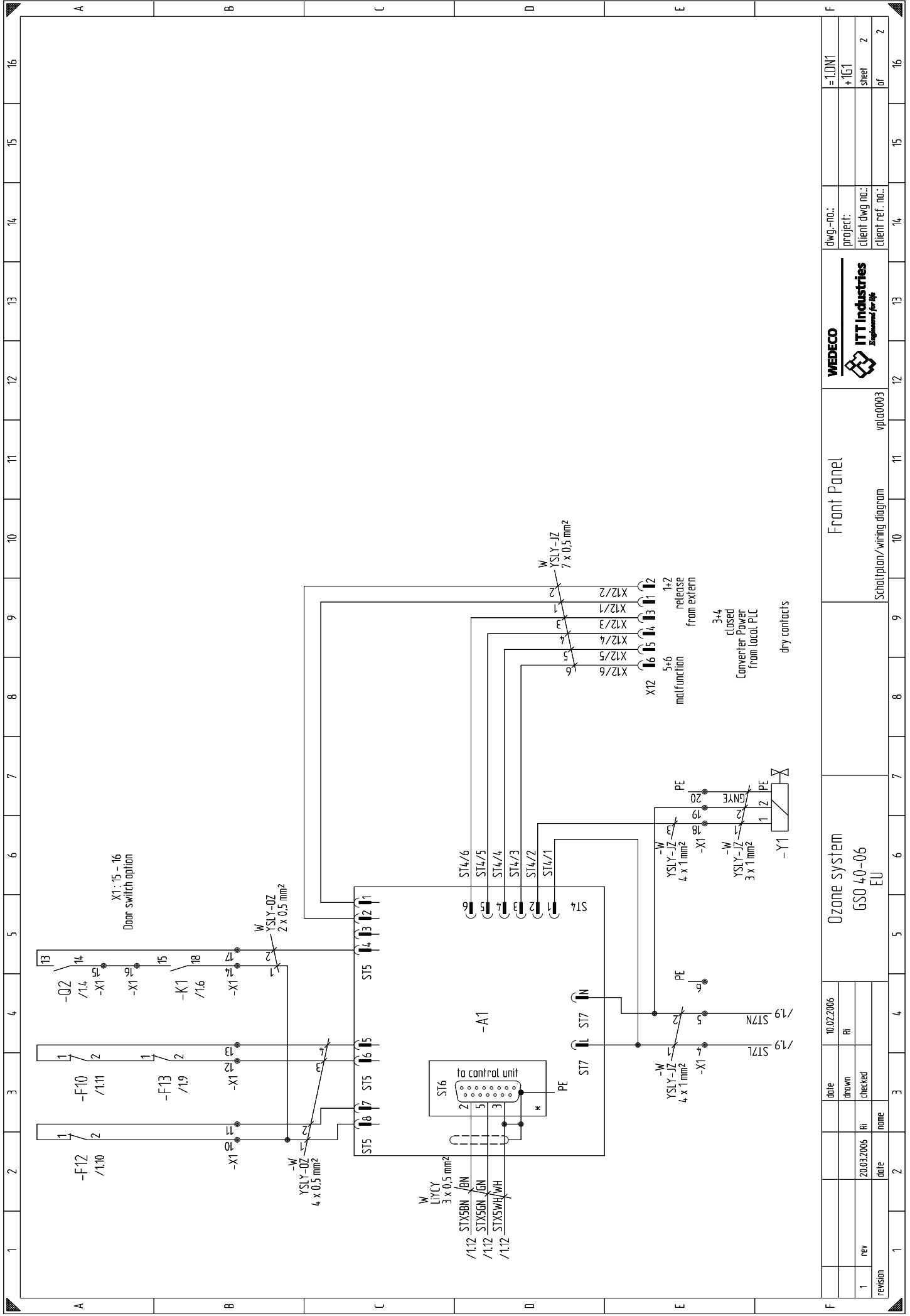
1		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
revision		date	name													
1	rev	20.03.2006	Ri													
		date	name													
		17.02.2006	Ri													
				Ozone system							Front Panel			dwg.-no.: =1.DN1		
				GSO 30							project: +1G1			client dwg no.: Sheet 2		
				EU							client ref. no.: vpla0011			client ref. no.: of 2		
											Schaltplan/wiring diagram			14		

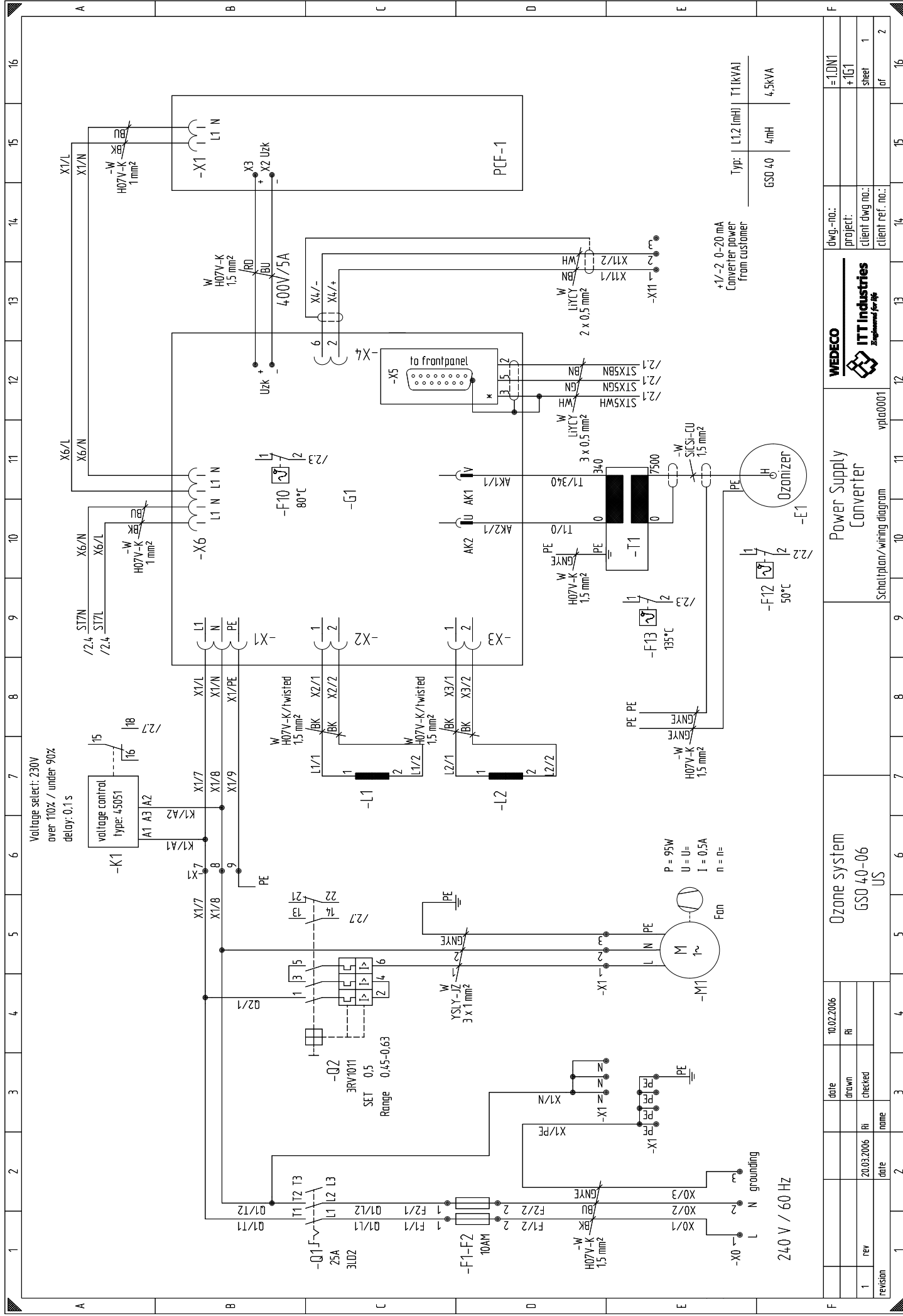
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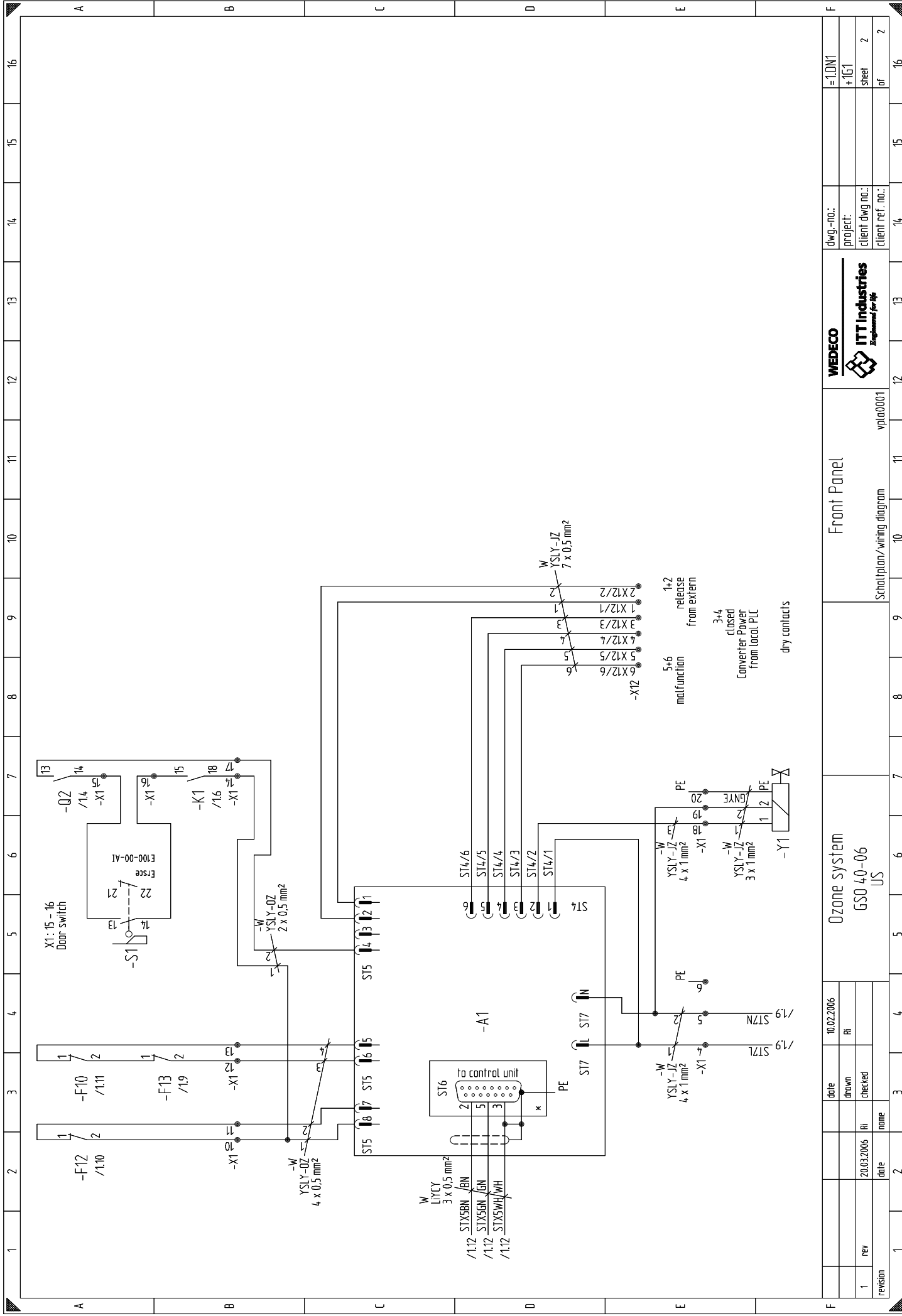


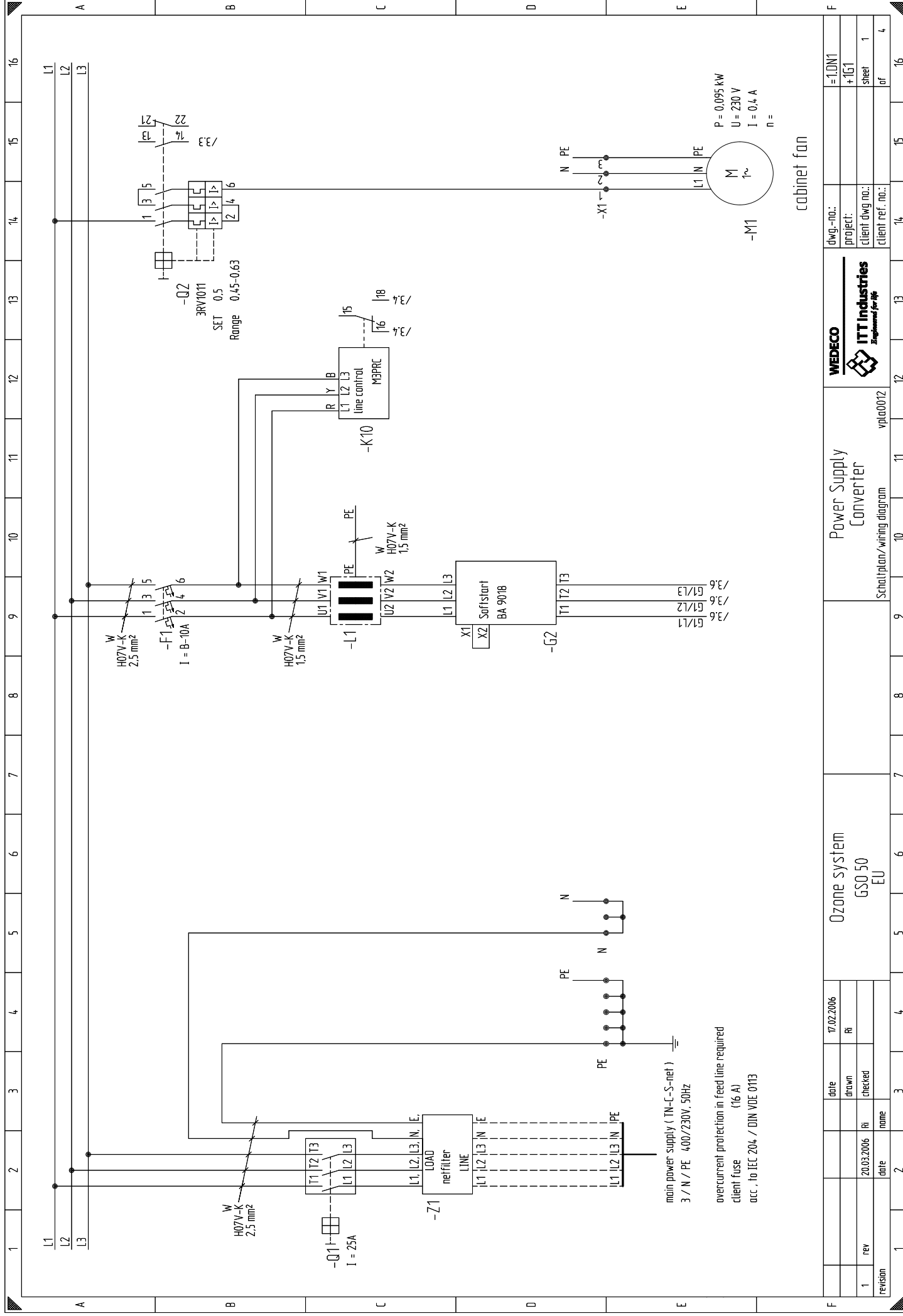


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