

Plant for heat recovery

Translation of the original operating instructions

SE_0084

Imprint

Version	Date	Initials	Description
1.0	30.11.2012	DOG/edv	Initial version
1.1	13.02.2013	DOG/edv	Revised

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Preface

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We reserve the right to make technical changes

We reserve the right to make variations in the equipment depending on the country in question, as well as technical changes to improve the equipment. This may result in deviations within the pictures and the text.

HINWEIS



The adjustment ranges and parameter values in these operating instructions are guideline values and non-binding. They may vary depending on the configuration of the plant.

The values permitted to operate your plant are determined and logged during startup.

Introduction

Welcome to the family of IS SaveEnergy AG customers and thank you for your trust in our products.

These operating instructions contain important information on all life cycles of an IS SaveEnergy AG plant.

In detail, this includes:

- Transport and installation
- Operation and maintenance
- Decommissioning and disposal

Observance of this information ensures safe economically successful and environmentally-friendly operation.

We wish you every success with your new plant.

IS SaveEnergy AG

Hinterdorfstrasse 4

Postfach 174

CH-8309 Nürensdorf, Switzerland

Type plate

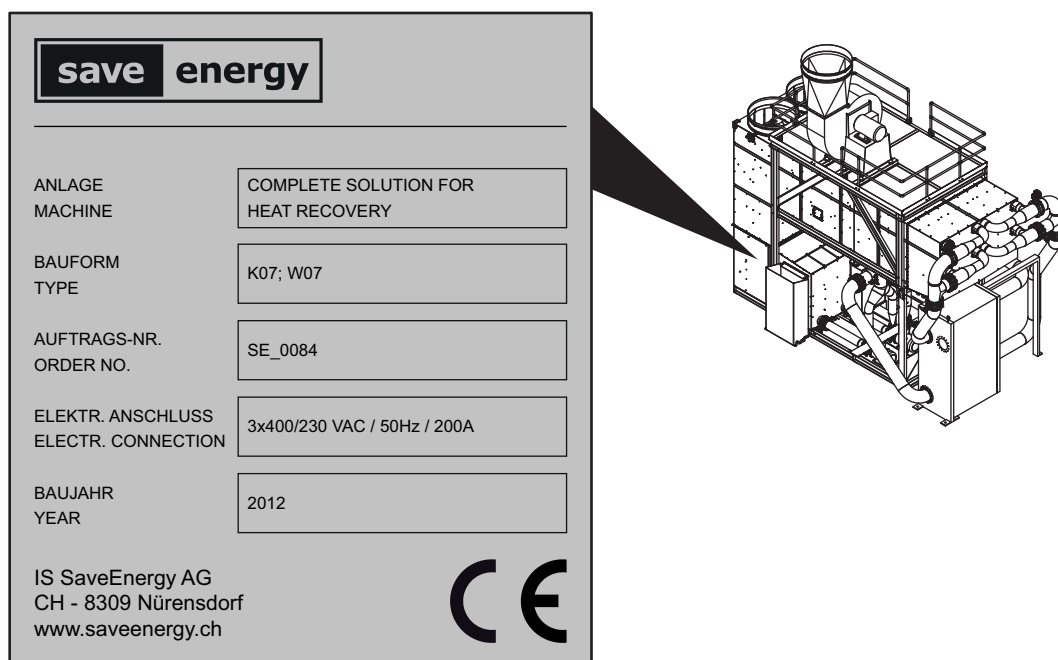


Fig. 1 - Type plate

The plant type plate is at the above-mentioned position and contains:

- The company name and the complete address of the manufacturer
- The name of the plant
- The CE mark is attached beneath the type plate
- Series or type name
- Year of manufacture in which the manufacturing process was completed
- Series or order number. This must always be indicated when ordering spare parts.

Customer service

Please always consult the customer service first if you have questions or problems. This will pass you on to the right person responsible.

Contact address of IS SaveEnergy AG:

IS SaveEnergy AG

Hinterdorfstrasse 4

Postfach 174

CH-8309 Nürensdorf

Phone +41 43 204 20 20

Important instructions

For your safety:

Observance of these operating instructions, especially Chapter «1 Safety instructions», ensures safe operation for persons, the machine and the environment.

HINWEIS



You must read all of Chapter «1 Safety instructions» before commencing any activities with the plant.

For your benefit:

These operating instructions should allow you to acquaint yourself with all of the functions of the plant and to operate and maintain it economically.

1 Safety instructions

1.1 Introduction

1.1.1 Basic principles

There are hazards associated with the use of technical products in certain life phases that can neither be alleviated by structural measures nor by protective equipment. These hazards are residual risks.

The manufacturer has determined the residual risks at the plant by means of residual risk analysis, has evaluated these for frequency of their occurrence and their gravity, and has provided concomitant safety instructions.

1.1.2 Significance of the basic safety instructions

The basic safety instructions in this chapter inform you of possible residual risks at the plant that remain permanent even when it is used in accordance to the instructions («2.2.3 Correct use in accordance to the instructions compliant to the conditions of the contract»), or that may occur unexpectedly.

To avoid injury to persons or damage to property and the environment, the safety measures described in this chapter for the protection of all persons working at the plant must be observed.

Everyone working on and with the plant must read and understand this chapter.

This regulation also applies in particular to persons who only work at the plant from time to time, and during all life phases of the plant.

1.1.3 Significance of the special safety instructions

Additional safety instructions that apply to certain life phases or activities have been inserted at the appropriate locations in the operating instructions.

To prevent against injury to persons as well as damages to property and the environment, the measures described at the appropriate locations must be observed.

1.1.4 Legal and technical safety instructions

In addition to the safety instructions in these operating instructions, the valid legal accident-prevention and environmental protection regulations that pertain in the country in which the plant is operated must also be observed. Recognised, technical regulations for safety and correct work must likewise be observed.

1.1.5 Consequences of disregarding the safety instructions

Nonobservance of the basic and/or special safety instructions, instructions and measures may result in accidents with severe injuries to persons as well as severe damage to property and/or environmental damages.

The manufacturer is not liable for any damages resulting from nonobservance of the basic and/or special safety instructions.

1.1.6 Definition of terms

To simplify matters, only the male form is used in these operating instructions when referring to qualified persons. Naturally, female experts are also included!

The following terms are also used to simplify matters:

- **Plant**

The sum of all heat recovery and flue gas cleaning systems from IS SaveEnergy AG is referred to as the plant. This includes the condenser, the wet electrode precipitator, the water treatment system, equipment for sludge handling and the devaporising.

- **Manufacturer**

The manufacturer of the plant is IS SaveEnergy AG.

- **Operator**

The operator is designated as the owner of the plant, irrespective of whether or not he is operating it on an independent machine or as part of a larger system, or whether or not it is integrated into a plant and passed on to third parties.

- **Personnel**

The personnel are all those persons that carry out any activities on or at the plant within any of its life cycles on order of the manufacturer and/or the operator, and who comply with the personnel qualifications required by the manufacturer, i.e. authorised persons. Depending on the life cycle, the word "personnel" is placed before the life cycle, e.g. in chapter «8 Maintenance and repairs» such personnel is referred to as maintenance personnel.

- **User**

The operating personnel are also referred to as users

- **Life phases / life cycles**

The life cycles are all phases in the condition and use of the plant from the moment the plant leaves its place of production until it is dismantled and disposed of.

All life cycles of the plant are dealt with in these operating instructions.

1.1.7 Qualifications of personnel

Different personnel qualifications are prescribed for the various life cycles of the plant. These are described in each case at the start of the appropriate chapter in these operating instructions.

The personnel qualification describes the minimum requirement that must be met by authorised persons carrying out certain activities.

Example:

The description of the qualifications required of operating personnel is at the start of Chapter «6 Operation», and the description of qualifications required of the maintenance personnel is described at the start of Chapter «8 Maintenance and repairs».

1.2 Hazard instructions and rules of conduct

Hazard instructions and rules of conduct are supported by warning symbols and pictograms. They are used both in the operating instructions, at the plant and in the vicinity of the plant. All describe circumstances whose nonobservance could result in injury to persons or damage to property and the environment.

1.2.1 Warning instructions in the operating instructions

The warning instructions in the operating instructions are designed according to a uniform plan. They inform you of residual risks that may result in injury to persons and damage to property.

Design of the warning instructions

- Signal word:
Indicates the severity of the risk (HAZARD, WARNING or CAREFUL)







See « Types of warning instruction» on page 18

Safety marks:



- Type and source of the risk:
e.g. live parts in the opened control cabinet.
- Possible consequences:
e.g. risk to life!
- Measures to avoid the risk:
e.g. always switch off and disconnect the power supply before making repairs at the control cabinet.


Types of warning instruction

 HAZARD	
	Indicates an immediate danger. Non-compliance with this information can result in death or serious personal injuries (invalidity).
 WARNING	
	Indicates a possibly dangerous situation. Non-compliance with this information can result in death or serious personal injuries (invalidity).
 CAREFUL	
	Indicates a situation that might be dangerous. Non-compliance with this information can result in damage to property or minor to medium personal injuries.

1.2.2 Rules of conduct in the operating instructions

The rules of conduct in the operating instructions are designed according to a uniform plan. They inform you on the technically correct and efficient use of the product.

Design of the rules of conduct

NOTE	
	Is used for general instructions describing useful user tips and work recommendations, but that do not have any effect on the health of the personnel.

1.2.3 Warning instructions and symbols at the plant

The following warning signs, symbols and labels are attached to those locations at the plant where the corresponding hazards occur:

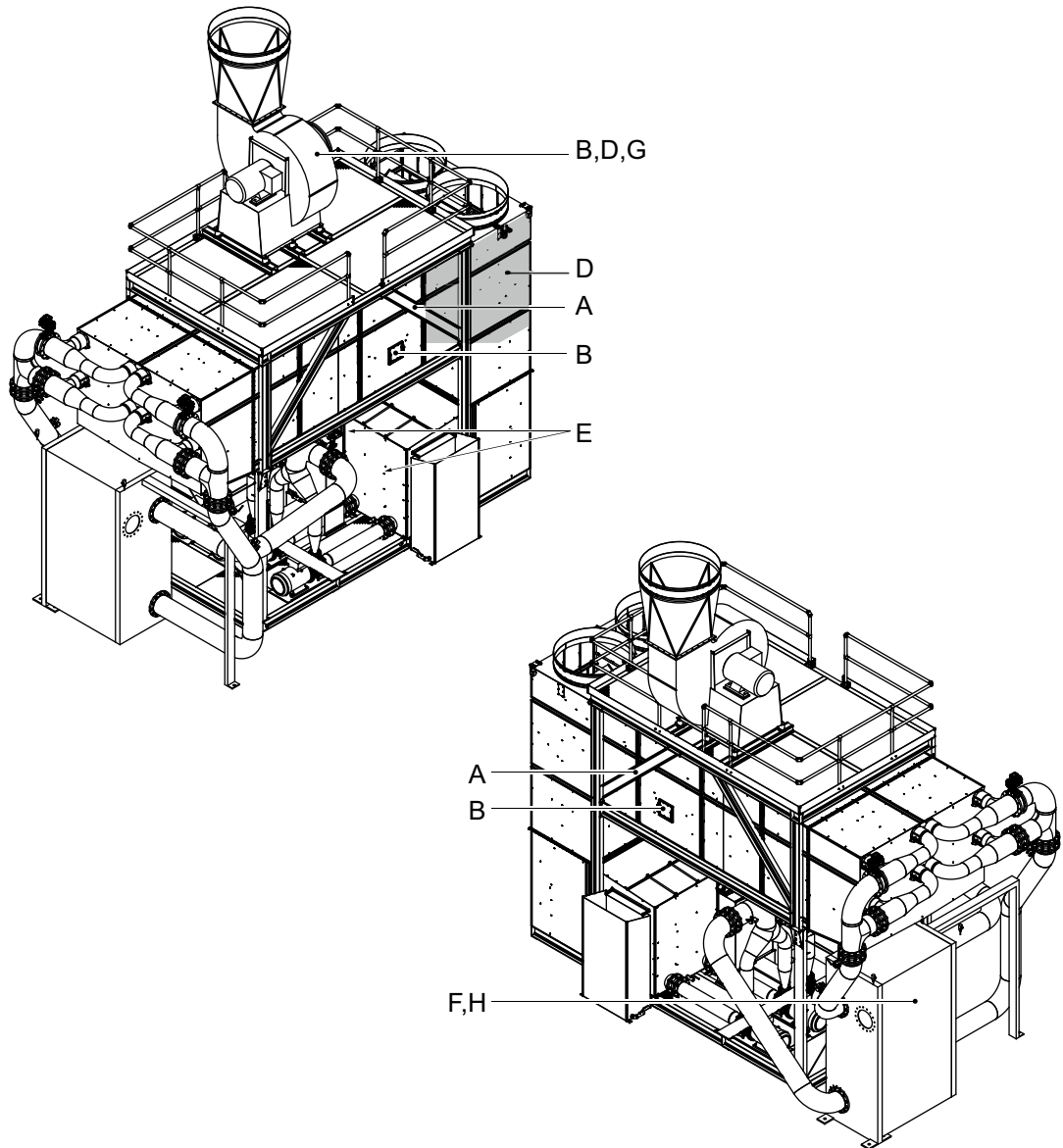


Fig. 2 - Warning instructions, symbols and labelling at the condenser

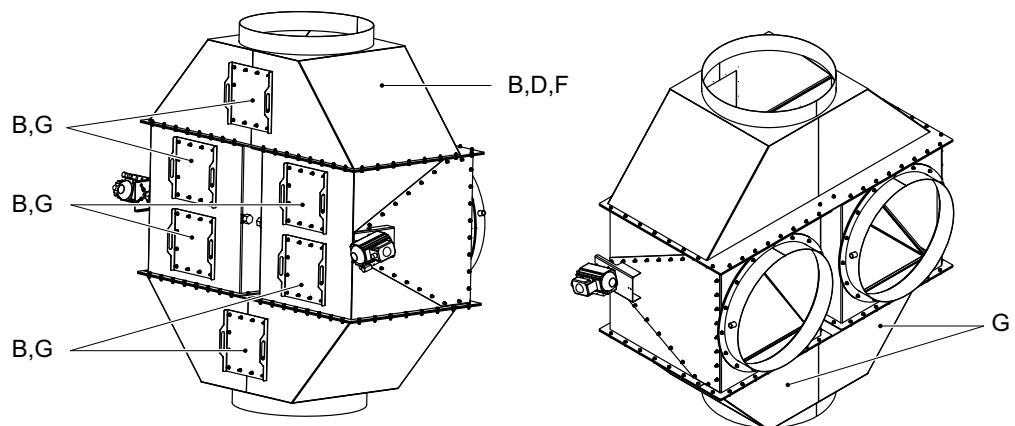


Fig. 3 - Warning instructions, symbols and labelling at the bypass flap

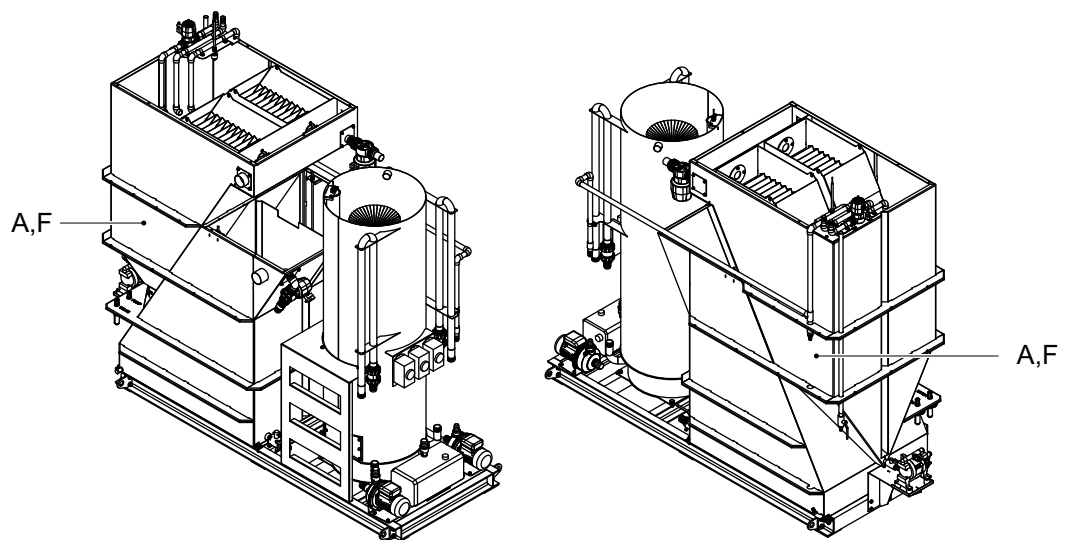






Fig. 4 - Warning instructions, symbols and labelling at the water treatment system



Warning instruction A

 HAZARD	
	High working areas Risk of falling
	<ul style="list-style-type: none"> ▶ Fatal or severe injuries caused by falling ▶ Always switch off the main switch and secure it before working at the plant. When working at heights above 2 m (6'), suitable platforms must be provided.



Warning instruction B

 HAZARD	
	<p>Hazardous gases</p> <p>Risk of death from asphyxiation</p> <ul style="list-style-type: none">▶ Loss of consciousness due to the effects of inhaling monoxides.▶ Only run maintenance work at the interiors under supervision. Always aerate the rooms thoroughly.



Warning instruction C

 HAZARD	
	<p>High voltage</p> <p>Risk from electrical energy</p> <ul style="list-style-type: none">▶ Fatal injuries caused by electrical shocks.▶ Remedy loose plug connections. Replace damaged cable.▶ Do not tamper with anything in the vicinity of high-voltage lines.▶ When working at the plant, specific work steps as well as protective measures must be observed. See details in Chapter «8 Maintenance and repairs».



Warning instruction D

 WARNING	
	<p>Hot surfaces</p> <p>Risk of burns</p> <ul style="list-style-type: none">▶ The complete bypass flap and the feed line to the condenser are hot. The insulator heating and the complete insulator housing are also hot. Do not touch. Wear personal protective equipment!▶ Protective gloves must be worn when working in the vicinity of hot surfaces.▶ Cool any burns with cold water, bandage the burns (sterile) and consult a doctor.



Warning instruction E

 WARNING	
	<p>Acids or alkalis</p> <p>Risk of chemical burns</p> <ul style="list-style-type: none">▶ Risk of injury to the eyes and limbs from contact with acidic process water.▶ In plants in which there are chemical processes, the safety-technical instructions of the supplier of the chemicals with regard to their use and handling must be strictly observed.▶ Personal safety equipment such as gloves and goggles must be used when handling chemicals.▶ The process water can be acidic or alkaline. Remains of ash are alkaline.



Warning instruction F

 WARNING	
	<p>Sharp-edged components</p> <p>Risk of injuries from cuts</p> <ul style="list-style-type: none">▶ Stabbing and cut wounds at sharp edges and thin-walled metal sheets.▶ Wear protective gloves. Keep your hands away from machine parts that are in motion.

Warning instruction G

 CAREFUL	
	<p>Moving components</p> <p>Risk of crushing</p> <ul style="list-style-type: none">▶ Moving parts can cause cutting and crushing wounds and injuries. Do not reach into the machine when it is running.

Warning instruction H

 CAREFUL	
	<p>Sensitive components</p> <p>Risk of damage to property</p> <ul style="list-style-type: none">▶ The lamellas of the heat exchanger are extremely sensitive to pressure. Care is advised when working near the lamellas.

General warning instructions

WARNING



Danger caused by missing overpressure protection in the supply line!

Severe injuries, damage to property!

- ▶ Overpressure protection must be installed in the supply line before starting up the plant.

WARNING







Plant in operation

Risk of injuries

- ▶ Do not enter the hazard zone when the plant is in operation.
- ▶ Do not open maintenance openings, flanges, covers and lids when the plant is in operation.
- ▶ Do not carry out any work on components in the vicinity of suction and discharge locations of fans and pumps when they are in operation.

1.2.4 Pictograms in the vicinity of the plant

	Wear goggles
	Wear protective gloves.
	Wear ear protection
	Secure the plant

1.2.5 Hazard zones at the plant

Hazard zones are maintenance openings, flanges, lids and covers. These must not be opened when the plant is running. Hot parts of the housing and pipelines in the area of the bypass flap and at the inlet to the condenser, as well as at the wet electrode precipitator, must also not be opened. The position of the warning instructions on the machine varies depending on the model/configuration of the plant. All of the space above the plant is also a hazard zone.

To secure the compressed air supply line, overpressure protection appropriate to the permissible operating pressure must be installed (detailed pressure specifications are contained in Chapter «3 Technical data»).

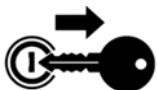
1.2.6 Safety equipment

Lockable main switch

The plant is equipped with a main switch at the front of the main control cabinet. The complete plant including the wet electrode precipitator can be shut down with this switch. There is an additional main switch on the front side of the control cabinet directly next to the wet electrode precipitator. Only the high voltage unit of the wet electrode precipitator can be switched off by this switch. Attaching padlocks to the switching levers prevents equipment from being unintentionally switched back on.



WARNING



Inadvertent switching on of the plant

Severe injuries.

- ▶ Completely switch off the plant during maintenance and repair work and secure the main switch with a padlock from being inadvertently switched back on.
- ▶ Remove the key from the padlock.



Platform

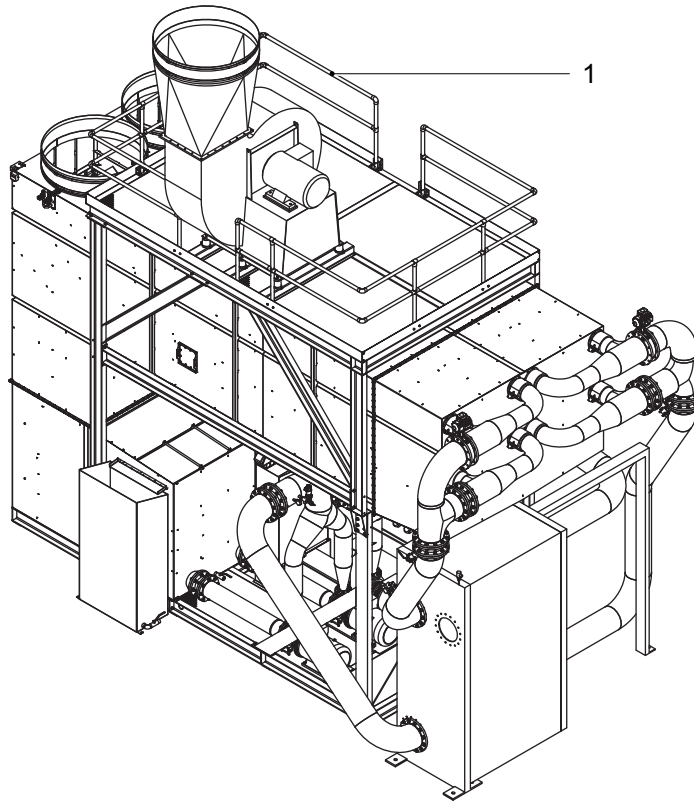


Fig. 5 - Protective equipment

This protective equipment includes a safety fence (1) or eyes to hook on the personal fall protection equipment for elevated, walk-on parts of the plant.

1.3 General safety regulations

1.3.1 General inspection and maintenance obligation

This obligation arises every time before startup, after all maintenance work, and after all repairs. The function of the protective and safety equipment in particular must be checked. All of the inspection and maintenance instructions contained in these operating instructions must be observed.

1.3.2 Modifications

Modifications to the plant such as additions and retrofits, especially those that may in any way affect the safety of the plant, are only permitted after previous consultation with and written agreement from the manufacturer.

This applies in particular to the attachment of inspection, supply and transfer systems supplied by third parties.

Any adjustments that may have to be made to the operating instructions in these cases are made by the manufacturer.

1.3.3 Safety and protection equipment

It is forbidden to remove or put out of operation any safety and protection equipment installed in the plant for its normal operation.

In special operation mode for startup, maintenance and repairs, the safety and protection equipment may only be removed or put out of operation taking into consideration all required safety measures.

Normal operating mode may only be switched back on after a complete check has been made of the completeness and correct operation of all safety and protection equipment.

Make sure that all hazard instructions and rules of conduct contained in these operating instructions are attached to the plant. Any defective or missing instructions must be replaced immediately.,

1.3.4 Power supply

The plants/systems may only be connected to the power supplies specified in the appropriate chapter.

See «3 Technical data» on page 42.

All power supplies must be able to be switched off on site.

The switch-off locations must be clearly labelled by the operator.



HAZARD



Risk of electrical shocks!

Severe injuries!

- ▶ For all work on electrical components, every main switch must be switched off and secured against being switched back on before the terminal cover or suchlike is opened.
- ▶ Earthing must be installed before all and any work on high voltage components.

1.3.5 Emissions



WARNING



Risk from escaping gases or hot water!

Severe injuries

- ▶ Maintenance openings and covers must not be opened when the plant is running.
- ▶ Do not open any lids, flanges and suchlike before the corresponding section of the pipe system is closed.
- ▶ Overpressure protection must be installed in the supply line before starting up the plant.

1.3.6 Fuels and lubricants

Only fuels and lubricants specified by the manufacturer may be used for the plant.

See Chapter «12.5 Data table of operating resources».

1.3.7 Spare parts

Only original spare parts as specified in these operating instructions may be used for maintenance and repair work. If original spare parts are not used then all warranty claims become void.

Damages arising from non-usage of original spare parts from IS SaveEnergy AG are also excluded from the warranty. When spare parts are required, contact IS SaveEnergy AG.

1.4 Organizational safety measures

1.4.1 Access to these operating instructions

The operating instructions must be within constant reach of all persons working at the plant.
The location of the operating instructions must be clearly marked by the operator.

1.4.2 Safety checks

At regular intervals, the operator must check that personnel are conscious of safety and the hazards involved in their work and are taking account of the operating Instructions.

Any assessed weaknesses must be remedied by training and instruction.

1.4.3 Personal protective equipment

Where necessary, or when so required by by regulations in these operating instructions, personal protective equipment must be used.

The personal protective equipment is supplied and kept in working order by the operator.

1.5 Duties and responsibilities

1.5.1 Obligations of the manufacturer

The manufacturer is responsible for the safety of the product; he thereby passes on significant obligations to the operator.

1.5.2 Obligations of the operator

Training, competencies

The operator ensures that all activities at the plant are only carried out by authorized personnel. He carries out regular courses of instruction, even for persons who only work at the plant occasionally. In particular, such instruction includes details of residual risks and safety instructions based on the details in these operating instructions. Furthermore, the operator also clearly specifies the competencies for work at the plant.

Instruction on hazards

The operator makes sure that all existing residual risks have been explained in full to his personnel and that work is only carried out on or at the plant based on these operating instructions. He ensures that all auxiliary material required for safety is provided and that instruction is given for this material.

Maintenance obligation and due diligence

The operator ensures that the plant is only operated in a technical perfect condition. He carries out the prescribed maintenance and repairs and keeps a logbook of this. He ensures that required repairs are carried out.

Registration and operating approval

The operator ensures that the registration required at the location of the plant is carried out by public authorities and official departments, or that the required operating approvals have been granted.

Monitoring and information

The manufacturer monitors the plant even after it has been delivered to the operator. He is authorised to demand information from the operator, especially regarding safety aspects.

The operator is duty bound to report all (residual) risks and hazards immediately to the manufacturer that have become apparent during operation and that are not described in these operating.

Measures ordered by the manufacturer after a report made to him based on the requirements made here must be followed by the operator (mandatory).

1.6 EC conformity

1.6.1 Declaration of conformity / CE mark

- The plant complies with the valid regulations of the EU for placing it into circulation with a CE mark and a declaration of conformity.
- The EC declaration of conformity is in the enclosure.

See «EC declaration of conformity» on page 139.

2 System overview

2.1 Introduction

2.1.1 Complete view

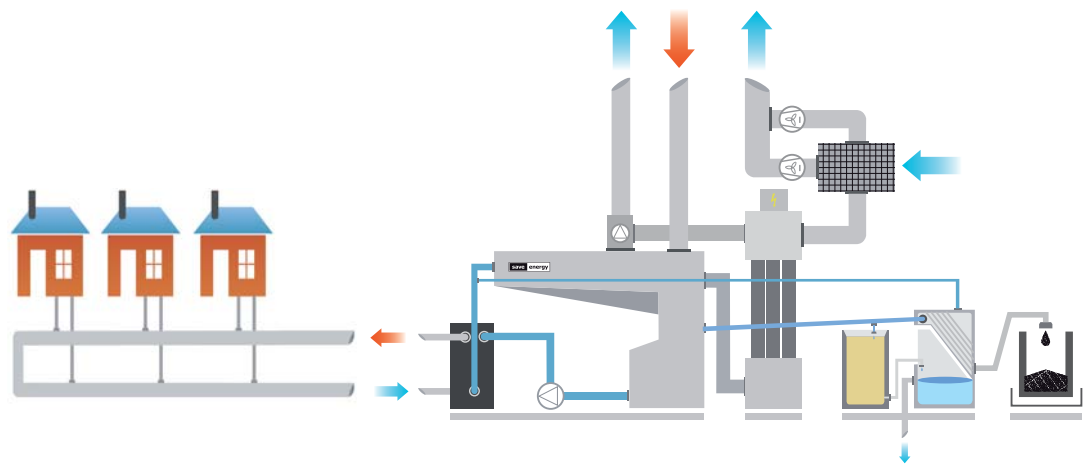


Fig. 6 - Schematic of complete view of plant

The SaveEnergy components are combined according to the requirements of the customer. All components are ideally matched to each other. A SaveEnergy system is comprised at minimum of the condenser, the bypass flap and the water treatment system. The following components can be optionally installed:

- On-site bypass flap
- Wet electrode precipitator
- Sludge handling
- Devaporiser

The core of the system is the condenser. It recovers the remaining heat from the flue gas. In addition to heat recovery, the flue gas is also cleaned.

The condensate from the condenser is prepared by the water treatment system for use within the process as well as for its discharge into the sewage. Solids are dried cleanly and free of emissions in an one-way big-bag for disposal.

The wet electrode precipitator cleans the flue gas while observing the emission regulations for dust.

The devaporiser prevents vapours from entering the atmosphere as the flue gas exits.

2.1.2 Scope of supply

Plant components

Your plant comprises the following components:

- Bypass flap
(Customer-supplied flap system controlled by IS Saveenergy AG)
- Condenser K07
- Water treatment system W07

Detailed information concerning type and performance is contained under « Type plate» on page 13 and in the chapter «3 Technical data» from page 42.

R & I schematics and maintenance tables

- 1 x maintenance tables complete
- 1 x RI-Bypass flap
- 1 x RI-Condenser
- 1 x RI-Water treatment system

In the enclosure «12 Enclosure» from page 138.

Accompanying schematic

- 1 x EI schematic complete plant

2.2 Intended use

2.2.1 Basic principles

The plant has been built according to the state-of-the-art and recognised safety regulations. Nevertheless, hazards to persons, property and the environment may occur when it is used.

2.2.2 Technical condition

The plant may only be used in technically perfect condition, in accordance to the instructions, and in full awareness of safety aspects and possible hazards in compliance to these operating instructions.

Operational malfunctions as well as defects, especially those that may impair the safety of the plant, must be remedied immediately. In such cases, the plant must be immediately put out of operation until the malfunction(s) have been completely remedied.

2.2.3 Correct use in accordance to the instructions compliant to the conditions of the contract

The plant is intended solely for heat recovery and cleaning of fine dusts from combustion processes, as well as exhaust air from industrial dryers. The sole purpose of any connected water treatment systems is to clean any condensate that occurs and the process water within the circulation system from solids (discharge condition of solid contents in the sewage: $<10\text{mg/l}$). The following details list the binding limitations of use and features, in addition to the specifications in the sales documents:

Chapter «3.2 Water treatment system» from page 45.

Any other or additional use is deemed an incorrect usage. The manufacturer is not liable for any injuries to persons or damage to property and the environment arising from such incorrect usage. Damage caused by such unintended use is at the sole risk of the operator.

In particular, use according to the instructions also includes compliance to these operating instructions, observance of the qualifications of personnel as well as observance of the inspection and maintenance conditions.

2.2.4 Special uses

Special uses of the plant are only allowed after technical adjustments have been made and written authorization for such special use has been issued by the manufacturer.



HAZARD



Hazard resulting from special uses of the plant!

Risk of fire and explosion!

- ▶ Technical adjustments must be made to the plant to adapt it for each special use.
- ▶ All adjustments must be previously approved in writing by the manufacturer.



WARNING



Hot surfaces

Risk of burns

- ▶ Components may become hotter due to special uses.
- ▶ Protective gloves must be worn when working in the vicinity of hot surfaces.
- ▶ Cool any burns with cold water, bandage the burns (sterile) and consult a doctor.



CAREFUL



Corrosion of components

Risk of damage to property

- ▶ Components may be subject to increased risk of corrosion due to special uses.
- ▶ When operating within the range of nonvalid pH values, seals or other components may be damaged.

2.3 Design and function

2.3.1 Process description - heat recovery

During heat recovery, a heated gaseous substance (usually factory fumes) is cooled by spraying with water. Heat exchange occurs on the surface of the water drops. The heat energy is absorbed with the water drops and reaches the heat customer via a plate heat exchanger.

During this process, the gas is cooled and partially condenses. The condensate gained is also used as process water, which cools the gas within a closed system.

See Chapter «2.3.3 Design of the plant».

2.3.2 Process description - flue gas cleaning

Flue gases often arise through combustion processes in the heat plant or power plant. Their composition depends on the fuel. Usually, they contain the nitrogen arising from the combustion air (normally more than two thirds), carbon dioxide and water vapour, as well as surplus oxygen. They also contain a small percentage of toxic substances such as fine dust, carbon monoxide, nitrogen oxide, sulphur oxide, chloride compounds, etc.

After cooling down in the condenser, the flue gas flows through the wet electrode precipitator. Here, not only dust particles but also carbon compounds, aerosol compounds (e.g. blue haze) and other chemical compounds are significantly reduced.

See Chapter «2.3.3 Design of the plant».

2.3.3 Design of the plant

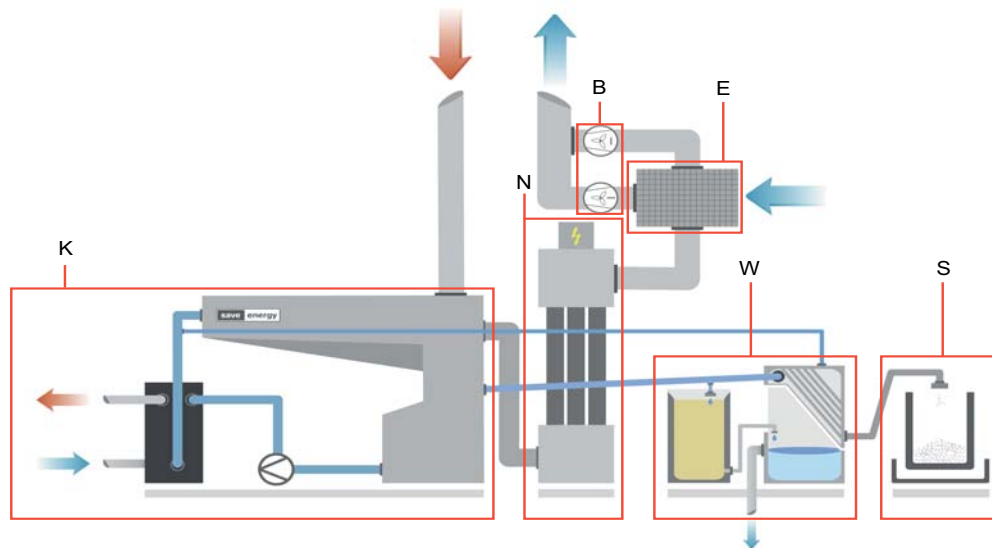


Fig. 7 - Design of the plant

- | | | | |
|---|-------------------------|---|---------------------------------------|
| K | Condenser | N | Wet electrode precipitator (optional) |
| B | Bypass flap (optional)* | S | Sludge handling (optional) |
| W | Water treatment system | E | Devaporiser (optional) |

*possible on site

NOTE



Depending on the configuration of the plant and the spacial conditions, the location of control cabinets may vary.

2.3.4 Condenser

Description of function

The flue gas is consecutively fed through the two cooling chambers of the condenser. The flue gas is sprayed with process water by nozzles inside the condenser. This washes out large dust particles from the flue gases with a concomitant, efficient heat extraction. The heat recovered is transferred via a plate heat exchanger to the heat consumer. The condenser is secured against overheating by an emergency cooling system. A controller system keeps the pH value within the permissible range by adding alkali or acid dosages, as well as the control value (chloride concentration) within the permissible range by adding fresh water.

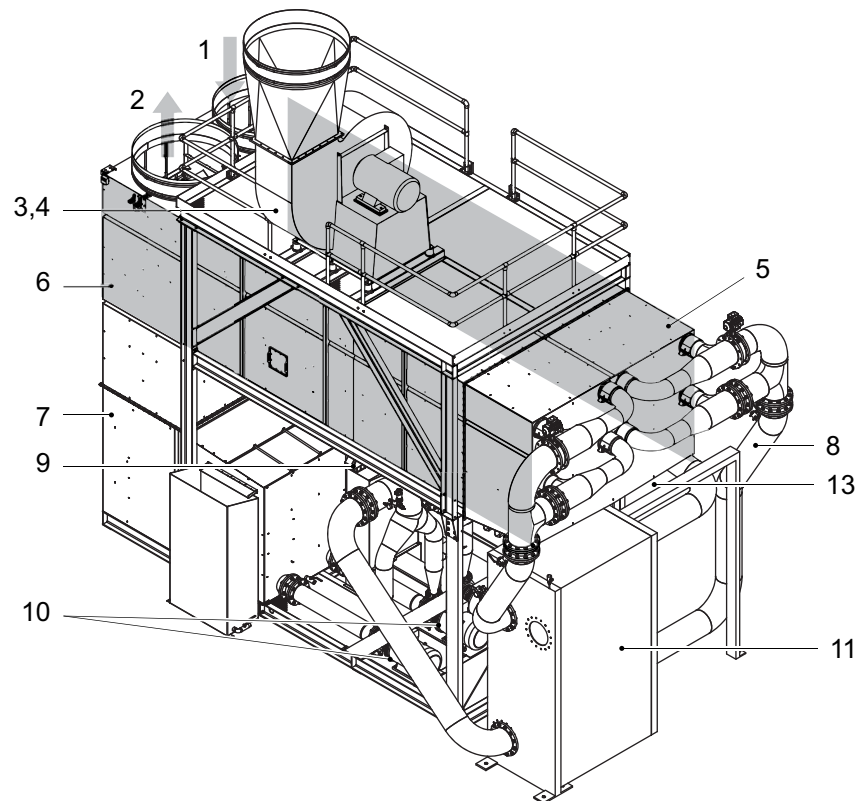


Fig. 8 - Design of condenser

- 1 Flue gas inlet
- 2 Flue gas outlet to flue gas fan or wet electrode precipitator
- 3 Flue gas fan
- 4 Droplet separator (optional)
- 5 Flue gas inlet side (cooling chamber stage 1)
- 6 Flue gas outlet side (cooling chamber stage 2)
- 7 Process water tank
- 8 Process water piping
- 9 pH pump
- 10 Process water pumps
- 11 Heat exchanger
- 12 Emergency cooling and fresh water feed
- 13 Control value measurement

2.3.5 Bypass flap

Description of function

The bypass flap is upstream from the condenser. The flue gas can be directly fed to the chimney from it, or fed to the condenser. It is always fully opened in one direction.

The bypass flap is controlled by a PLC using a pneumatic or electrical drive. If there is a power failure, the bypass flap opens with a spring return in the direction of the chimney, and closes the feed line to the condenser. The flap is not 100% gas tight.

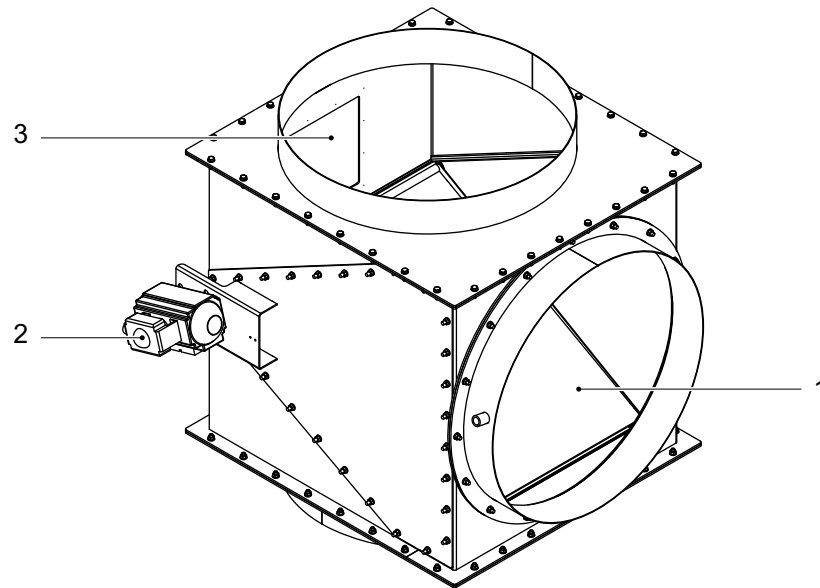


Fig. 9 - Example bypass flap

- 1 Bypass flap
- 2 Pneumatic or electrical drive
- 3 Maintenance opening at the rear

2.3.6 Water treatment system

Description of function

The water condensed from the flue gas is continuously neutralised, discharged and cleaned by a two-stage cleaning unit. The partial flow from process water stage 1 is continuously fed to the water treatment system. Precleaning is carried out by a lamella separator (gravity separation). The second stage is comprised of a backflushable sand filter.

The precleaned condensate in the lamella separator is then reused within the process or fed via the sand filter for final cleaning and discharge into the sewer system. The sedimentary solids in the lamella separator are discharged by a sludge pump. The sludge pump is a diaphragm pump operated by air pressure. When adding compressed air, a diaphragm is thereby set into motion, and the medium is thereby conveyed. The stronger the compressed air, the higher is the conveying height of the pump (pump pressure). A normal value of 3 bar compressed air is desirable. Thereafter, the filter sludge is dewatered in a big-bag handling system or an alternative system (e.g. band filter).

Depending on the configuration of the plant and the spatial conditions, additional conveying or return flow pumps may be required.

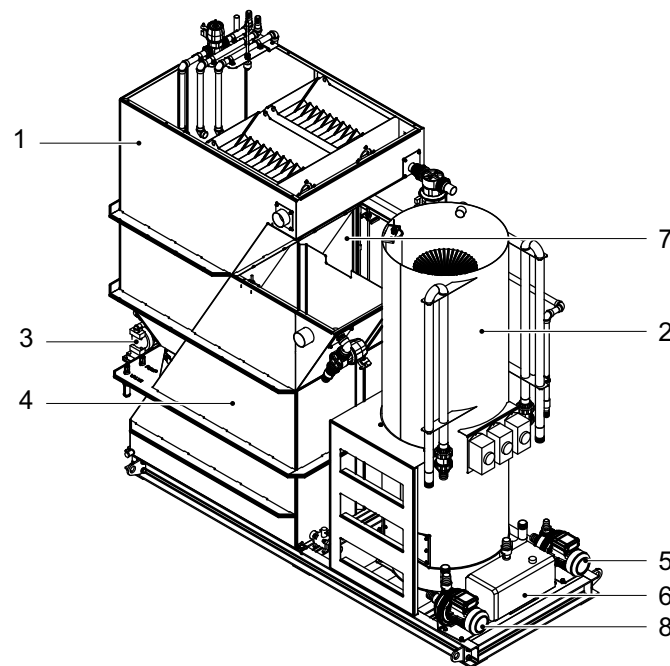


Fig. 10 - Water treatment system

- 1 Lamella separator
- 2 Sand filter
- 3 Sludge pump
- 4 Clear water tank
- 5 Return flow pump
- 6 Backflushing compressor
- 7 Sewage tank
- 8 Backflushing pump

2.3.7 Controls and displays at the plant

The machine is operated at the plant control panel. It is on the condenser or a wall in its immediate vicinity.

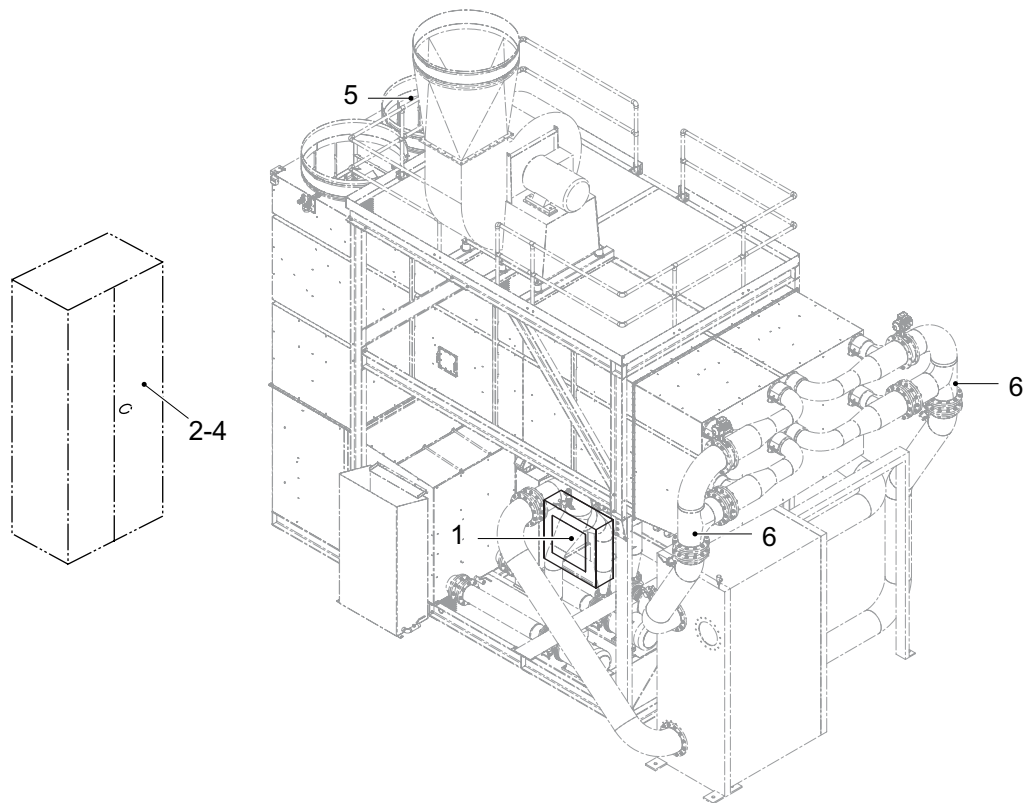


Fig. 11 - Controls and displays

- 1 Control panel with touchscreen
- 2 Main switch on the main control cabinet
- 3 Main switch for high voltage unit of the wet electrode precipitator (integrated into the main control cabinet)
- 4 Main switch for the high voltage unit at the separate control cabinet of the wet electrode precipitator (see «Fig. 1 - Wet electrode precipitator» on page HIDDEN, Item 11)
- 5 Differential pressure measurement (underpressure)
- 6 Manometer before and after the heat exchanger
- Various ball taps for manual emptying or pump settings

Main control cabinet of the plant

The plant is fitted with a main control cabinet.

It contains the following:

- The main switch for the complete plant,
- The heavy current section with relays,
- Motor controller and thermoswitch,
- Safety circuits for protective equipment,
- PLC.

3 Technical data

NOTE



The technical data may vary depending on plant configuration, dimensions and available space.

- If you are uncertain about specific data, please contact IS SaveEnergy AG. Please have the details on the type plate at hand when you do so (see « Type plate» on page 13).

3.1 Condenser

3.1.1 Dimensions

Dimension K..	Sizes						
	02	04	07	11	15	22	30
Length in mm	3476	4847	5371	6697		8131	
Width in mm	2049	2708	2993	3807		4826	
Height in mm (without fan)	2750	3218	3848	4427		5500	
Transport weight of condenser in kg	3100	3380	4000	4800		14540	
Operating weight of condenser in kg	5700	6600	7300	9100		31440	
Transport weight of heat exchanger in kg	1400	1600	2630	3390		8250	
Operating weight of heat exchanger in kg	1800	1970	3280	4500		10740	
Transport weight of fan in kg	450	500	760	1480		2870	

3.1.2 Electrical connection

Dimension	Value
Operating voltage	3 x 400 V AC
Fusing of supply line	max. 400 A

3.1.3 Compressed air connection

Dimension	Value
Operating pressure	min. 6 bar
Volume	1 nl/min (nl = normal litres)
Quality	Class 4 (ISO 8573.1)
	1) Oil free
	2) Dew point 3 °C

3.1.4 Fresh water characteristics

Dimension	Value
Filter	Filtered by fine filter 100 ym
Water pressure	4 - 6 bar
Connected power	68 l/min < K15
	102 l/min > K15
Water hardness	< 25 °fH

3.1.5 Pipeline connections

Dimension	Sizes						
	02	04	07	11	15	22	30
Flue gas inlet in mm	DN500	DN700	DN800	DN1000	DN1000	DN1300	
Flue gas outlet in mm	DN500	DN700	DN800	DN1000	DN1000	DN1300	
Fresh water connection, in inches	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	
Compressed air connection, in inches	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	
Sewage connection	DN100	DN100	DN100	DN100	DN100	DN100	

3.1.6 Sewage characteristics at inlet

Dimension	Value
Temperature at inlet	250 °C
Solids content at inlet	150 mg/nm ³
Temperature at outlet (depending on set temperature controller value)	90 °C Safety measures > 75°C
Solids content at outlet	< 100 mg/nm ³

3.1.7 Process water characteristics

Dimension	Value
Process temperature	70 °C
Process water pressure	2.5 bar
pH characteristic	tendentiously acidic

3.1.8 Fuel characteristics

Fuel characteristics are listed in Chapter «12.5 Data table of operating resources» on page 152.

3.2 Water treatment system

3.2.1 Dimensions

Dimension W..	Sizes						
	02	04	07	11	15	22	30
Length in mm			3147	3557			
Width in mm			1000	2455			
Height in mm			2679	2770			
Transport weight of water treatment system in kg			1340	2700			
Operating weight of water treatment system in kg			5610	12000			

3.2.2 Pipeline connections

Dimension	Sizes						
	02	04	07	11	15	22	30
Connection of sewage condenser in mm			28	28			
Connection of sewage wet electrode precipitator in mm			28	28			
Connection of sludge removal in mm			28	28			
Compressed air connection, in inches			1/2"	1/2"			
Return line to condenser			DN90	DN90			
Sewage connection			DN100	DN100			

3.2.3 Compressed air connection

Dimension	Value
Operating pressure	min. 6 bar
Volume	1 nl/min (nl = normal litres)
Quality	Class 4 (ISO 8573.1)
	1) Oil free
	2) Dew point 3 °C



4 Erection and installation

4.1 Qualifications of personnel

The plant may only be installed by expert personnel or fitters with comparable mechanical and electrical knowledge who have acquainted themselves with these instructions. It is recommended to have the plant installed by IS SaveEnergy AG.

Startup and training must be carried out by IS SaveEnergy AG.

4.2 Safety regulations

 HAZARD	
	Missing instruction!
	Risk of injury!
	▶ Read through the safety chapter in these operating instructions.
	<hr/> <i>See «1 Safety instructions» on page 15.</i> <hr/>
	▶ Please observe that the plant has a one-sided load bias. ▶ Observe the local safety instructions and the floor load. ▶ When lifting the plant onto its foundation without a crane, make sure the ground is good and stable. ▶ Only establish the installation platform or the definitive working platform after the plant has been put into place.

4.3 Supply connections on site

The technical data for the on-site supply connections are contained in the arrangement planning or in the connection diagram.

4.4 Environmental conditions

NOTE



Different clearances/spaces are required for operation and startup work. All of the clearances described in the following are recommended minimum dimensions. If these cannot be observed then please consult IS SaveEnergy AG

Clearances

Component	Clearance	Clearance
Condenser	At the side of the condenser	1 m
	Before the maintenance opening	1 m
	Behind the heat exchanger	1.5 m
Water treatment system	Front and both facing sides	1 m
Wet electrode precipitator	Before the maintenance opening	1 m

Other conditions

- Relative air humidity (non-condensing) in operation of 20% to 80%; out of operation, 5% to 90%
- Operating temperature 5 °C to 35 °C
- Shock- and vibration free work platform.

The required floor load may also have to be considered depending on transport of the plant to its final location.

See «Technical data» on page 42.

NOTE



Observe the weight specifications of the plant and single components to determine the permissible floor load.

4.5 Erecting the plant

Requirement

To facilitate the installation, startup and optimum operation of the plant, the following minimum requirements must be met:

- The foundation must be established at a roofed location as per our instructions.
- Supply connections for power, fresh water and compressed air must be installed. Sewage connections must also be established.
- Installation aids such as crane, lifting gear, sliding and auxiliary materials for the sub-structure, erection scaffold, tools, etc. should be organised in advance and in readiness.
- Additional personnel and experts must be organised (welders, electricians, etc.).
- Auxiliary equipment and aids such as prescribed cleaning agent for startup by IS SaveEnergy AG expert personnel must be provided.
- Such soiling may result in corrosion.



CAREFUL



Damage due to corrosion

- ▶ During installation work of all assembly sections, steel dust and other impurities may enter the plant.
- ▶ Close all openings tightly.

Unpacking and cleaning

To avoid losses and damages:

Only unpack parts of the plant as they are required.

When unpacking, check the delivery schedule for completeness and any transport damages. Only destroy the packaging material after such checks have been made.

Report any damages or shortages immediately!

Open all packages from the lid and remove items from the top.

Open overseas packaging of the plant as follows:

- ▶ Remove the lid and make sure that nothing falls into the package, thereby damaging the machine.
- ▶ Remove side walls outwards.
- ▶ Remove the slide guards (wooden beams).
- ▶ Remove the fixture on the crate floor (front and rear above the plant frame).
- ▶ Remove the plastic from the control cabinet.

Special cleaning is unnecessary because no protective agent is used for transport.

Transport lock

The transport lock may only be released after the plant stands firmly on its foundation, except if it is to be hooked onto the plant frame.

See «Reloading, transshipping and unloading» on page 134

Erection

The plant must be placed down according to the installation diagram.

4.6 Installing the plant

Installation and erection work is divided into the following sections:

Installation

(by the manufacturer's fitter)

- Install condenser and additional plant components

Connect pipelines

(by the operator under instruction from the manufacturer's fitter)

- Fresh water supply and sewage
- Compressed air

Electrical connection

- Lay electrical connections as required

Final inspection

Only to be carried out by manufacturer's experts.

- Correct erection and installation
- Direction of rotation of motors
- Machine functions

Condition of plant on delivery

The plant is preassembled at the factory. The preassembled parts are joined together during installation on site. Only the protective equipment as well as the peripheral devices need to be installed separately, and the required supply lines must be connected.

NOTE



To ensure optimum requirements for trouble-free operation, it is recommended that installation be carried out by a fitter supplied by IS SaveEnergy AG. This ensures that the full guarantee warranty of the plant is maintained.

If installation is carried out by the operator then the installation sequence described in the following pages must be observed.

Putting the plant into place using a crane

The plant is unpacked and stands freely on the floor of the crate.

- ▶ Clean the foundation and check tolerances and dimensional accuracy with the surveyor's level or the hydrostatic level.
- ▶ Hook the plant onto the crane using the eyes intended for this.

See «Reloading, transshipping and unloading» on page 134

- ▶ Place the plant onto the foundation according to the floor plan. Finally, align and if necessary, use dummy sheets to correct for tolerances.

Check with the surveyor's level.



CAREFUL



Laid cable, pipes and hoses.

Risk of tripping!

- ▶ When transporting and installing, pay attention to any cable, pipes and hoses that have been laid.

NOTE



For the rest of the installation, the definitive operating platform or installation scaffolding is required. Make sure that the protective equipment sides of the operating platform can still be retracted from the front.

NOTE



Welding on site must be carried out with protective gas. The weld joints must then be pickled.

No holes must be drilled into components that convey gas!

Installing protective equipment

NOTE



Complete assembly drawings and parts lists are required for self installation of the protective equipment. These can be obtained on request.

Electrical connections

Establish electrical connections according to the electrical diagrams. The electrical diagrams contain terminal labelling and the recommended wire cross-sections together with their appropriate designations.



HAZARD



Unqualified personnel

Risk of injury and damage to equipment!

- ▶ All of the work at the electrical systems described in the following may only be carried out by trained experts. The electrician assigned to the work must ensure that the legally prescribed cable cross-sections required for installation are observed.

Before carrying out any work at the mains connection and at live parts of the plant, disconnect the plant from the electrical network at all phases and secure against unauthorized reconnection:

- Switch off the main switch and secure it with a U-lock, or
- Unplug the relevant mains cable, or

- Switch off/remove the mains fuse(s).

NOTE



At the electrical connections, make sure that power is always supplied to the heaters, even when the plant is shut down.

NOTE



Electrical supply of the motors must always be established in the correction direction of rotation. The correct direction of rotation is indicated by an attached arrow.

- ▶ Connect the main supply line for high voltage current to the control cabinet of the plant.
- ▶ Connect the connection cable of the following assemblies to the control cabinet:
 - Limit switch of protective equipment doors
 - Terminal boxes for plant components
 - Control panel
 - Periphery signals
- ▶ Wire the solenoids and limit switches in the control cabinet
- ▶ Ground all parts of the plant.

Final inspection

- ▶ Establish the definitive working platform as per the instructions
- ▶ Make sure that all plant parts are installed, screwed on and connected as prescribed.
- ▶ Check the position at the front and rear for escape routes between the shaft and the bearing plate. The requirement for this measurement is that the plant foundation is within prescribed tolerances or, if necessary, that the plant has been bolstered until such tolerances are met.

5 Startup

5.1 Introduction

Startup is carried out after erection and installation of the plant.

See Chapter «4 Erection and installation» on page 46.

5.1.1 Qualifications of personnel

The plant may only be started up by trained personnel. Training or instruction by the manufacturer is mandatory.

5.1.2 Safety regulations



HAZARD



Residual risks!

Risk of injury.

- First read Chapter «1 Safety instructions» thoroughly and observe the warning instructions contained in it.

See Chapter «1 Safety instructions» on page 15.

5.2 Initial startup

5.2.1 Measures to be taken before initial startup

Measures to be taken before initial startup

- Check the horizontal position of the plant (important for bearing and condensate discharge)
- Check the sealing of all pipeline flanges at pumps and containers
- Check the electrical and pneumatic connections
- Fill the plant with fresh water or desalinated water
- Check the direction of rotation for pumps and fans
- Cleaning the plant
- Make sure that all required operating resources are available in sufficient quantity and quality.

5.2.2 Required operating resources

The required operating resources are:

- Electricity
- Compressed air
- Chemicals for water treatment
 - pH neutralisation agent
 - Foaming agent (suppresses formation of foam caused by bad burning)
- Water
- Lubricants
- Cleaning agent

Information on suitability of the operating resources is contained in the following chapters:

«3 Technical data» on page 42.

«12.5 Data table of operating resources» on page 152.

«12.6 Lubricants» on page 152.

5.2.3 Initial startup

WARNING



Initial startup may only be carried out by trained experts from the manufacturer!

CAREFUL



Risk of corrosion!

Risk of damage to property

- ▶ The pumps may only be put into operation (also check of direction of rotation) after the complete plant is filled with water. Otherwise, the pump will be damaged (dry running).

NOTE



All required instructions provided to carry out initial startup, as well as detailed instructions on the prevention of risks to persons, the environment and the machine, are also contained in Chapter «1 Safety instructions».

The following conditions must be met to ensure our experts can travel to the place of installation:

- All prescribed and required safety equipment must be installed and in working order.
- Recommended peripheral devices must be installed and in working order. This equipment can be started up together with the plant by the appropriate experts.
- Operating resources such as power, water, compressed air, neutralisation agent and the prescribed lubricants must be available in sufficient quantities. The required connections must be installed and ready.
- Lines for compressed air and sewage have been blown out or rinsed out before connecting.
- The required cleaning agents are available in sufficient quantity.
- Protective gloves and goggles are in readiness at the place in which the plant is used.

5.3 Acceptance of the plant

Acceptance criteria

Acceptance is carried out after installation and startup of the plant. The startup engineer fills out a transfer and training protocol which is then signed by both himself and the operator. Also, the statement of compliance for handling high-voltage plants must be signed by the operator*. The plant is thereby transferred to the operator.

See Chapters «EC declaration of conformity» and Chapter «Declaration of compliance for working on high voltage plants».*

* With installed wet electrode precipitator.

Carrying out the acceptance process

This is done according to criteria agreed upon contractually, whereby the following at least must be contained in the contract:

- Transfer of technical documentation
- Check for complete delivery
- Check of the installation
- Check of the safety equipment
- Check of machine functions
- Initial startup by expert personnel
- Training of operating and maintenance personnel
- Running of flue gas measurements by an external company (carried out on site).

NOTE





The plant can be expanded for heat recovery. You can obtain information on this from the plant manufacturer.

5.4 Startup by the operator

5.4.1 Qualifications of personnel

The plant may only be started up by trained personnel. Training or instruction by the manufacturer is mandatory.

5.4.2 Safety regulations

 HAZARD	
	Residual risks!
	Risk of injury.
	<ul style="list-style-type: none">► First read Chapter «1 Safety instructions» thoroughly and observe the warning instructions contained in it. <hr/> <i>See Chapter «1 Safety instructions» on page 15.</i> <hr/>

5.4.3 Procedure during startup

The complete system is controlled by the condenser PLC. This chapter describes startup of the system.

Checklist before startup

- ▶ Close inspection and maintenance openings on all plant components (i.e. condenser, water treatment, wet electrode precipitator, vaporiser, etc.).
- ▶ Set the main switch to ON.
- ▶ Switch on the compressed-air system.
- ▶ Check and switch on the water supply.
- ▶ Make sure that the boiler is in operation and its temperature is within the normal operating range.
- ▶ Check the process water levels in the process water container. When required, top up with water and neutralisation agent (NaOH).
- ▶ Check the process water levels in the lamella separator and in the condensate container. Top up with water as required.
- ▶ Switch the main switch ON. It is on the outside at the main control cabinet of the condenser.

When no alarm is displayed, the plant can be started up as described in Chapter «7.2.2 Start the plant».

6 Operation

This chapter contains detailed information on the configuration, operation and parameterization of the controller of a SaveEnergy system.

These instructions provide a reference for daily work with the controller, as well as training documents.

6.1 Abbreviations

Abbreviations used in the description of the controller and in the screenshots are explained in the text.

6.2 Safety

6.2.1 Personnel qualification

The system may only be operated by trained persons. The manufacturer must provide training or instruction.

6.2.2 General safety instructions

These operating instructions, and especially Chapter «1 Safety instructions», are intended to ensure safe operation of the IS SaveEnergy AG system, especially with regard to persons, the system itself, and the environment.



HAZARD



Read the Safety chapter before startup and follow the appropriate instructions.



HAZARD



Unexpected startup of the system.

Risk to life and limb!

- ▶ Before switching on the system, make sure that there is nobody within the hazard zone.
- ▶ If there are several persons involved in starting up the system then they must keep eye contact with each other and always discuss each workstep in advance.

6.2.3 Safety functions

Emergency-stop function

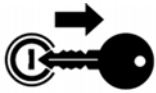
All power supply to the system is interrupted by actuating the main switch on the main control cabinet.

Lockable main switch

The main switch is on the front of the main control cabinet. Attaching a padlock to the control levers prevents the system from being switched back on unintentionally.



HAZARD





Maintenance work may only be carried out when the system is at standstill. The main switch must be locked and secured.

6.3 Operating concept

6.3.1 Operating with a touch panel (touchscreen)

The system is mainly operated by buttons and input fields shown on the displayed software screens.

! CAREFUL	
	Due to the risk of damage, only touch the surface of the touch panel with your finger or a soft object.

NOTE	
	Certain areas within the system can only be operated after entering a password.

6.3.2 Alarm messages

If a fault occurs in the system then an alarm message is displayed on the control panel. This type of alarm must be acknowledged. Detailed information on alarm messages is contained in Chapter «6.6.4 Message system».

6.4 Software screens

NOTE



The adjustment areas and parameter values in these operating instructions are guideline values and are not mandatory. They may vary depending on the configuration of the system.

The permissible values for operation of the system are determined and logged during startup.

6.4.1 Standard buttons and navigation

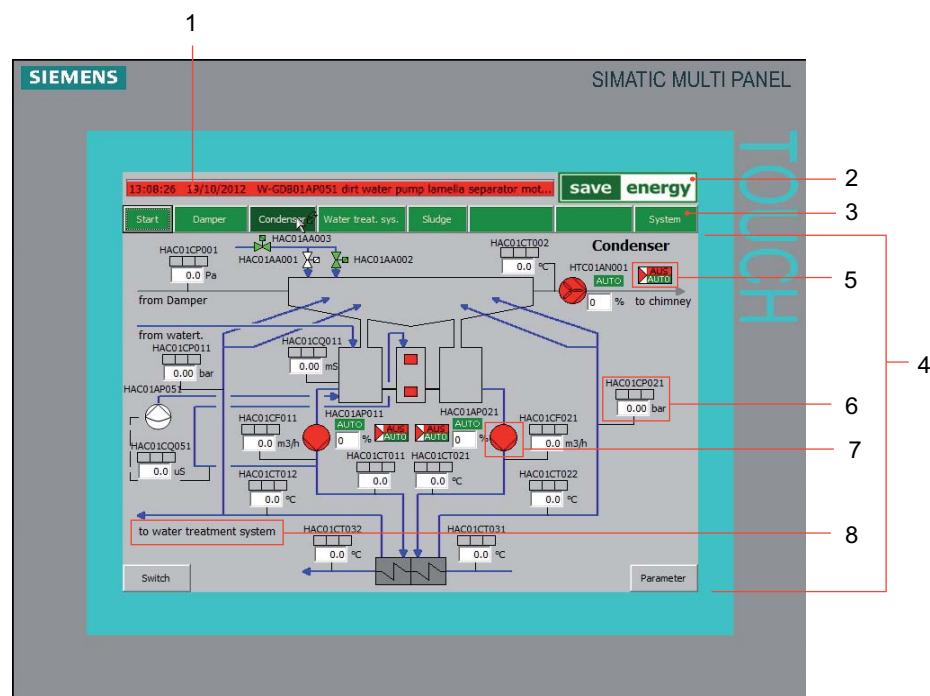


Fig. 12 - Design of the screens

- 1) Message bar for alarm and process messages. Touch the alarm bar to open the alarm list (see Chapter «6.6.4 Message system»).
- 2) Return to the start screen and log off by tapping the logo (see Chapter «6.4.3 Start screen»).
- 3) Navigation bar with buttons for the process screens of the various system components.
- 4) Display area and additional navigation buttons.
- 5) Navigate to "PID controller" screen of the selected system component.
- 6) Navigate to "Analogue value" screen of the selected system component.
- 7) Navigate to "Switches and status" screen of the selected system component.
The operating hours are displayed by touching on a consumer in the "Switches and status" screen.
- 8) Navigate to the process screen of the selected system component, analogous to Item. 3.

Visualization

The user interface provides a visual representation of the system and indicates the current state of the process at all times:












- Representation of the section of the process is made to indicate the current state of the units, and the process data.
- Various sensors register the valve position, pressure, level and temperature.
- Display the operating state of the pumps.







The display area is shown differently depending on the component and the additional functions. Certain screens may not be needed when their system components are not controlled by the IS SaveEnergy AG controller.




6.4.2 Description of symbols and buttons

Screen switchovers / Call a screen

Navigation is by means of buttons and symbols. The most important symbols and their operating states are explained in the following.

State	Consumer symbols			Note
	Pump	Drive	Heating	
Ready				Operating hours counter is active
Running				
Fault				Motor protection switch has triggered; check the alarm messages.
Revision			---	Indicates that the revision switch at the corresponding unit is actuated and can therefore not be switched on

State	Valve/flap	Control valve	Note
Closed			Runtime monitoring is active
Centre position			
Open			
Fault			Limit switch monitoring, runtime error

State	Controller	Note
Locked		No release from automatic system
Active		Runtime monitoring is active
OFF & locked		All switches on AUTO (see Chapter «6.6.1 System»)

6.4.3 Start screen

This screen is displayed after starting up the software.

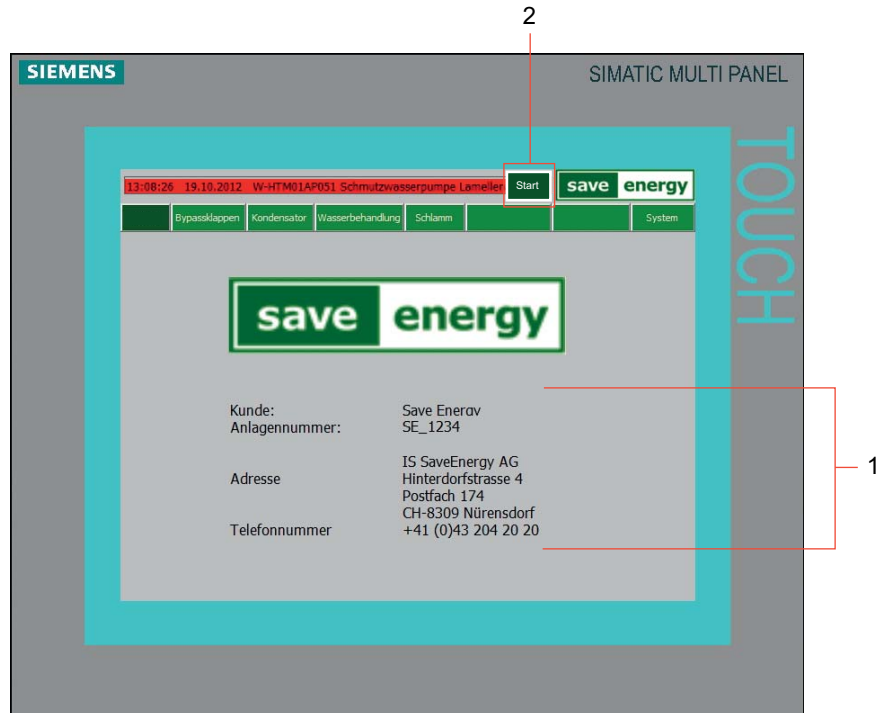


Fig. 13 - Start screen

- 1) Customer information and plant number
- 2) Start button

6.5 Plants and detailed screens

6.5.1 Bypass flaps

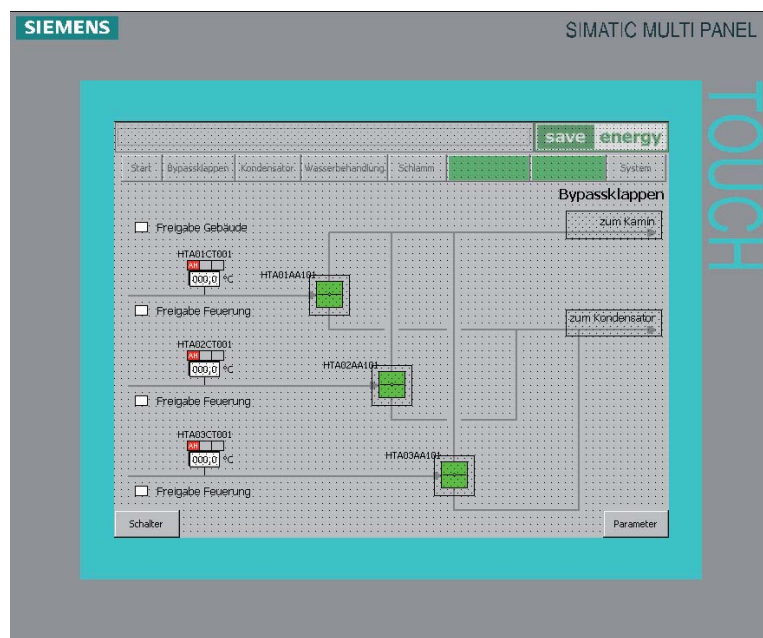


Fig. 14 - Bypass flap process screen

The following switch and parameter settings of the bypass flaps are displayed in a process screen on this screen:

Setting	Function
Release building	Indicates the release for firing-dependent plants.
HTA01CT001	Displays the actual temperature; the switching temperature to open the flap is set in the parameters.
Release firing	Displays the release signal for firing and releases the condenser.
HTA02CT001	Displays the actual temperature; the switching temperature to open the flap is set in the parameters.
Release firing	Displays the release signal for firing and releases the condenser.
HTA03CT001	Display the actual temperature; the switching temperature to open the flap is set in the parameters.
Release firing	Displays the release signal for firing and releases the condenser.

NOTE



The bypass flap is automatically opened and closed at regular intervals to check its function.

The "Switches" navigation button moves you to the switch settings of the bypass flap; see Chapter «6.5.2 Bypass flaps - Switches».

The "Parameter" navigation button moves you to the parameter settings of the bypass flap; see Chapter «6.5.3 Bypass flaps - Parameters».

6.5.2 Bypass flaps - Switches

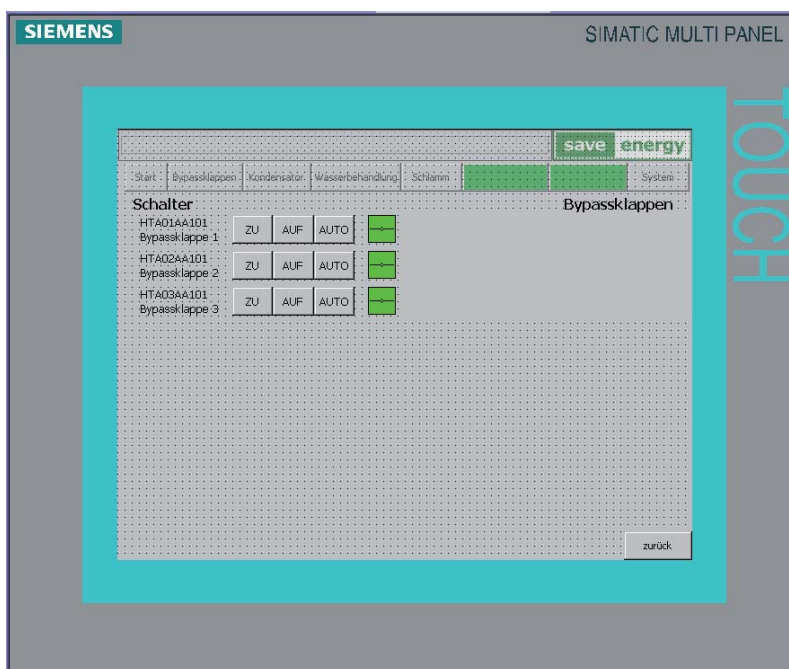


Fig. 15 - Bypass flaps - Switches

The following switch positions of the bypass flaps can be influenced in this screen:

Switch	Function	Setting values
HTA01AA101 Bypass flap 1	Open or close the bypass flap or switch over to auto-matic mode.	CLOSE/OPEN/AUTO
HTA02AA101 Bypass flap 2	Open or close the bypass flap or switch over to auto-matic mode.	CLOSE/OPEN/AUTO
HTA03AA101 Bypass flap 3	Open or close the bypass flap or switch over to auto-matic mode.	CLOSE/OPEN/AUTO

Move back to the previous screen with the "back" button

6.5.3 Bypass flaps - Parameters

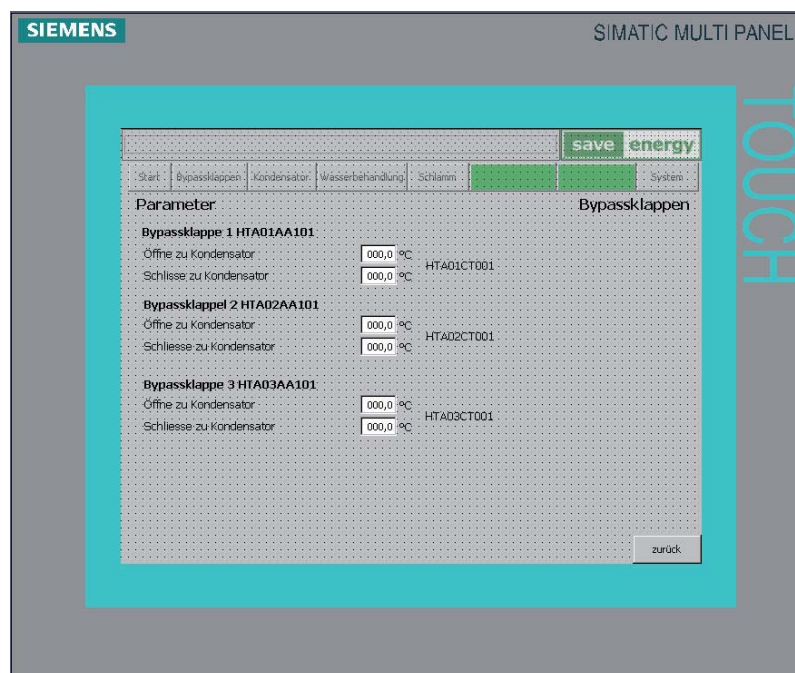


Fig. 16 - Bypass flaps - Parameters

The following parameters can be set in this screen:

Parameter	Function	Adjustment area
Bypass flap 1 HTA01AA101		
Open to condenser	Using this function, the flap to the condenser is opened on reaching the set temperature.	0-100°C
Close to condenser	Using this function, the flap to the condenser is closed on reaching the set temperature.	0-100°C
Bypass flap 2 HTA02AA101		
Open to condenser	Using this function, the flap to the condenser is opened on reaching the set temperature.	0-100°C
Close to condenser	Using this function, the flap to the condenser is closed on reaching the set temperature.	0-100°C
Bypass flap 3 HTA03AA101		
Open to condenser	Using this function, the flap to the condenser is opened on reaching the set temperature.	0-100°C
Close to condenser	Using this function, the flap to the condenser is closed on reaching the set temperature.	0-100°C

Move back to the previous screen with the "back" button

6.5.4 Bypass flap - Analogue value

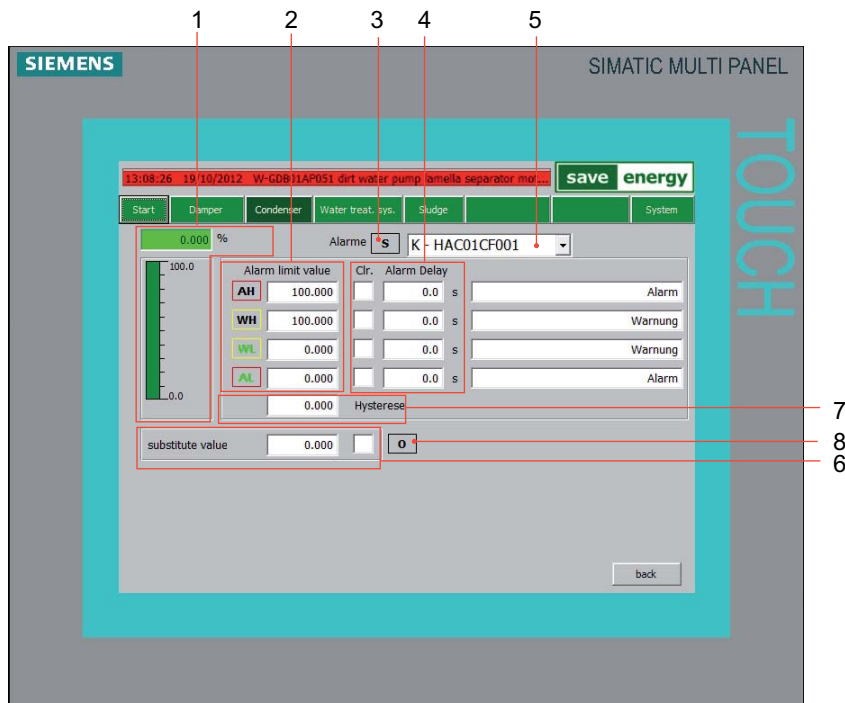


Fig. 17 - Bypass flap analogue values

- 1) Current actual value
- 2) Alarm limit values (can also be set on the parameter list). The alarm is only set when the release ('clear') box (Clr.) is ticked.
- 3) S = Collective alarm (wire break or limit violation)
- 4) Alarm delay. Only emits an alarm when the set time has expired. Requirement: The release box is activated.
- 5) Dropdown menu to select the required sensor. The menu also contains sensors not installed in the plant. Installed sensors can be seen on the R-I schematic («12.4 R & I schematics»).
- 6) Substitute value. The actual value can be overwritten by the substitute value. This option is used when a situation is to be simulated or when a sensor is defective and the plant should continue to be operated. The substitute value may only be activated for a short time. The plant must be put back into automatic mode as quickly as possible (without using substitute values) to prevent possible damages to it.
- 7) Hysteresis. If an alarm value is exceeded and the alarm delay time has expired then the alarm can only be acknowledged after the actual value has dropped below the *alarm value - hysteresis* value.
- 8) Substitute value entered by the operator.

NOTE



As soon as substitute values have been set, all responsible persons must be informed of this.

Abbreviations

AH	Alarm high
AL	Alarm low
WH	Warning high
WL	Warning low

Move back to the previous screen with the "back" button

NOTE



If the temperature at the flue gas inlet exceeds 250°C then the bypass flap automatically switches to bypass because the incoming temperature is too high. An A alarm is triggered.

Terms

- Alarm: *Alarm* indicates an operating state that is hazardous to persons and to the machine. The plant switches off.
- Warning: In the *Warning* operating state, the plant continues to be operated within a limit range.

6.5.5 Condenser

The switch positions and parameter settings of the condenser are displayed in an overview in this screen.

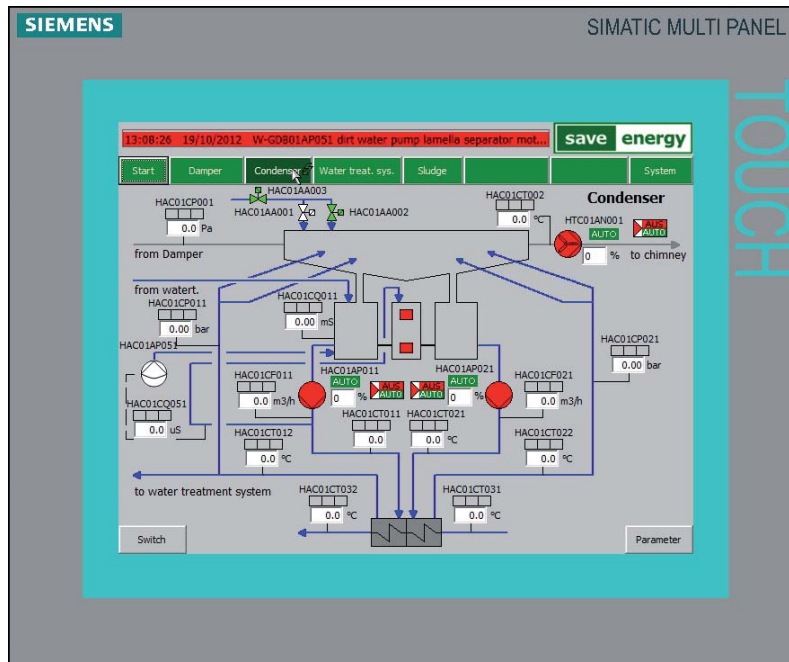


Fig. 18 - Condenser process screen

The "Switches" navigation button moves you to the switch settings of the condenser; see Chapter «6.5.6 Condenser - Switches».

The "Parameter" navigation button moves you to the parameter settings of the condenser; see Chapter «6.5.7 Condenser - Parameters».

6.5.6 Condenser - Switches

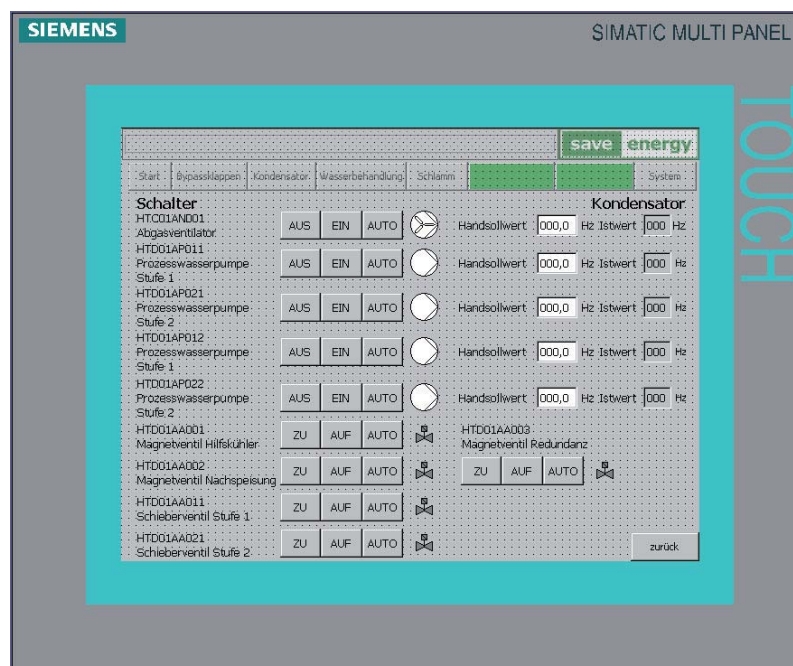


Fig. 19 - Condenser - Switches

The following switch positions and set values of the condenser can be influenced in this screen:

Switch	Function	Setting values
HTC01AN001 Flue gas fan	Switch on or off the flue gas fan, or switch over to automatic mode.	OFF/ON/AUTO
HTD01AP011 Process water pump, Stage 1	Switch on or off the process water pump, or switch over to automatic mode.	OFF/ON/AUTO
HTD01AP021 Process water pump, Stage 2	Switch on or off the process water pump, or switch over to automatic mode.	OFF/ON/AUTO
HTD01AP012 Process water pump 2, Stage 1	Switch on or off the process water pump, or switch over to automatic mode.	OFF/ON/AUTO
HTD01AP022 Process water pump 2, Stage 2	Switch on or off the process water pump, or switch over to automatic mode.	OFF/ON/AUTO

Parameter	Function	Setting values
Manual set values	Sets the active set value of the frequency converter (FC) of the respective unit (flue gas fan and recirculation pumps). A minimum frequency is stored on the FUs to ensure the unit is not damaged.	0-100%

Switch	Function	Setting values
HTD01AA001 Auxiliary cooler solenoid	Open or close the solenoid or switch over to automatic mode.	CLOSE/OPEN/AUTO
HTD01AA002 Backfeed solenoid	Open or close the solenoid or switch over to automatic mode.	CLOSE/OPEN/AUTO
HTD01AA011 Power Save Stage 1	Open or close the slide valve or switch over to automatic mode.	CLOSE/OPEN/AUTO
HTD01AA021 Power Save Stage 2	Open or close the slide valve or switch over to automatic mode.	CLOSE/OPEN/AUTO
HTD01AA003 Redundancy solenoid	Open or close the solenoid or switch over to automatic mode.	CLOSE/OPEN/AUTO

Move back to the previous screen with the "back" button

6.5.7 Condenser - Parameters

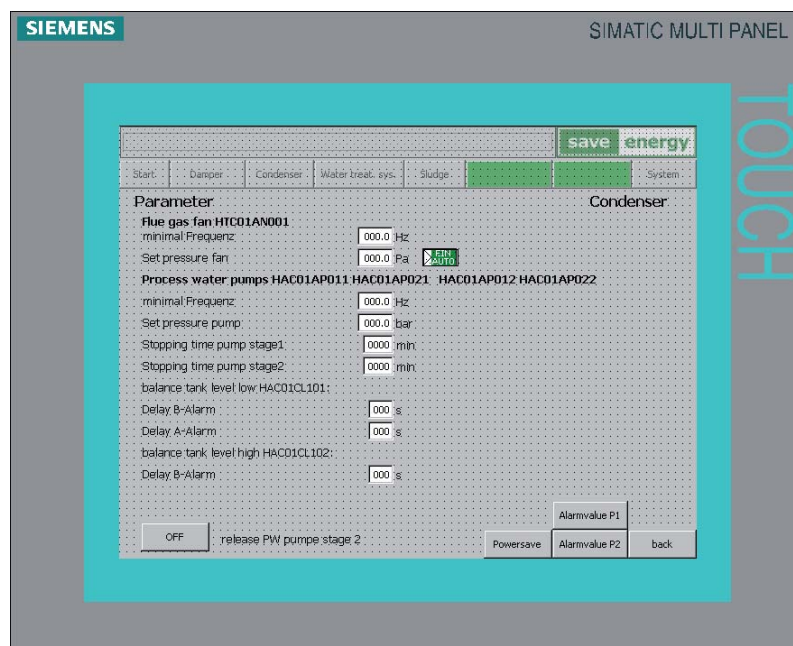


Fig. 20 - Condenser - Parameters

The following parameters can be set in this screen:

Parameter	Function	Setting range
Flue gas fan HTC01AN001		
Minimum frequency	Set the minimum speed of the flue gas fan using the frequency converter. A minimum frequency is stored on the FUs to ensure the unit is not damaged.	10 Hz
HTD01CP001 Set pressure fan	Set the pressure in Pascal.	-50 ... 0 Pa

Parameter	Function	Setting range
Process water pumps HTD01AP011, HTD01AP021, HTD01AP012, HTD01AP022		
Minimum frequency	Set the minimum speed of the process water pumps using the frequency converter. A minimum frequency is stored on the FUs to ensure the unit is not damaged.	25 Hz
Set pressure pump	Set the pressure value	1.5 bar
Stopping time pump stage 1	Set the pump stopping time.	300 min
Stopping time pump stage 2	Set the pump stopping time.	0 min
Balance tank level low HTD01CL101		
Delay B-Alarm	Set the delay.	10 s
Delay A-Alarm	Set the delay.	10 s
Balance tank level high HTD01CL102		
Delay B-Alarm	Set the delay.	10 s

The "Alarm value" navigation button moves you to the settings of the alarm thresholds; see Chapter «6.5.8 Condenser - Alarm thresholds».

The "PowerSave" navigation button moves you to the settings of the alarm thresholds; see Chapter «6.5.9 Condenser - PowerSave».

Move back to the previous screen with the "back" button

6.5.8 Condenser - Alarm thresholds

The alarm thresholds and the delay times of the condenser can be set in this screen. Alarm messages are displayed if these values are undershot/overshot.

Alarm hysteresis

The alarm hysteresis settings generally delay the output of the alarm. If an alarm value is exceeded and the alarm delay time has expired then the alarm can only be acknowledged after the actual value has dropped below the *alarm value - hysteresis* value.

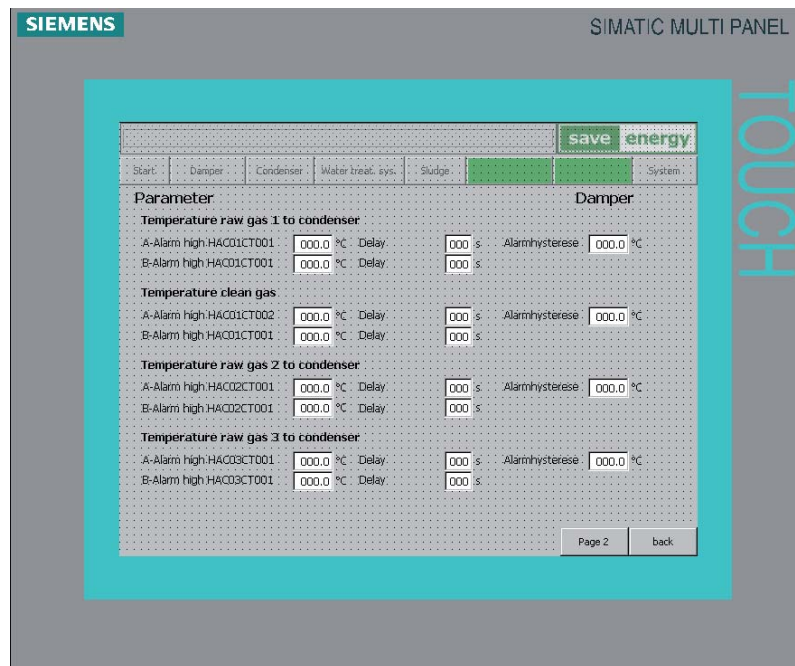


Fig. 21 - Condenser - Alarm threshold Screen 1

Move back to the previous screen with the "back" button

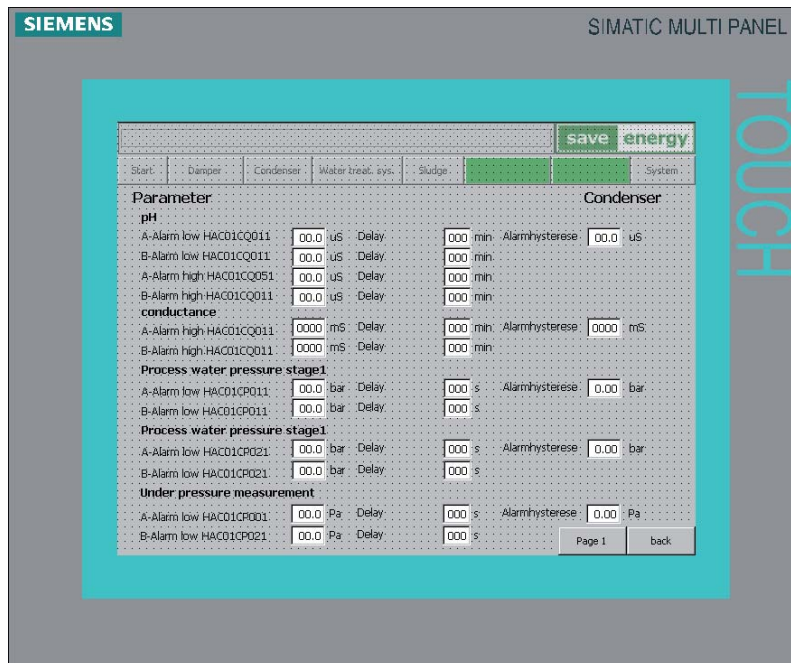


Fig. 22 - Condenser - Alarm threshold Screen 2

Move back to the previous screen with the "back" button

6.5.9 Condenser - PowerSave

PowerSave function

Automatic

The PowerSave function adjusts the flow rate (volume flow) on the primary side to the flow rate on the secondary side (heating network). The primary side flow rate should not be greater than the flow rate on the secondary side to ensure optimum heat extraction. Furthermore, the electrical power requirement can be significantly reduced by the PowerSave function.

The PowerSave function switches the valves at the inlet of the process water in the cooling chamber and controls the pressure of the process water pipe.

Manual

If no automatic PowerSave is installed, the valves at the inlet of the process water in the cooling chamber can be closed. When the boiler is at full capacity, the valves should be open to achieve optimum heat extraction. If the boiler capacity drops below 60% then the valves can be closed to reduce the electrical power requirement to the pumps. It is the responsibility of the operator to find the optimum settings for his operating conditions.

In the following screen, rules are defined governing condenser units in automatic mode. If the set values are violated (overshot/undershot), then e.g. valves open or close, pumps are switched on or off, or control settings are made.

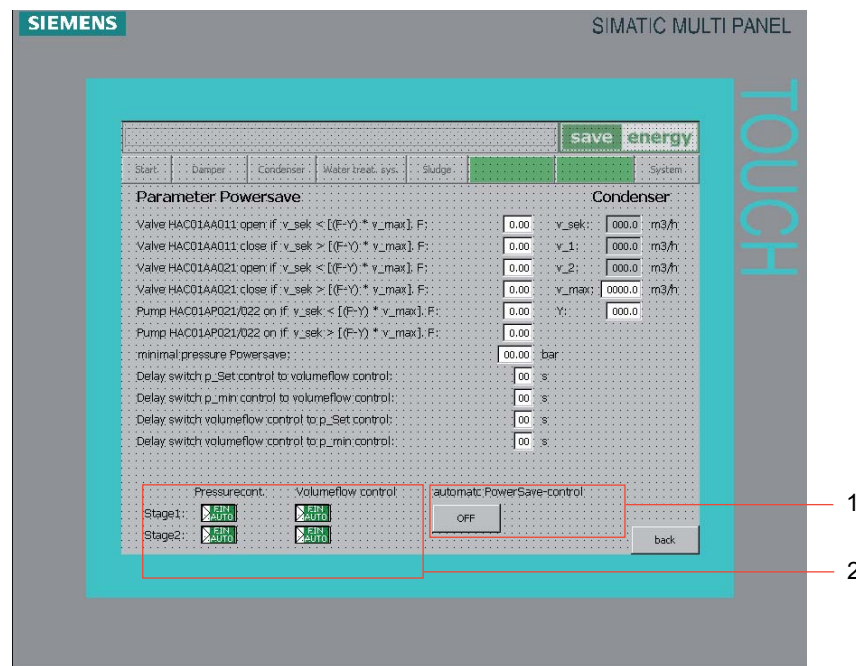


Fig. 23 - Condenser - PowerSave

- 1) Switch on and off the automatic controllers. The setting parameters of the controllers are described in Chapter «6.5.10 Condenser - PID controller (MUX)» on page 80.
- 2) Switch on and off automatic PowerSave control.

Abbreviations

V_sek	Volume flow at the secondary side (heating network side) [m3/h]
V_1	Volume flow of process water Stage 1 [m3/h]
V_2	Volume flow of process water Stage 2 [m3/h]
V_max	Maximum volume flow of process water Stage 1/2 [m3/h]
F	Switching factor
Y	Reduction factor
Y	Adjustable value of the PowerSave pressure control Y=0.1, when PowerSave pressure control is ON Y=0, when PowerSave pressure control is OFF
P_set	Set value of pressure in process water
P_min	Minimum permissible pressure

NOTE



After being optimised, these values should normally no longer be changed.

Move back to the previous screen with the "back" button

6.5.10 Condenser - PID controller (MUX)

The controller action of the condenser can be defined in this screen. It controls the components and units in automatic mode.

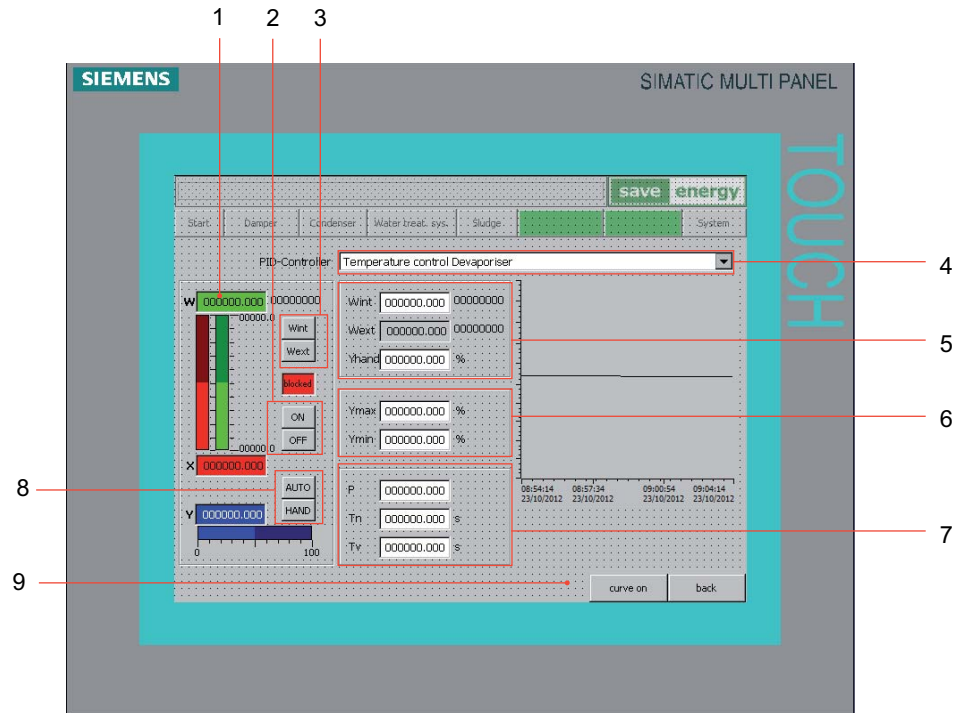


Fig. 24 - Condenser - PID controller

- 1) Actual value
- 2) Switch on or off the controller
- 3) Buttons to switch between set values Wint and Wext
W-value = default value
Wint = Internal value (calculated by the controller)
Wext = external value (entered manually)
- 4) List selection, PID controller set value
- 5) Manually set values with "HAND" button selected (mainly for testing purposes)
- 6) Limit the control value (only adjust this after consultation with IS Save Energy AG!)
- 7) Control parameter
P Gain factor
Tn Reset time (integral time)
Tv Delay time (proportional band)
- 8) Buttons to switch over between manual and automatic control
- 9) Switch on the graphic curve within the screen



CAREFUL



The plant must not be operated automatically when manual control is activated.

After being optimised, these values should normally no longer be changed.

Move back to the previous screen with the "back" button

A trend display is shown/hidden with the "curve on" button

Setting values

	P[*]	Tn [s]	Tv [s]	Ymin [%]	Ymax [%]
Temperature control devaporiser	1.0	10.0	0.0	0.0	100.0
Fan pressure control	1.0	10.0	0.0	0.0	100.0
Process water pump pressure control, Stage 1	1.0	10.0	0.0	0.0	100.0
Process water pump pressure control, Stage 2	1.0	10.0	0.0	0.0	100.0
Process water pump volume flow control, Stage 1	1.0	10.0	0.0	0.0	100.0
Process water pump volume flow control, Stage 2	1.0	10.0	0.0	0.0	100.0

* Unit may vary depending on the controller.

6.5.11 Water treatment system

The switch positions and parameter settings of the water treatment system are displayed in a process screen in this screen.

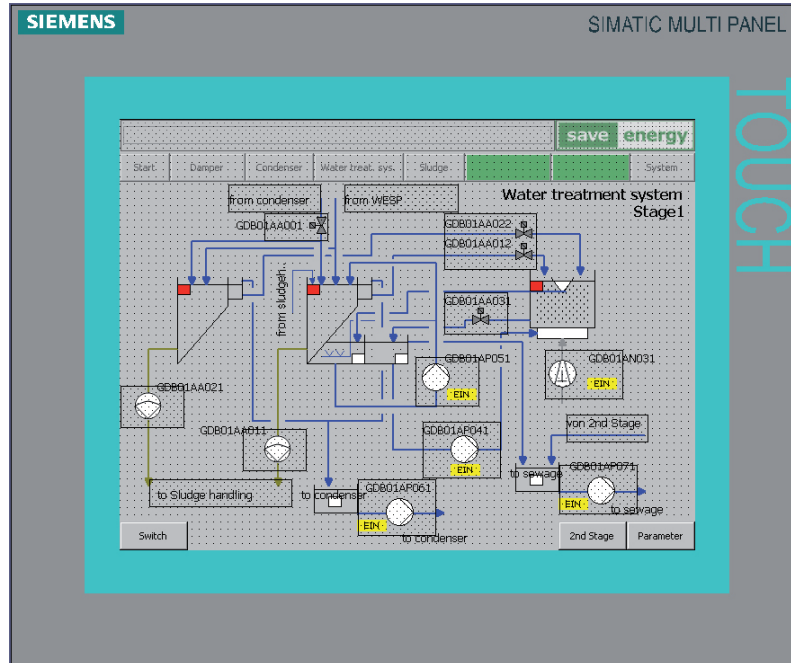


Fig. 25 - Water treatment system process screen

The "Switches" navigation button moves you to the switch settings of the water treatment system; see Chapter «6.5.12 Water treatment system - Switches».

The "Parameter" navigation button moves you to the parameter settings of the water treatment system; see Chapter «6.5.13 Water treatment system - Parameters».

6.5.12 Water treatment system - Switches

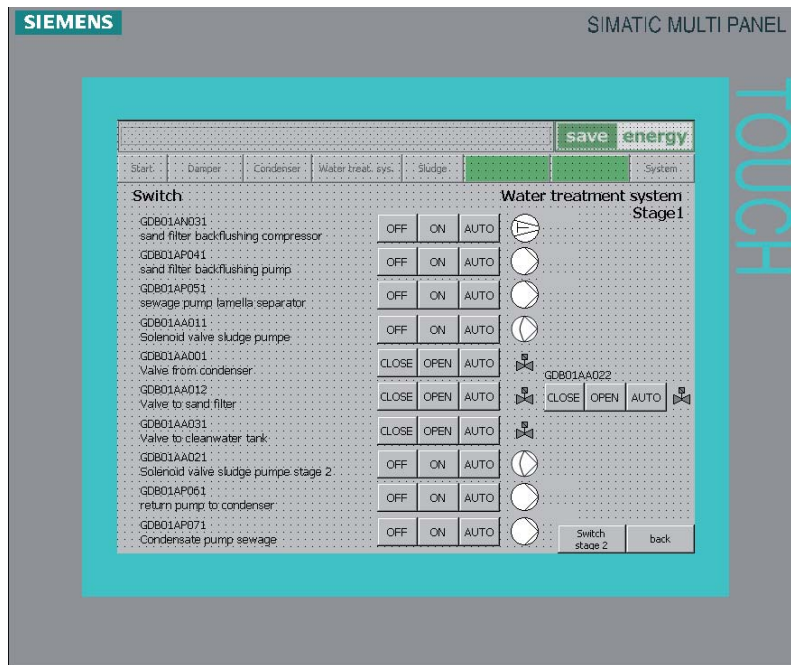


Fig. 26 - Water treatment system - Switches

The following switch positions and set values of the water treatment system can be influenced in this screen.

Switch	Function	Setting values
HTM01AN031 Sand filter backflushing compressor	Switch on or off the sand filter backflushing compressor, or switch over to automatic mode.	OFF/ON/AUTO
HTM01AP041 Sand filter backflushing pump	Switch on or off the sand filter backflushing pump, or switch over to automatic mode.	OFF/ON/AUTO
HTM01AP051 Sewage pump lamella separator	Switch on or off the sewage pump of the lamella separator, or switch over to automatic mode.	OFF/ON/AUTO
HTM01AA011 Solenoid valve sludge pump	Switch on or off the solenoid for the sludge pump, or switch over to automatic mode.	OFF/ON/AUTO
HTM01AA001 Valve from condenser	Switch on or off the solenoid for the feed from the condenser, or switch over to automatic mode.	CLOSE/OPEN/AUTO
HTM01AA012 Valve to sand filter	Switch on or off the solenoid for the feed to the sand filter, or switch over to automatic mode.	CLOSE/OPEN/AUTO
HTM01AA031 Valve to cleanwater tank	Switch on or off the solenoid for the feed to the cleanwater tank, or switch over to automatic mode.	CLOSE/OPEN/AUTO

Switch	Function	Setting values
HTM01AA021 Solenoid valve sludge pump stage 2	Switch on or off the solenoid for the sludge pump of the 2nd stage, or switch over to automatic mode.	CLOSE/OPEN/AUTO
HTM01AA012 Solenoid valve sand filter stage 2	Switch on or off the solenoid for the feed to the and filter of the 2nd stage, or switch over to automatic mode.	CLOSE/OPEN/AUTO
HTM01AA061 Return pump to condenser	Switch on or off the return pump to the condenser or switch over to automatic mode.	CLOSE/OPEN/AUTO
HTM01AA071 Clearwater pump to sewage	Switch on or off the cleanwater pump to the sewage or switch over to automatic mode.	CLOSE/OPEN/AUTO

Move to the screen of the 2nd stage with the "Switch stage 2" button.

Move back to the previous screen with the "back" button

6.5.13 Water treatment system - Parameters

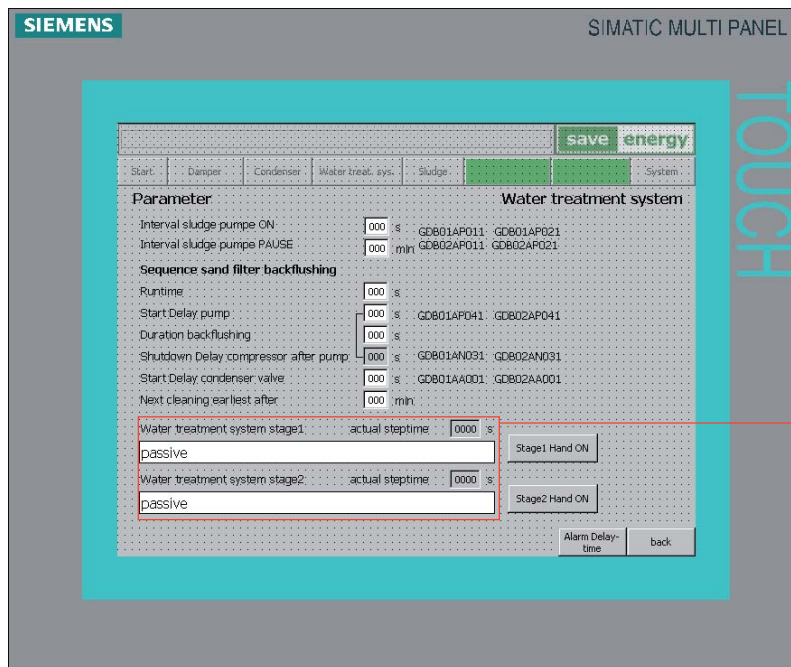


Fig. 27 - Water treatment system - Parameters

- 1) Displays the current sequencing of backflushing.

Sludge pump

The following parameters can be set in this screen:

Parameter	Function	Setting range
Interval sludge pump ON	Set the running time of the sludge pump.	0...4 s
Interval sludge pump PAUSE	Set the pause time until the sludge pump runs again.	0...4 min

Setting the running time and the pause

An attempt is made to frequently remove the sedimented sludge form the lamella separator. If the pauses are tool long then the sedimented sludge may block lines and pumps.

The length of the pause should be selected so that when activating the pump, thick sludge is initially conveyed. The running time should be set so that the pump stops as soon as the thick sludge is followed by clear water.

Backflushing filter sequence

Mode of operation

The sand filter is automatically backflushed when the water level in the sand filter rises up to the level sensor. Backflushing rinses particles held back in the sand filter from the sand filter.

Backflushing is triggered by the level sensor. The following steps are run in this order:

- ▶ Valve HTM01AA012 for feed to the sand filter closes, valve HTM01AA001 for feed to the lamella separator closes and the valve to the cleanwater tank HTM01AA031 closes.
- ▶ Backflushing compressor HTM01AN031 starts.
- ▶ Backflushing pump HTM01AN041 starts after a delay.
- ▶ Backflushing stops after a set time or when the level in the cleanwater tank drops too low.
- ▶ All valves closed in Step 1 re-open.

The following parameters can be set in this screen:

Parameter	Function	Setting range
Start delay backflushing	Set the switch-on delay after the valve closes.	2 s
Start delay pump	Set the delay time for switching on the pump after the compressor.	4 s
Duration backflushing	Set the backflushing duration.	120 s
Shutdown delay compressor after pump	Display the stopping time of the compressor. (depending on the start delay of the pump after the compressor)	-
Start delay condenser valve	Set the valve delay time	?? s
Next cleaning earliest after	Set the next cleaning interval.	min
Water treatment system stage 1 actual step time	Display the actual step time	-
Water treatment system stage 2 actual step time	Display the actual step time	-

The "Alarm delay time" navigation button moves you to the settings of the alarm thresholds; see Chapter «6.5.8 Condenser - Alarm thresholds».

Move back to the previous screen with the "back" button

6.5.14 Water treatment system - Alarm thresholds

The delay time of the water treatment system alarm thresholds can be set in this screen.

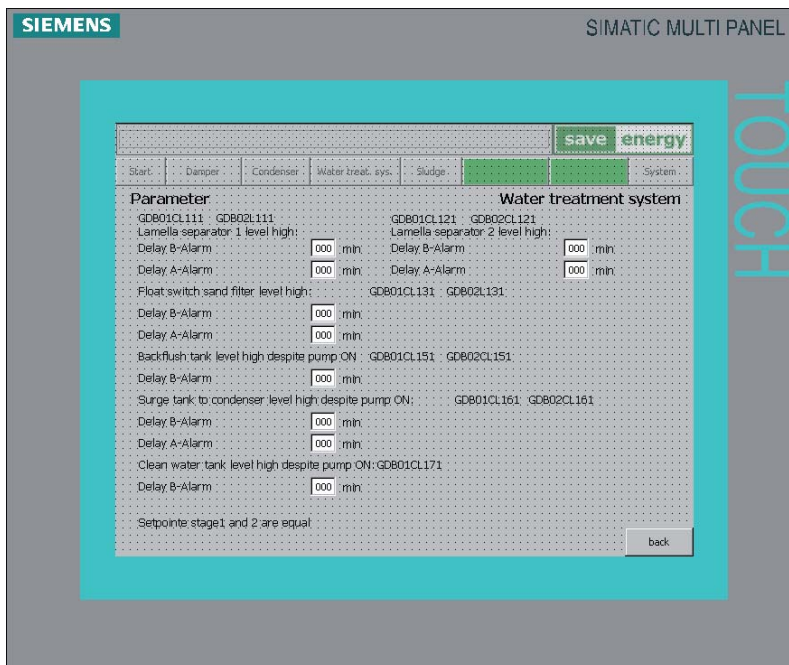


Fig. 28 - Water treatment system - Alarm thresholds

Parameter	Function	Setting range
HTM01CL111, HTM02L111 Lamella separator 1 level high		
Delay B-Alarm	Set the delay time of the B-Alarm.	1 min
Delay A-Alarm	Set the delay time of the A-Alarm.	1 min
HTM01CL131, HTM02L131 Sand filter level high		
Delay B-Alarm	Set the delay time of the B-Alarm.	8 min
Delay A-Alarm	Set the delay time of the A-Alarm.	15 min
HTM01CL151, HTM02L151 Backflush tank level high despite pump ON		
Delay B-Alarm	Set the delay time of the B-Alarm.	10 min
HTM01CL161, HTM02L161 Surge tank to condenser level high despite pump ON		
Delay B-Alarm	Set the delay time of the B-Alarm.	10 min
Delay A-Alarm	Set the delay time of the A-Alarm.	40 min
HTM01CL171 Clean water tank level high despite pump ON		
Delay B-Alarm	Set the delay time of the B-Alarm.	5 min
HTM01CL121, HTM02CL121 Lamella separator 2 level high		
Delay B-Alarm	Set the delay time of the B-Alarm.	1 min
Delay A-Alarm	Set the delay time of the A-Alarm.	1 min

NOTE



Normally no settings have to be made in this screen.

Move back to the previous screen with the "back" button

6.5.15 Switch clock

In this screen, tasks can be programmed for the functions selected in the dropdown menu.

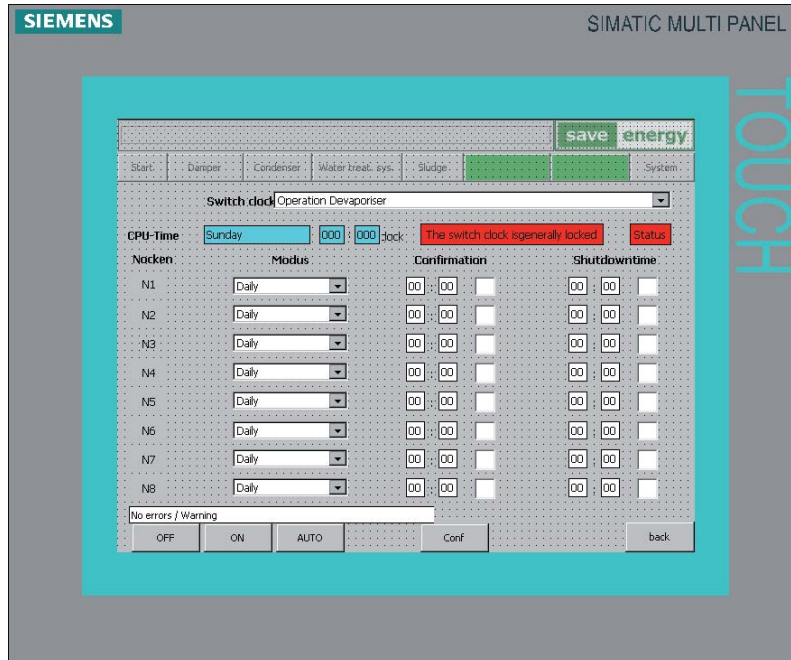


Fig. 29 - Devaporiser - Switch clock

The set switching times are manually deactivated with the "OFF" button.

The set switching times are manually activated with the "ON" button.

The set switching times are automatically controlled with the "AUTO" button.

All entries are confirmed with the "Conf" button.

Move back to the previous screen with the "back" button

6.6 System screens

6.6.1 System

System settings can be made in this screen.

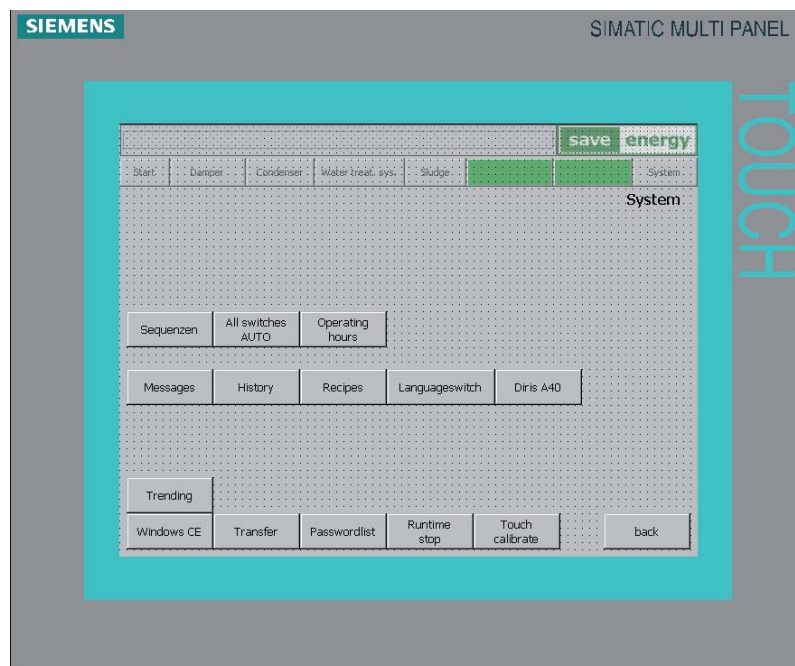


Fig. 30 - System

Legend

Button	Target / Function
Sequences	See Chapter «6.6.2 System - Sequences».
All switches AUTO	If various switches are set to "OFF", then you can set all switches to "AUTO" with this button.
Messages	Message system (see Chapter «6.6.4 Message system»).
History	
Programme	Parameter management of basic settings in a table (see Chapter «6.6.5 Program management»).
Languages switch	You can switch between the available languages here. If you want to change the language permanently, then press the "Runtime stop" button before switching over the language, and then restart the system.
Diris A40	Overview of all actual current, voltage and performance values
Trending	Display measured data curves
Windows CE	Open the system settings
Transfer	Transfer is required to transfer programs (only used by the manufacturer).
Password list	Passwords and logoff times can be changed here. This requires appropriate permissions.

Button	Target / Function
Runtime stop	Power down the display. To re-start the display, press the main switch on the control cabinet.
Touch calibrate	The touch panel can be recalibrated at any time. Follow the instructions in the menu!
back	Navigate to the previous screen

6.6.2 System - Sequences

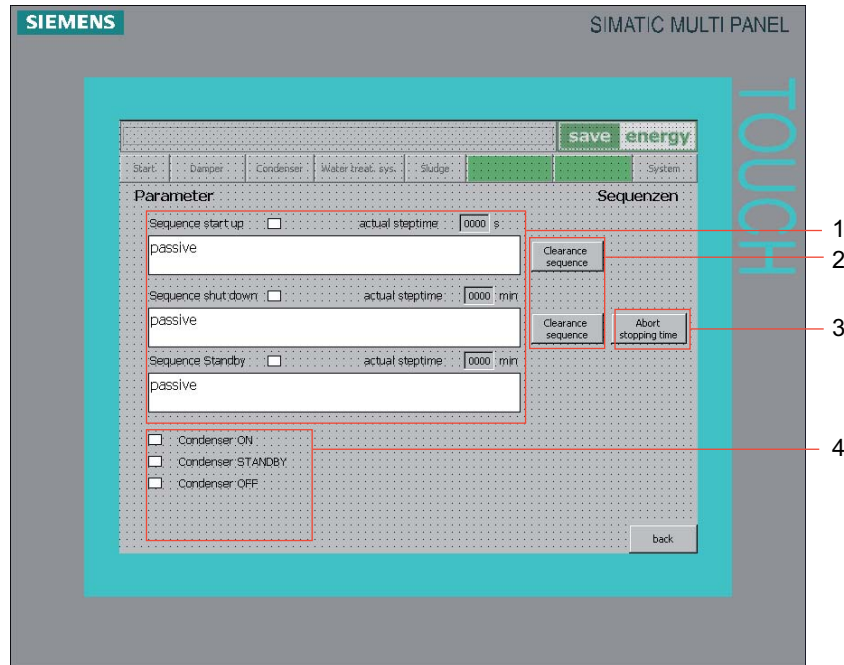


Fig. 31 - System - Sequences

- 1) Display sequencing steps
- 2) Clearance sequence. Manual clearance (release) of the sequence. Boundary conditions for the sequence are skipped in order to directly start or stop the plant.
- 3) Abort stopping time. Stopping times are stopped immediately
- 4) Display of condenser status

NOTE



ATTENTION: If the sequence is released manually, the interface to third-party systems is NOT taken into consideration!

When possible, a sequence should always be run through completely.

The stopping time should only be switched off in exceptional cases. The stopping time of the pumps is required for stable operation.

Move back to the previous screen with the "back" button

6.6.3 Operating hours

The operating hours of the listed units are displayed in this screen. The operating hours can be reset by tapping the input fields. This function is password protected.

Screen 1

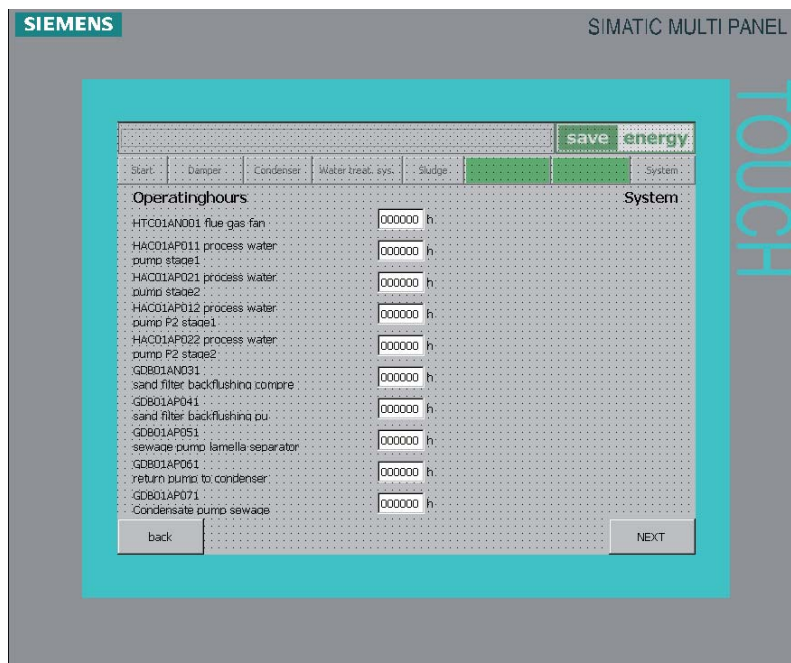


Fig. 32 - Operating hours Screen 1

Move back to the previous screen with the "back" button

Screen 2

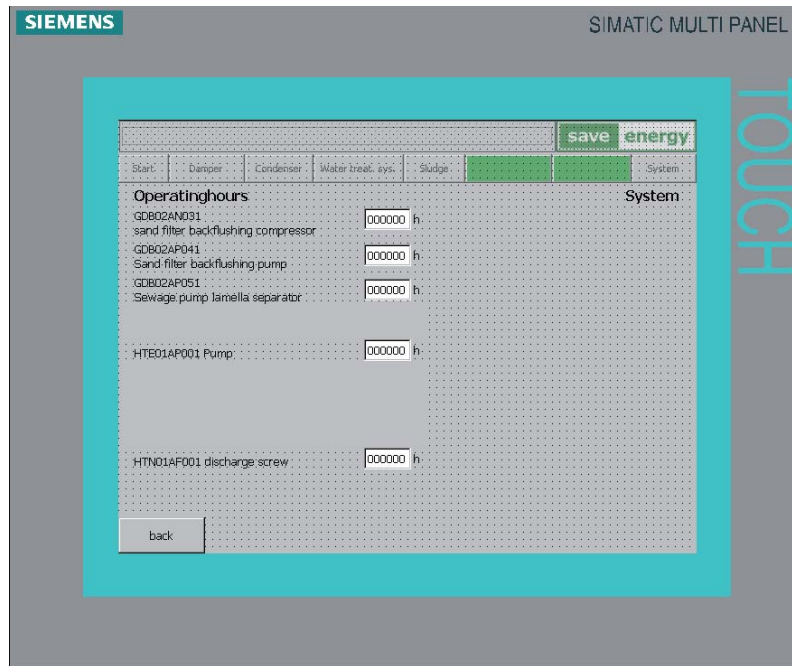


Fig. 33 - Operating hours Screen 2

Move back to the previous screen with the "back" button

6.6.4 Message system

Tap on the "System" button and then on "Messages" to jump to the screen with the queued error messages.

Queued messages

All units (pumps, heaters, valves) with a malfunction are listed here. A-Alarms red and B-Alarms orange. The last message that has occurred is shown in the top line.

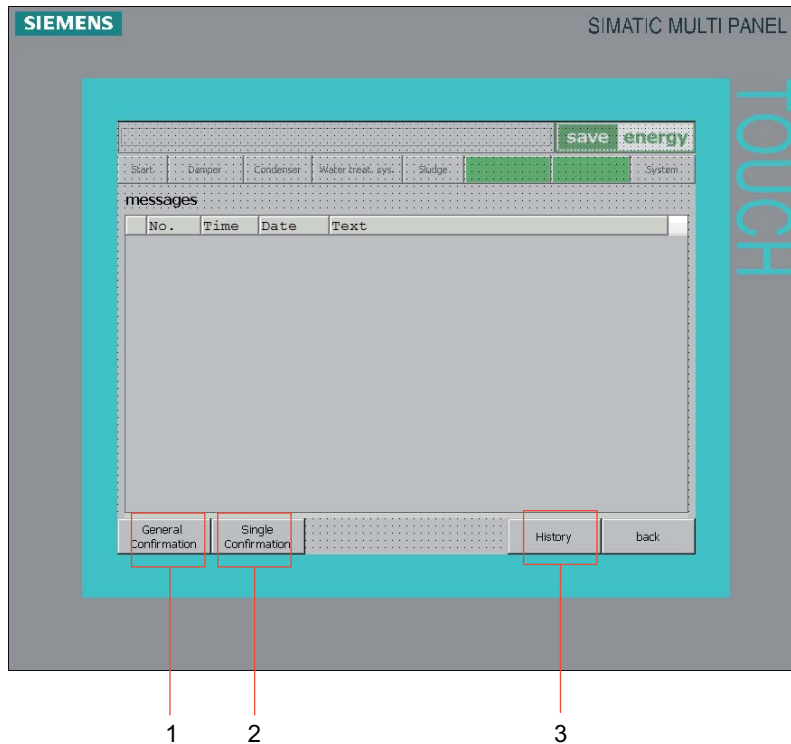


Fig. 34 - Queued messages

- 1) General Confirmation. All messages are acknowledged (confirmed).
- 2) Single confirmation. Single messages that have been previously marked are acknowledged.
- 3) History. Switches to the History screen.

Queued messages only disappear after the fault has been remedied and the appropriate confirmation has been issued.

Move back to the previous screen with the "back" button.

History

Tap on the "System" button and then on "History" to jump to the screen with the acknowledged error messages. The last message that has occurred is shown in the top line.

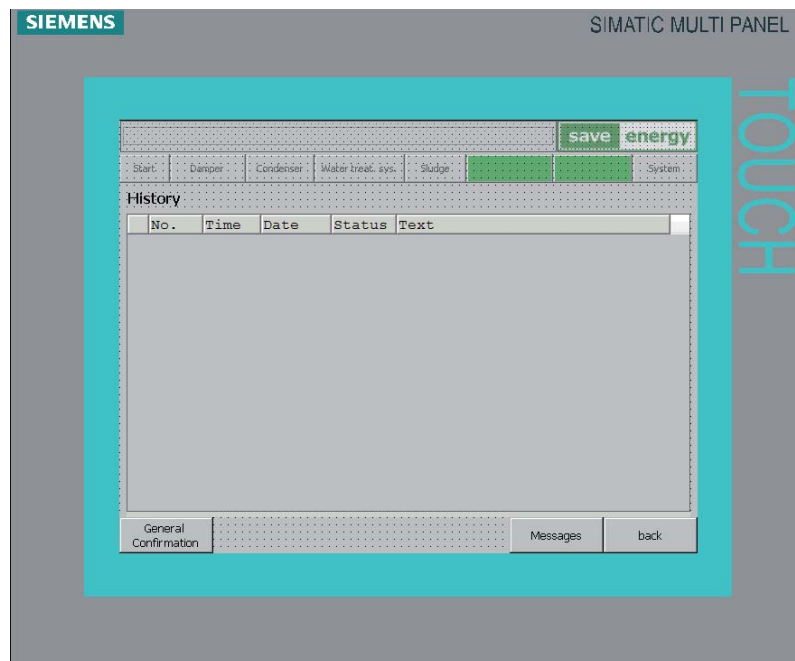


Fig. 35 - Queued messages

- 1) General Confirmation. All messages are acknowledged (confirmed).
- 2) Messages. Switches to the Messages screen.

Message classes

There are 4 different message classes:

A-Alarms	A red	AH - Alarm High , AL - Alarm Low Results in an action, shutdown (see description of controller)
B-Alarms (warnings)	W orange	WH - Warning High, WL - Warning Low No function, no message
Faults	S black	Automatic faults, general fault messages, No feedback protection, wire break analogue value
Operator prompts	O blue	(Instruction that a unit is not in the AUTO operating mode or an analogue measurement has activated the substitute value mode. Operator prompt to actuate something when in automatic mode)

6.6.5 Program management

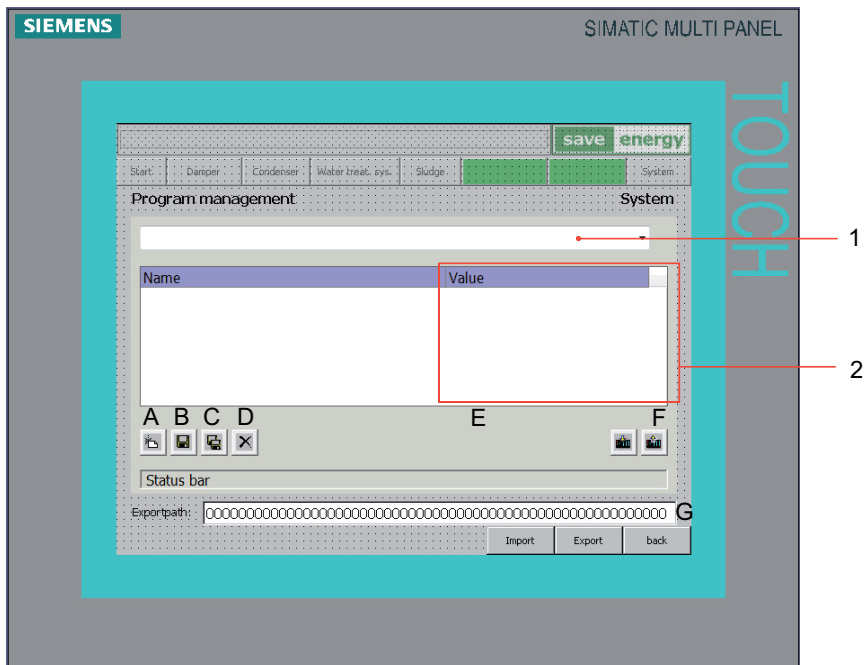


Fig. 36 - Program management

- 1) Program selection
- 2) Editable parameter

Editing function for program management

- A Create new data record
- B Save current data record locally
- C Save all data records locally
- D Delete current data record
- E Read parameter from the PLC into the current data record
- F Write current data record into the PLC (ATTENTION: all parameters on the PLC are overwritten by the data record and cannot be recovered. Recommendation: First run A and then E and save the data record)
- G Export path of the import/export function (e.g: USB stick)
- Import all data records from the "AnlagenParameter.SaE" file
- Export all data records from the "AnlagenParameter.SaE" file

Existing programs can be read-in using the "Import" button.

Existing programs can be read-out using the "Export" button.

Move back to the previous screen with the "back" button

NOTE



Care must be taken when using the F editing function. Careless manipulations may result in loss of data!

The "AnlagenParameter.SaE" file can be opened and edited with Excel or a text editor.

6.6.6 Languages switch

The required language is selected in this screen

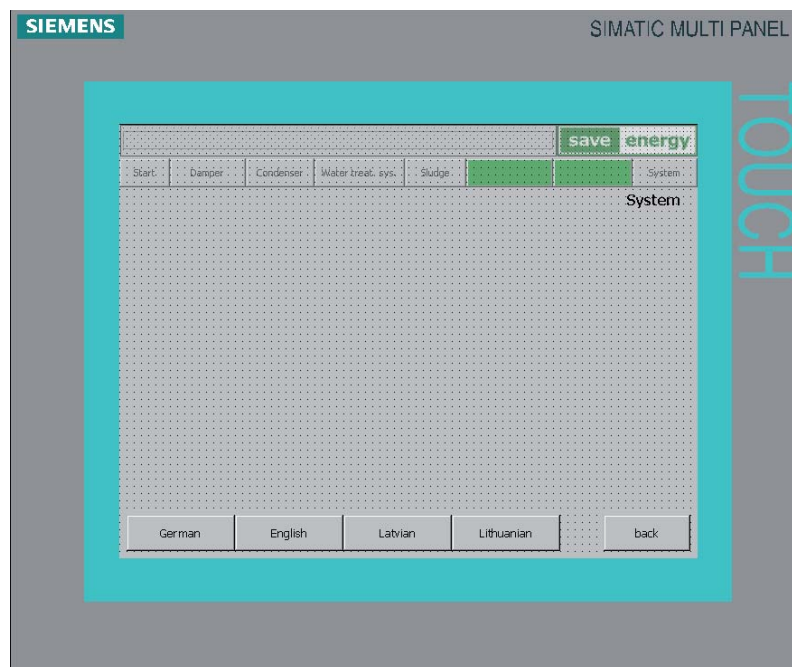


Fig. 37 - Languages switch

Move back to the previous screen with the "back" button

6.6.7 Diris A40 (request current, voltage and performance)

The actual current, voltage and performance data of the plant are displayed in this screen.

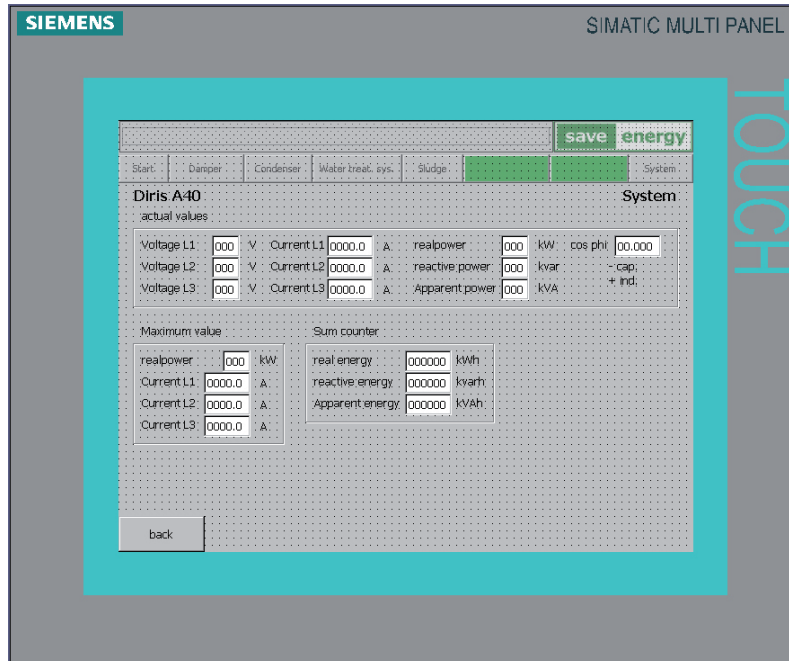


Fig. 38 - Diris A40 screen

Move back to the previous screen with the "back" button

6.6.8 Trending

Various curves of the plant components can be called up in this screen.

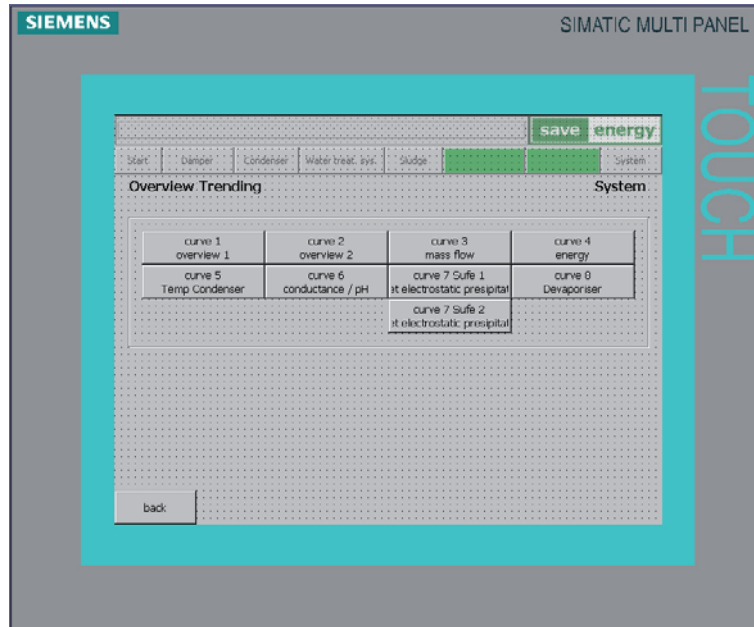


Fig. 39 - Trending screen

Move back to the previous screen with the "back" button

Example condenser

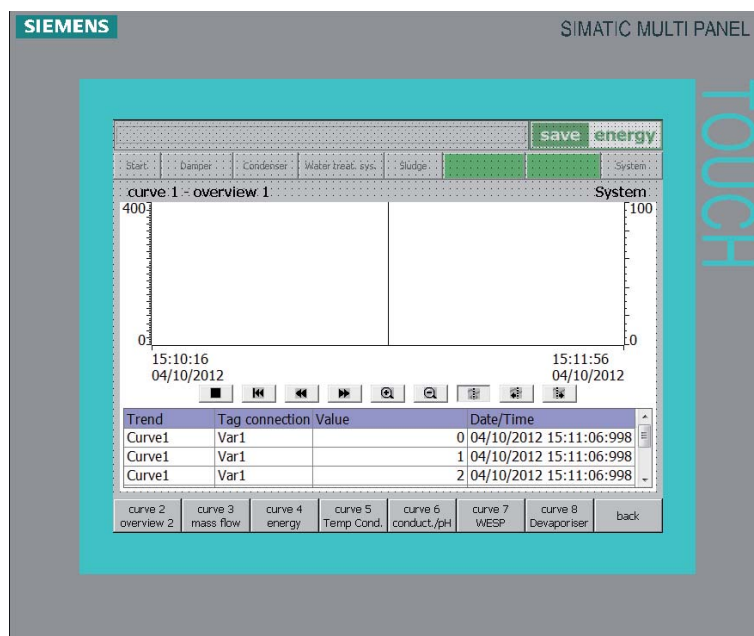


Fig. 40 - Trending condenser

You can switch directly to the trending screens of other components from this screen.

Move back to the previous screen with the "back" button

6.6.9 Password list

Currently assigned users, passwords and group memberships are managed in this screen.

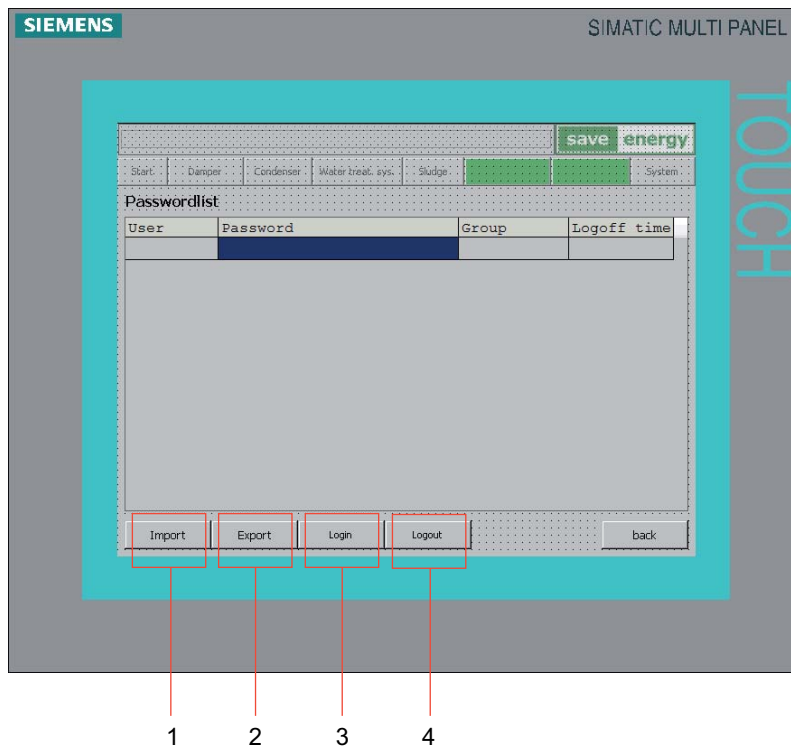



Fig. 41 - Password list screen


- 1) Import. New users can be imported.
- 2) Export. User data can be exported.
- 3) Login. Users can login here.
- 4) Logout. Users can logout here.

Move back to the previous screen with the "back" button

7 Operating the plant

7.1 Controller startup

 **HAZARD**



Inadvertent startup of the plant

Risk of death and injury!

- ▶ Make sure nobody is in the hazard zone before switching on the plant.
- ▶ If there are several people involved in operation of the plant, then they must keep visual contact to each other and discuss each workstep.

The operating software is started with the startup of the plant and is displayed on the control panel.

The start screen is displayed after the controller is started:

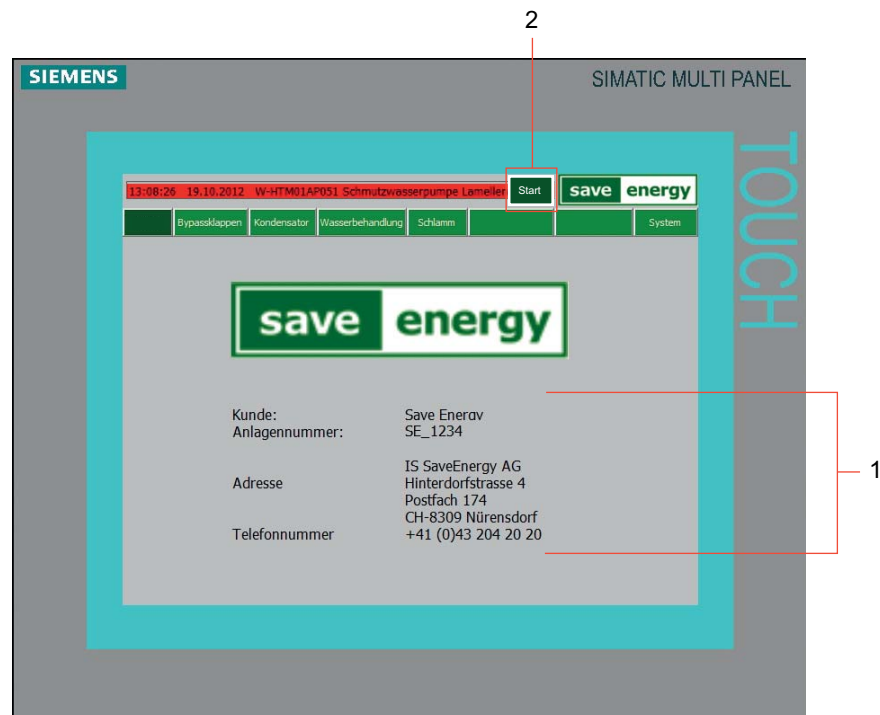


Fig. 42 - Start screen

- 1) Customer information and plant number
- 2) Start button

7.1.1 Login

Operation is password protected to ensure the plant is only operated by authorised persons. There are two password levels.

- Operator
- Administrator (plant manufacturer)

A password prompt is issued before actions are made at the display. If no action is taken at the display for 5 minutes then the display is locked.

7.1.2 Passwords

Passwords are preset by the supplier of the plant.

User password	100
---------------	-----

7.1.3 Adjust program management

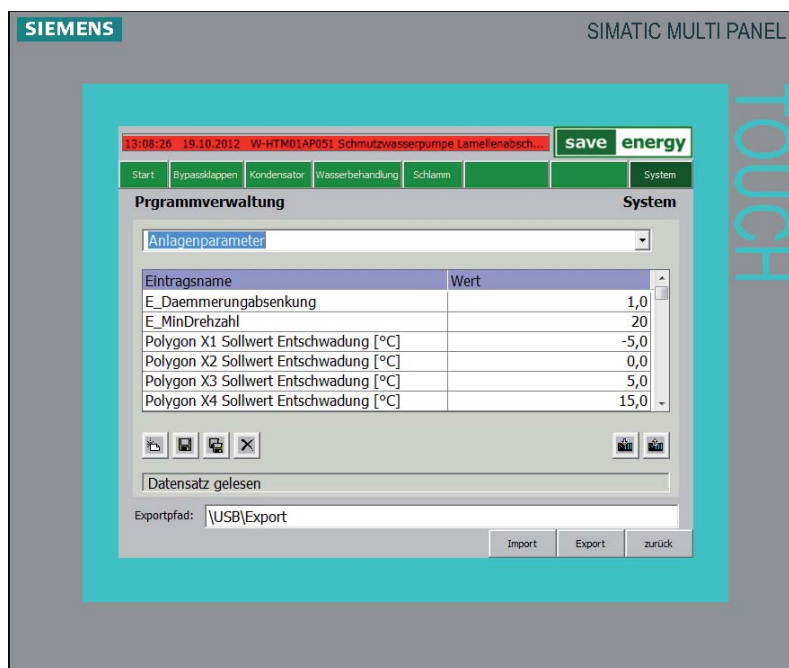


Fig. 43 - Adjust program management

The plant operator does not have to make any adjustments here.

7.2 Operation

7.2.1 Qualifications of personnel

The plant may only be operated by trained personnel. Training or instruction by the manufacturer is mandatory.

7.2.2 Start the plant

Procedure

- ▶ Make sure no alarms are activated. If an alarm is displayed in the report bar then it must first be remedied.

See Chapter «7.4 Troubleshooting» on page 108

If a "B-ALARM" is displayed in the report bar then the function of the plant is not effected. Nevertheless, it is recommended to remedy the cause of this alarm before starting the plant.

- ▶ Start the condenser, the water treatment system, and optional equipment such as the wet electrode precipitator and the devaporiser by activating the "Start" button on the control panel (Fig. 42 - Item.2).
- ▶ Check the messages on the control panel. If an alarm appears then remedy its cause.
- ▶ Continue starting up the plant.
- ▶ The controller checks all releases. If they accord to the specifications then the plant is started up.
- ▶ A signal is transmitted to the flue gas fan and the pumps instructing them to adjust the parameters according to the preset parameters.
- ▶ The flue gas fan speeds up to the value set in the frequency converter.

Once the flue gas fan and the pumps have reached their set values, the bypass flap starts to open in the direction of the condenser. The opening time of the bypass flap is determined by the type of flap drive. Runtimes of 10 s to 150 s are possible.

7.2.3 Automatic operation sequences and description of functions

In automatic mode, there are various sequences that are triggered by the controller.

Bypass flap

Automatic function test

Condenser units

Fresh water feed

Water is fed in the following situations:

- Low level
- High chloride content (>2000yS, specific to the plant; must be determined by manual measurement)
- Low pH value <5.9
- PowerSave.

Emergency cooling

The emergency cooling is connected in the following circumstances:

- Temperatures are too high at the flue gas inlet (>250°C)
- Temperature are too high at the flue gas outlet (>75?)
- The bypass flap is not closed and the process water pump is not in operation or the pressure is too low.

pH control

- The pH value in level 1 process water is determined by a pH sensor. When the pH value <6.5 (controller integrated into the pH pump) then soda lye is added to reach the set target value.

If the process water is alkaline (>8 pH value) then the soda lye must also be replaced by formic acid or light sulphuric acid. However, permission to do this must first be obtained from the plant supplier.

NOTE



Before soda lye is replaced by formic acid or sulphuric acid, permission to do this must be obtained by the plant supplier.

Condenser sequences

Condenser control

- Differential pressure measurement (underpressure) HTD01CP001 («6.5.7 Condenser - Parameters» on page 74).
This controls the speed of the flue gas fan so that the target pressure is always present in the flue gas line on entry. This permits the varying incoming volumes of flue gas from the boiler to be processed.
- Pressure transmitter in distributor pipe, level 1, HTD01CP011/12
The pump controls the pressure in the distributor pipe to the set target value. If pressure control is activated in PowerSave then the controller controls the pressure to within a given bandwidth.
- Pressure transmitter in distributor pipe, level 2, HTD01CP021/22
The pump controls the pressure in the distributor pipe to the set target value. If pressure control is activated in PowerSave then the controller controls the pressure to within a given bandwidth.
- PowerSave («6.5.9 Condenser - PowerSave» on page 78)

Water treatment system unit

- The valve from the condenser to the water treatment system is normally open. It is closed when level HTM01CL111/121 («6.5.14 Water treatment system - Alarm thresholds» on page 87) in the lamella separator is too high or during backflush of the sand filter.
- Return feed pump HTM01AP051 («6.5.12 Water treatment system - Switches» on page 83) starts when the level sensor reports that the level is too high, and stops when the level sensor reports a level that is too low.
- Valve HTM01AA012/022 («6.5.12 Water treatment system - Switches» on page 83) opens to the sand filter when the water level sensor in the condenser HTD01CL102 («6.5.7 Condenser - Parameters» on page 74) reports a level that is too high.
In special cases the valve can also be opened by means of interval control, to force the water to be discharged from the condenser. However, depending on the setting and the operating situation, this may result in an increased consumption of fresh water.
- Additional, optional pumps (sewage conveyor pump or return feed pump to the condenser) are controlled by suspended float switches.

Sludge pump

The feed of compressed air to the sludge pump is controlled by valve HTM01AA11/21. However, the compressed air feed is only activated as long as the level 1 process water pump at the condenser is in operation and the level sensors of the sludge handling do not report a level that is too high.

Backflushing the sand filter

How to backflush the sand filter is described in «6.5.13 Water treatment system - Parameters» on page 85.

7.2.4 Stop operation

Short stop

No special measures have to be taken if operation is stopped for less than 1 week.

Procedure

- ▶ Press the stop button on the control panel to stop the plant.

Long stop

Special measures have to be taken if operation is stopped for more than 1 week.

Procedure

- ▶ Before stopping it, run the plant in bypass mode so that the process water is fed over the water treatment system for cleaning.

Basic setting: 5 h.

- ▶ Press the stop button on the control panel to stop the plant.

Seasonal stop in operation

If there is an even longer stop in operation such as a summer pause, then the plant must be additionally prepared for this stop.

Procedure

- ▶ Discharge the process water via the water treatment system and then refill with fresh water.
- ▶ Press the stop button on the control panel to stop the plant.

7.3 Switch off the plant

When shutting down the plant after operation, the following sequence must be observed:

- Rinse the plant and clean it if required
- Switch off the main switch at the control cabinet if required.

7.4 Troubleshooting



A list of error messages and appropriate measures to be taken is enclosed in the annex.

«12.3 Troubleshooting» on page 146.

8 Maintenance and repairs

8.1 Introduction

To avoid malfunctions and operational outages, regular, preventive maintenance measures are required. These are described in the following section.

 HAZARD	
	<p>During maintenance and repair work: Hazard when switching back on!</p> <ul style="list-style-type: none">• Decommissioning the plant• Set the main switch to «0» and secure it with a padlock! <p>Exception: Lubricating the bearing</p>



8.1.1 Qualifications of personnel

The plant may only be maintained by trained maintenance personnel.

Inspection and maintenance work to the electrical components may only be carried out by a trained, approved electrician.

Assistants may only be used under supervision and control of the maintenance personnel and only for work that they have knowledge of.

 WARNING	
	<p>Unqualified personnel</p> <p>Risk of injury and damage to equipment!</p> <ul style="list-style-type: none">▶ All maintenance activities may only be carried out by trained experts with knowledge of electrical and mechanical systems.

 HAZARD	
	<p>High voltage</p> <p>Risk from electrical energy</p> <ul style="list-style-type: none">▶ Fatal injuries caused by electrical shocks.▶ Remedy loose plug connections. Replace damaged cable.▶ Do not tamper with anything in the vicinity of high-voltage lines.▶ The wet electrode precipitator may only be put out of operation and maintained by trained personnel.

8.1.2 Safety regulations

WARNING



Insufficient qualification of the personnel!

Risk of injury!

- ▶ Only personnel whose qualification accords to the qualification required by the manufacturer for maintenance personnel may carry out maintenance work.

WARNING



Missing instruction!

Risk of injury!

- ▶ Read through the safety chapter in these operating instructions.

«1 Safety instructions» from page 15.

- ▶ Observe all warning and behaviour instructions given to prevent residual risks.

WARNING



Hot surfaces

Risk of burns

- ▶ The supply pipes to the bypass, the bypass flap and the feed line to the condenser are hot. Do not touch. Wear personal protective equipment!
- ▶ Protective gloves must be worn when working in the vicinity of hot surfaces.

8.1.3 Consequences of non-observance of the maintenance and safety instructions

IS SaveEnergy AG does not accept any responsibility for damages to property and injury to persons caused by non-observance of the safety instructions and the correct execution of the work described in the maintenance plan.

Additionally, damages arising from non-usage of original spare parts from IS SaveEnergy AG are also excluded from the warranty should such parts be used.

NOTE



Note on consequences of insufficient maintenance

- Insufficient cleaning may result in heavier wear to the plant or to a reduction in performance of the plant.
- Insufficient lubrication results in damages to the bearings and the guides.

8.1.4 Technical documents

This chapter contains an extract of the most important maintenance instructions for plant components from IS SaveEnergy AG. Specific information on other components are contained in the maintenance documentation of the appropriate manufacturer.

8.2 Auxiliary aids and fuels and lubricants

8.2.1 Special tools, lifting gear and equipment

The following special tools are supplied with the system:

- Litmus paper
- Titration or dipsticks to check the chloride content
- Gauge to check the nozzles

If nuts are placed onto chrome steel screws or threaded bolts then the screws must be treated with appropriate grease to ensure that the nut does not fret. If brass nuts are used then these do not need to be greased.

8.2.2 Lubricants



Unsuitable lubricant!

Risk of damage to the plant!

- ▶ Only use recommended lubricants.
- ▶ Only use other lubricants with the appropriate specifications after consulting with IS SaveEnergy AG.

The table of lubricants is in the enclosure.

See «12.6 Lubricants» on page 152

8.2.3 Cleaning products

WARNING



Excessive foaming caused by unsuitable cleaning agent!

Risk of chemical burns from escaping foam!

- ▶ Only use recommended cleaning agent.

CAREFUL



Incorrect handling of cleaning products!

Risk of injury!

- ▶ When handling cleaning products, always observe the safety recommendations of the manufacturer.

NOTE



For correct dosing, refer to the recommendations of the manufacturer.

NOTE



The terms used in the following for the products are the usual terms used for them in Germany and Switzerland. The same products sometimes have different names in other countries.

See «8.11 Cleaning the plant» on page 126

The table of cleaning agents is in the enclosure.

See «12.5 Data table of operating resources» on page 152

8.3 Maintenance plan

8.3.1 Content of the maintenance plan

The maintenance plan provides an overview of all measures required for maintenance of the components in the system. It shows all required worksteps to be taken after a given time period (interval).

Maintenance work includes:

- Checks
- Cleaning
- Lubrication

NOTE



The maintenance tables are contained in the enclosure, see Chapter «12.2 Maintenance tables» on page 140.

8.3.2 Condenser maintenance plan

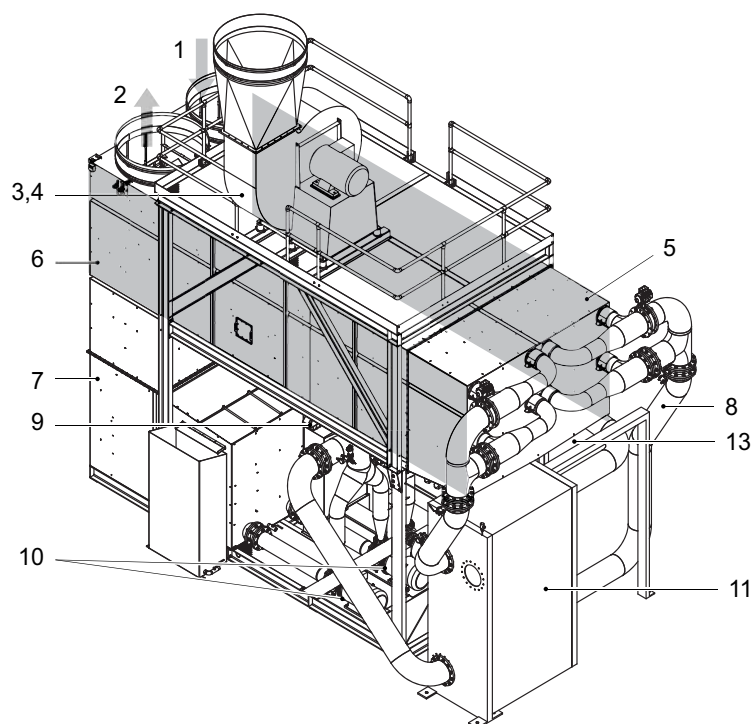


Fig. 44 - Condenser components requiring maintenance

Item	Component	Type of maintenance		
		Inspection	Cleaning	Lubrication
1	Flue gas inlet	x	x	-
	Emergency cooling and fresh water feed	x	x	
	Baffle plates at the flue gas inlet	x	x	-
2	Flue gas outlet to flue gas fan or wet electrode precipitator	x	x	-
	Baffle plates at the flue gas outlet			
3	Flue gas fan	x	x	x
4	Droplet separator (optional)	x	x	-
5	Flue gas inlet side (cooling chamber stage 1)	x	x	-
6	Flue gas outlet side (cooling chamber stage 2)	x	x	-
7	Process water tank	x	x	-
8	Process water piping	x	-	-
9	pH pump	x	x	x
10	Process water pumps	x	x	x
11	Heat exchanger	x	x	-
-	Manual determination of the chloride content and the pH	x	-	-
-	Valves, nozzles	x	-	-
-	Floating switches, sensors	x	x	-

NOTE



The maintenance table for the condenser is contained in the enclosure, see Chapter «12.2.1 Maintenance table - condenser» on page 140.

8.3.3 Water treatment system maintenance plan

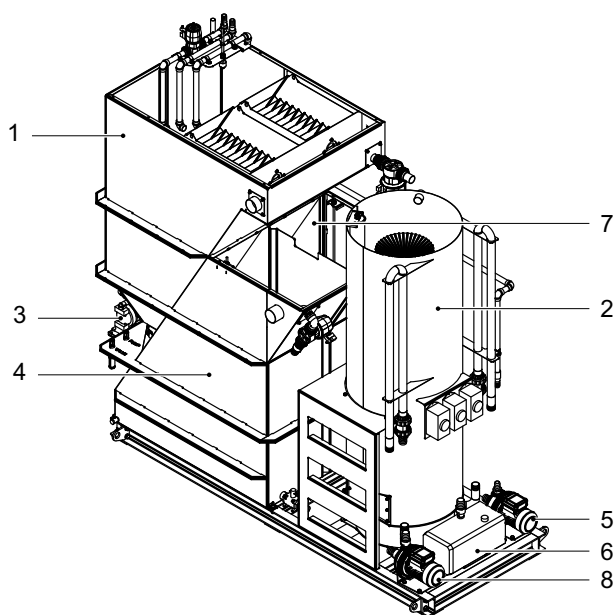


Fig. 45 - Water treatment system components requiring maintenance

Item	Component	Type of maintenance		
		Inspection	Cleaning	Lubrication
1	Lamella separator	x	x	-
2	Sand filter	x	x	-
3	Sludge pump	x	x	-
4	Clear water tank	x	x	-
5	Return flow pump	x	x	-
6	Backflushing compressor	x	x	-
7	Sewage tank	x	x	-
8	Backflushing pump	x	x	-
-	Valves	x	x	-
-	Level sensors	x	x	-
-	Filter sand	x	x	-
-	Compressor intake filter	x	x	-

NOTE



The maintenance table for the water treatment system is contained in the enclosure, see Chapter «12.2.2 Maintenance table - water treatment system» on page 143.

8.4 General maintenance work

8.4.1 Emptying the plant

Procedure

- ▶ Close the return line from the water treatment system to the condenser using the supplied plugs to allow the condenser can be vented.
- ▶ Convey the water from the condenser with an external pump in the water treatment system. The water must not be fed to sewer system uncleaned.



CAREFUL



Risk of damage to plant components!

- ▶ Do not empty using the process water pump to avoid damages caused by a dry run.

8.5 Maintenance work at the condenser

8.5.1 Manually check the pH value and the chloride content

The pH value and the chloride content in the process water must be checked during the inspection. These checks are made to facilitate adjustments and to check the automatic measurements. If the manual measurements agree with the automatic measurements over the course of several checks then the interval for the manual measurement can be extended.

If the basic conditions change then the measurements must be repeated at shorter intervals until operation has once more stabilised.

Replacing the type of fuel

If the fuel type used changes then the chloride content in the condensate must be continuously checked.

The process water should be checked for foaming. When required, small amounts of foam suppressant must be added to the process water.

8.5.2 Checking and cleaning the droplet separator

The lamellas in the droplet separator must be cleaned when there is a loss in pressure of more than 500 Pa. This corresponds to a 50 mm water column on the U pipe display.

Carry out the following to clean the lamellas:

- ▶ Switch the condenser to bypass mode.
- ▶ If necessary, remove the baffle plate.
- ▶ Open the maintenance openings at the droplet separator.
- ▶ Clean the lamellas with a high-pressure cleaner. Water and dirt flow over the discharge and flue gas pipe into the process water container.
- ▶ Check the seals. Damaged seals must be replaced.
- ▶ Close the maintenance opening.

NOTE



Before CIP cleaning (Cleaning In Place), consult with the supplier to prevent damage to the seals.

8.5.3 Inspection and cleaning of the cooling chamber, baffle plates and nozzles

The feed and emergency cooling nozzles must be inspected every month and cleaned as required. Inspection and cleaning can be carried out when the boiler is running in bypass mode (flap towards the condenser is closed).

Take the following steps to check and clean the nozzles:

- ▶ Switch the condenser to bypass mode.
- ▶ Open the maintenance openings at the condenser.
- ▶ Check the nozzles with a gauge
- ▶ Clean the dirty nozzles with a high-pressure cleaner.
- ▶ Close the maintenance opening.

8.5.4 Clean the heat exchanger

The heat exchanger may become blocked in operation. This is noticeable by a drop in pressure over the heat exchanger as well as in the nozzle pipe.

To keep the heat exchanger free of contamination, add 25 kg of citric acid every month to the primary process water container.

If there is more severe soiling then the heat exchanger can be backflushed or cleaned by CIP (Cleaning In Place) (chemical).

8.5.5 Cleaning the control cabinet filter

Clean the air filters in the control cabinet door once per month. The filters can be cleaned from the outside while the plant is in operation. Remove the filter elements and blow off the dust or replace the filter,

8.5.6 Cleaning the process water containers

The process water containers must be cleaned during inspections. Carry out the following to clean them:

- ▶ Switch off the boiler and the condenser.
- ▶ Empty both containers through their front outlets using a pump or an immersion pump. The water must thereby not be directly fed to the sewage system, but must be cleaned and discharged via the water treatment system.
The water must be sucked off before the rear maintenance opening at the condenser is opened.
- ▶ Open the maintenance opening at the rear of the condenser, check the seals and replace any that are defective.
- ▶ Drain/suction off water from both siphons.
- ▶ Free the containers of any deposits using a brush or a high-pressure cleaner.
- ▶ Fill the containers with clean, fresh water. Feeding with softened water is not required, although it can be used.
- ▶ Close the maintenance opening.
- ▶ Check the containers for leaks.

8.5.7 Replacing the nozzles

Carry out the following to replace the nozzles:

- ▶ Switch off the condenser.
- ▶ Allow the plant to cool down and wait until the distributor pipe has emptied.
- ▶ Remove the baffle plates.
- ▶ Enter the plant and replace the nozzles from the inside.

HAZARD



Hazardous gases

Risk of death from asphyxiation

- ▶ Loss of consciousness due to the effects of inhaling monoxides.
- ▶ Only run maintenance work at the interiors under supervision. Always aerate the rooms thoroughly.
- ▶ Allow the flue gas fan to rotate slightly so that the cooling chamber is rinsed by fresh air.

8.5.8 Cleaning and lubricating the flue gas fan

The maintenance opening on the fan housing must be opened to clean the flue gas fan. The impeller must be turned manually fin by fin, allowing it to be cleaned in steps. Brushes or high-pressure cleaners can be used for cleaning.

IS SaveEnergy AG recommends you lubricate the main fan at regular intervals with grease. Details are contained in the operating instructions from the fan manufacturer.

8.6 Maintenance of the bypass flap



HAZARD



Hazardous gases

Risk of death by asphyxiation due to escape or accumulation of flue gases with dangerous components such as COx etc.

- ▶ The flap is not 100% gas tight. Be careful when opening service openings at parts that convey gas.
- ▶ Only run maintenance work at the interiors under supervision. Always aerate the rooms thoroughly.

The bypass flap requires the following monthly maintenance:

- ▶ Drain water from the compressed air water separator.
- ▶ Check the compressed air hoses for any conspicuous bends. Replace if necessary.
- ▶ Remove any solid deposits in the flap.
- ▶ Check the function of the bypass flap.

8.7 Maintenance work at the water treatment system

8.7.1 Lamella separator

The lamellas must be cleaned of deposits with a rod.

- Insert the rod into the lamella, move it to and fro and wipe off the deposits. Clean each lamella in the same way.

8.7.2 Sedimentation tanks

Empty and rinse out the sedimentation tanks. If larger particles cannot be rinsed out then open the small opening at the bottom of the container and empty.

8.7.3 Sand filter

Replacing the sand in the sand filter

The sand in the sand filter is checked during the inspection. If it has to be replaced (reason: clumping or frequent backflushing) then switch off the condenser. The best way to replace the sand is by vacuuming off from the sand filter (sewer cleaning vehicle).

- Clean the sand filter tank and make a visual inspection of the filter nozzles on the ground. If filter nozzles have been damaged by vacuuming or if they are blocked then they must be replaced. You can get new nozzles from IS SaveEnergy AG.
- Once all filter nozzles have been cleaned or replaced: Fresh sand can be filled in. Coarse-grained sand goes to the bottom and fine-grained sand to the top.
- Vacuum off the sand. Fill the sand filter with fresh sand. Rough-grained sand should be at the bottom and finer sand at the top.

Volume of sand

Plant component	Grain size in mm	Amount in kg
W07	0.7 - 1.2	xy
	3.0 - 5.6	xy
W11	0.7 - 1.2	xy
	3.0 - 5.6	xy

8.7.4 Sludge pump

Make sure that the pump is conveying sludge. If the pump is not conveying sludge then the following steps must be taken:

- ▶ Establish the supply of compressed air.
- ▶ Check the suction and pressure line for blockages. Check the hose at the suction and pressure side for blockages by squeezing them. If they are blocked:
 - Close the ball tap
 - Remove the suction and pressure lines
 - Remove the blockage.
- ▶ If the pump is blocked or a diaphragm is defective:
 - Open the pump and remove soiling or replace the diaphragm.

8.7.5 Drain the pressure control valve

The valve labelled "VALVE" controls the air pressure, which is used for all water valves. This pressure controller must be set to 6 bar.

The valve labelled "PUMP" controls the air pressure of the sludge pump. The nominal value of the pressure controller is approx. 3 bar. The suitable pressure settings are contained in the startup log and vary depending on the location of the installation.

Maintenance steps:

- ▶ Check the compressed air hoses for any conspicuous bends.
- ▶ Each pressure controller is fitted with a water separator. The water separator container is emptied by pressing the valve on the floor of the container.
- ▶ Check the pressure.

For pressure specifications, refer to Chapter «3.2 Water treatment system» on page 45

8.7.6 Air compressor

The air filter at the air compressor must be checked and replaced if necessary.

- ▶ Release the wingnuts at the top on the air compressor
- ▶ Remove the air filter cover.
- ▶ Check the air filter cover for wear and replace when necessary.
- ▶ Re-mount the air filter cover.

8.7.7 Replace the filter nozzle

- ▶ Unscrew defective filter nozzles. Screw new filter nozzles back in from the top.

8.8 Maintenance log

Keep a log of all maintenance work. These logs are very important to us as the manufacturer. You should therefore be able to show them to us on request. An example of a maintenance log that you can use as a checklist is contained in the enclosure.

«12.2 Maintenance tables» from page 140.

8.9 Customer service information

If you have any questions then please contact our service department:

IS SaveEnergy AG

Hinterdorfstrasse 4

Postfach 174, Switzerland



Tel: +41 43 204 20 20

Mail: info@saveenergy.ch

Web: www.saveenergy.ch

8.10 Repairs



8.10.1 Qualifications of personnel

 WARNING	
	Insufficient qualification of the personnel!
	Risk of injury!
	Damage to the plant <ul style="list-style-type: none">▶ All repair work on the plant may only be carried out by repair personnel that has been trained by the manufacturer.▶ The valid general safety and work-protection regulations at the place of the installation must be observed.

8.10.2 Damages during operation

- When in constant operation, the plant must be inspected by the operator at least after every 3 days.
- If irregularities or damages (abnormal noises, leaks, etc.) are detected then these must be remedied **immediately**.

If this is not possible then the manufacturer must be informed immediately. The damage, fault or malfunction must be described in as much detail as possible and preferably documented with pictures. The attendant circumstances must also be described.

 CAREFUL	
	Machine damages due to insufficient monitoring or ignoring fault states!
	Expiry of liability claims!
	<ul style="list-style-type: none">▶ Have the machine monitored by qualified personnel for incorrect operation▶ Report any fault states to IS SaveEnergy AG immediately.

8.11 Cleaning the plant

8.11.1 Safety



HAZARD



Wetting of skin and eyes by cleaning products or cleaning solutions. Escape of cleaning solution or foam from the plant.

Chemical and other burns on skin and eyes!

- ▶ Wear protective goggles, gloves and clothing
- ▶ Observe the instructions on the safety data sheets of the individual cleaning products
- ▶ Only have the cleaning process carried out by trained personnel
- ▶ Make sure that there is no-one within the hazard zone during cleaning
- ▶ Observe the safety instructions of the operating instructions
- ▶ Observe the storage regulations of the cleaning products

8.11.2 Basics

Plant cleaning is carried out to remove mineral and organic contamination from the surfaces that touch the product. The frequency of cleaning depends significantly on the characteristics of the flue gas and other operational factors.

NOTE



The plant must always be cleaned immediately after it is shut down.

Depending on the type of contamination, several cleaning steps may be required for a successful cleaning process, and these may include using different cleaning solutions:

8.11.3 Cleaning products / dosing

The cleaning products, settings and dosages are contained in the enclosure.

See «12.5 Data table of operating resources» on page 152

9 Shut down/ decommission the plant



9.1 Introduction

9.1.1 Qualifications of personnel

Decommissioning and storing the plant can be carried out by personnel who have basic mechanical knowledge.

See also Chapter «10 Transport and storage instructions»

9.1.2 Safety regulations

 HAZARD	
	Missing instruction!
	Residual risks!
	<ul style="list-style-type: none">▶ Read through the safety chapter in these operating instructions. <hr/><i>«1 Safety instructions» on page 15.</i><hr/>▶ Observe all warning and behaviour instructions given to prevent residual risks.

9.2 Standstill requirements

9.2.1 Temporary standstill

The plant must be decommissioned in the following order.

- ▶ The plant must be cleaned inside and out. The control cabinet, the control console and the drive units must be protected from splashing water when doing so.

CAREFUL



Use of unsuitable cleaning agent!

Risk of damage to the plant!

- ▶ Do not use a cleaning agent containing chloride.

- ▶ Carry out the due maintenance work (see maintenance schedule).

See Chapter «8.3 Maintenance plan» on page 114

- ▶ Make sure that the plate heat exchanger has been thoroughly rinsed and flushed with water (reduces aging to the seals).
- ▶ Replace the process water by pumping out the process water in the condenser with an external pump from the process water basin and into the water treatment system.

See Chapter «8.5.6 Cleaning the process water containers» on page 120

- ▶ Disconnect the power supply (current, water, compressed air).

Protect the controller and drive units from extreme temperature fluctuations and damp.

NOTE



At the electrical connections, make sure that power is always supplied to the heaters, even when the plant is shut down.

If revisions have to be made or damages are detected. Immediately contact the IS SaveEnergy AG customer service.

Ambient conditions during a standstill

- ▶ As long as the water is in the system, make sure that the ambient temperature does not drop below 1°C.
- ▶ Protect the plant from penetration of hot flue gases.

9.3 Decommissioning

9.3.1 Cleaning

- ▶ The plant must be cleaned inside and out. The control cabinet, the control console and the drive units must be protected from splashing water when doing so.
- ▶ The complete plant must be emptied and the process water must be professionally disposed of or cleaned.

See Chapter «8.5.6 Cleaning the process water containers» on page 120



CAREFUL



Use of unsuitable cleaning agent!

Risk of damage to the plant! Pitting corrosion!

- ▶ Do not use any cleaning agent containing chloride.

9.3.2 Lubrication and rust-proofing

- ▶ Bearing points at the fan must be greased.

9.3.3 Shut down

- ▶ Rinse the complete plant with fresh water until the process water no longer shows any signs of contamination and is clear in colour.
- ▶ After this, clean the complete plant inside and out of contamination/dirt.
- ▶ Disconnect the power supply (current, water, compressed air).
- ▶ If there is a danger of frost, empty the complete plant and water lines or protect from frost. Pay attention to the heat exchanger. Blow out delicate areas with compressed air to make sure that there are no remains of water. Make sure that the water treatment system is cleanly rinsed and has been completely emptied.
- ▶ Protect the controller and drive units from extreme temperature fluctuations and damp.

NOTE



At the electrical connections, make sure that power is always supplied to the heaters, even when the plant is shut down.



CAREFUL



Risk of damage to plant components!

- Remains of process water (concentrations) may result in corrosion.

9.4 Recommissioning

The plant can be put back into service according to the specifications in these operating instructions.

Siehe Kapitel «5 Startup» ab Seite 53.

10 Transport and storage instructions

NOTE



The weights of the heat exchanger, fans and other periphery devices may vary depending on the plant model.

- ▶ Weight specifications are contained in «3 Technical data» on page 42 or on the type plates attached to the components, or available from IS SaveEnergy AG customer service.

10.1 IS SaveEnergy AG customer service

Correct operation and handling, timely remedy of faults, and consultation and training of the operating personnel are of decisive importance in order to receive optimum use of your plant.

The packaging, transport and installation instructions and recommendations contained in these operating instructions must be observed at all times. The local general and legal safety requirements must also be observed. They are of special importance for the economical use of your plant.

The guarantee becomes invalid if the purchaser does not follow the regulations of the factory (packaging, transport and installation instructions as well as operating and maintenance instructions) on the handling of the purchased object.

Furthermore, all damages resulting from the following are excluded from the warranty:

- incorrect packaging, transport and installation
- use of unsuitable operating or cleaning agent and additional units
- non-use of original spare parts from IS SaveEnergy AG.

The guarantee is based on the sales contract and our general terms of delivery.

Contact data

IS SaveEnergy AG

Hinterdorfstrasse 4

Postfach 174

CH-8309 Nürensdorf, Switzerland

Telephone: +41 43 204 20 20



10.2 Packaging and transport

10.2.1 Qualifications of personnel

Personnel with electrical and mechanical knowledge is required to prepare the plant for transport and to install the machine.

For packaging and transport of the plant, mechanical knowledge as well as knowledge of methods of transport (securing heavy loads, vibrations, etc.) is sufficient, as well as observation of the special instructions in this chapter.

10.2.2 Safety regulations

 HAZARD	
	Missing instruction!
	Risk of injury!
	▶ Read through the safety chapter in these operating instructions.
	<i>See «1 Safety instructions» on page 15</i>
	▶ Observe all warning and behaviour instructions given to prevent residual risks.
▶ Please observe that the plant has a one-sided load bias.	
▶ Switch off the power, air and water to prepare the installed machine for transport.	
▶ Observe the local safety instructions and the floor loads.	

10.2.3 Packaging

Preparatory measures

- ▶ Close the maintenance openings Seal the remaining openings off from dust and penetration of dirt.
- ▶ Switch off and disconnect the power, air and water.
- ▶ Observe the installation instructions. Disassemble in reverse order to the installation.

See «4.5 Erecting the plant» on page 48 and «4.6 Installing the plant» on page 50.

- ▶ Preparing for transport «4.5 Erecting the plant» (proceed in reverse order).

Selecting the packaging

Standard packaging



Plant components covered with tarpaulin. Accessories packaged in boxes, wooden crates and drums.

Packaging for overseas transport

Plant must be packaged in a box with 2 protective rails and control console. Accessories stored in boxes, wooden crates and drums within a 20' container. Openings closed airtight with cling foil to prevent penetration of sea water.

Packaging procedure

In addition to general considerations such as due diligence, water protection, fixing in place, etc., the following points must be particularly observed:

 CAREFUL	
	<p>Unprofessional transport!</p> <p>Risk of damage to the plant!</p> <ul style="list-style-type: none">▶ Only use lashing belts for transport. Wear to the chains may cause corrosion on the chrome steel.

- ▶ Package the control cabinet in plastic.
- ▶ Secure pipelines and valves from vibrations.
- ▶ Pack the touchscreen in a box using shock and vibration absorbing material.
- ▶ Pack all sensors and sensitive components into separate boxes.
- ▶ Seal-off and reinforce (stiffen) the overseas packaging of the plant. Otherwise, boxes may be pressed together when being attached.

10.2.4 Transport

Method of transport

All common transport methods can be used to transport the plant. Transport dimensions must be observed.

The following should be observed to prevent transport damages:

Transport by rail

- ▶ The plant should preferably be packed into boxes or completely in tarpaulin.
- ▶ Packages containing accessories should preferably be packaged in containers or boxes.

Sea transport

- ▶ Only using overseas packaging.

Intermediate storage

To prevent storage damages: Intermediate storage of the plant and accessories in a dry warehouse.

Reloading, transshipping and unloading

HAZARD



Suspended loads.

Risk to life!

- ▶ When transporting with a crane or other transport aids, always secure the load against slippage.
- ▶ Always observe local applicable safety instructions regarding hooking-on and transport of loads!
- ▶ Use lifting gear, load-carrying equipment and sling gear with sufficient bearing capacity.
- ▶ Do not twist ropes and belts.
- ▶ Cable eye stiffeners, beackets, attachment rings and other suspension links on the load hook must be able to move freely.
- ▶ Do not lift the load above persons.
- ▶ Observe the accident-prevention regulations.

CAREFUL



Incorrect position of support cable during crane transport.

Risk of damage to plant components!

- ▶ Strap down loose parts.
- ▶ Never lift devices at their line connections or studs!

CAREFUL



Incorrect position of the plant during transport.

Risk of damage!

- ▶ Observe the correct horizontal position of the plant when transporting with a crane!
- ▶ Only use lashing belts for transport. Wear to the chains may cause corrosion on the chrome steel.
- ▶ Only use defined eyebolts and wide belts to ensure the plant is not dented when wrapping on the belts.
- ▶ Always use wooden shims when moving plant components. To prevent dents, never place the shims in the middle of hoods or piping packages.
- ▶ Be aware of any protruding flanges to ensure they are not damaged during transport or when shimming components.

10.2.5 Crane transport

Condenser

The following methods of suspension can be used for crane transport:

Attach crane eyes or eyebolts to the base frame (see below for the position). Fix hoisting slings to the eyes and connect with a brace to the crane hook to ensure the belts do not cause any denting in the thin housing structure.

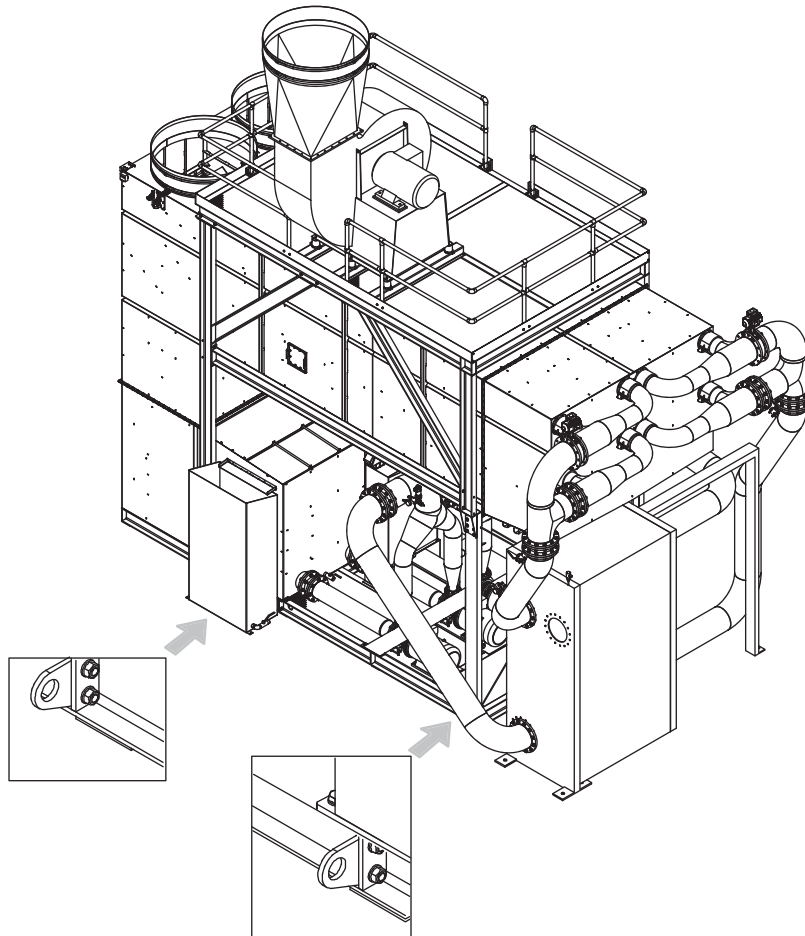


Fig. 46 - Transport points at the condenser. Example of crane eyes.

Water treatment

Attach crane eyes or eyebolts to the base frame (see below for the position). Fix hoisting slings to the eyes and connect with a brace to the crane hook to ensure the belts do not cause any denting in the thin housing structure.

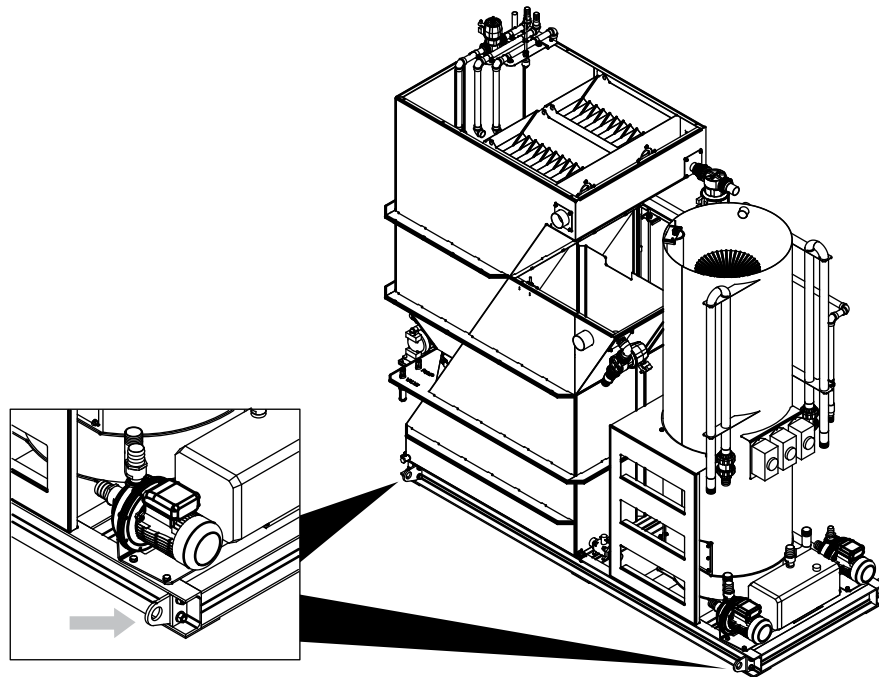


Fig. 47 - Transport points of the water treatment system. Example of crane eyes.

HINWEIS



Further detailed information about transporting supplied parts such as the gas flue fan, process water pumps and plate heat exchangers etc. is contained in the relevant manufacturer's documentation.



11 Instructions for disposal

11.1 Introduction

11.1.1 Qualifications of personnel

Basic mechanical knowledge is sufficient for disposal of the plant.

11.1.2 Safety regulations

 HAZARD	
	Missing instruction!
	Residual risks!
	▶ Read through the safety chapter in these operating instructions. <hr/> <i>See «1 Safety instructions» on page 15</i> <hr/>
	▶ Observe all warning and behaviour instructions given to prevent residual risks.

11.2 Disposal locations, agencies

11.2.1 Regulations issued by the legislator

The various materials must be disposed of compliant with the local regulations.

11.2.2 Reporting to the manufacturer

Decommissioning and/or disposal must be reported to the manufacturer.

12 Enclosure

The following is located in the enclosure:

Regulations / Declarations

«12.1 EC declaration of conformity» on page 139.

Maintenance tables / reports

«12.2.1 Maintenance table - condenser» on page 140.

«12.2.2 Maintenance table - water treatment system» on page 143.

Troubleshooting

«12.3 Troubleshooting» on page 146.

Schematics / lists

«12.4 R & I schematics» on page 147.

«12.5 Data table of operating resources» on page 152.

«12.6 Lubricants» on page 152.

12.1 EC declaration of conformity

In accordance to Machinery Directive 2006/42/EC

In accordance to the Low Voltage Directive 2006/95/EC

In accordance to the Directive on Electromagnetic Compatibility 2004/108/EC

We hereby declare that the product designated in the following accords in its design and construction type, as well as in the configuration in which we have put it onto the market, to the basic safety and health requirements of EC Directive 2006/42/EC. This declaration becomes invalid if any changes are made to the product or its components that have not been discussed and agreed upon with us.

Product: Plant for heat recovery and flue gas cleaning

Components: Condenser
Bypass flap (optional)
Water treatment system
Wet electrode precipitator (optional)
Sludge handling (optional)
Devaporiser (optional)

Year of construction: 2012

Manufacturer: IS SaveEnergy AG
Hinterdorfstrasse 4
Postfach 174
CH-8309 Nürensdorf, Switzerland

The following standards were applied in the design and construction of the product:

EN ISO 12100:2010	Standard on "Safety of machines".
EN 954-1:1996	Safety of machinery – Safety-related parts of control systems - Part 1: General principles for design.
EN 50110-1:1996	Operation Of Electrical Installations.
EN 60204-1:2006	Safety of machinery – Electrical Equipment of Machines - Part 1: General requirements.
EN 61000-6-2:2006	Electromagnetic Compatibility (EMC) - Part 2: Generic standards - Immunity for industrial environments (IEC 61000-6-2:2005)
EN 62079:2001	Preparation of instructions - Structuring, content and presentation.

Nürensdorf, 1. December 2012

Roger Stahel, CEO



Marco Baumgartner, CTO
(Responsible for documentation)



12 Enclosure

12.2 Maintenance tables

12.2.1 Maintenance table - condenser

Complete solution for heat insulation and flue gas cleaning

Condenser

save energy

Components	Maintenance and repairs	D	W	3M	6M	Y
HTC01AN001_Radial fan Impeller	The impeller must be inspected immediately when <ul style="list-style-type: none"> the permissible thresholds are exceeded there are changes in the running noise Check the impeller every 5000 h and at least 1x per year for changes (cracks, geometrical changes, state of balance, wear and caking). The check can be made, i.e. as a non-destructive crack test. Fans subject to high dynamic loads must be checked in acc. to the additional agreement (maintenance plan) within the set intervals (see Fan operating instructions).					x
Shaft seal	The sealing rings must be checked and replaced if the sealing gas consumption or leakage increases.					x
Shaft grounding	The shaft seal must be checked regularly for correct function depending on the operating conditions; the contacts must be replaced when necessary.					x
Motor	Check for any unusual noise during operation and for smooth running; remove dust deposits when necessary Tighten screws and check the bearing	x		x		
Motor terminal box	Check the motor and renew the bearing when applicable; refer to the maintenance plan of the manufacturer					x
Monitoring and auxiliary connections	Clean the insides; tighten the screws Determine the measured data Function check	x				x
Compensators	Check at regular intervals and when required if processes are changed					
Fan, complete	Check; retighten screws when necessary and replace if worn Check for unusual noises during operation and for smooth running Check impeller, motor bearing, shaft seal, compensators for wear and mend or replace as necessary		x			x
HTD0xCT0xxx_Temperature sensor	Function check; replace if necessary					x
HTD01AA00x_Valves	Function check; replace if necessary					x
HTD01AA001_Flap	Function check; replace if necessary					x
HTD01AA311_Ball tap	Function check; replace if necessary					x
HTD01AC002_Plate HE	Clean the heat exchanger (pressure < 1.5 bar) without disassembling it (see heat exchanger operating instructions)					x
	Clean the heat exchanger after disassembling it if it cannot be cleaned without being disassembled (see heat exchanger operating instructions)					x
	Check heat exchanger for leaks, especially at the water connections.		x			x

Maintenance work
carried out on: _____

Responsible person: _____

1/3

Fig. 48 - Condenser maintenance table, page 1/3

Complete solution for heat insulation and flue gas cleaning		Condenser				save	energy
HTD01AT001_Droplet separator	Soluble and porous deposits can normally be removed by targeted spraying off. Crystalline and solid deposits can be removed using high-pressure cleaners. Any remaining deposits can be removed using a suitable tool (e.g. plastic scrapers) The special rigidity and ductility of plastic lamellas must be considered.						
HTD01AP01.1-12_Process water pumps							
Shaft seal	Check the pump for leakages and unusual noises.		x				
Motor	Check for any unusual noise during operation and for smooth running; remove dust deposits when necessary Tighten screws and check the bearing		x				x
Motor terminal box	Check the motor and renew the bearing when applicable; refer to the maintenance plan of the manufacturer						x
HTD01BNxxx_Nozzles	Clean the insides; tighten the screws						x
HTD01CLxxx_Floating switches	Check for wear Function check; replace if necessary Cleaning				x		
HTD01CP001_Differential pressure	Function check; replace if necessary Clean the measuring hose						x
HTD01CP5xxx_Manometer	Function check; replace if necessary						
HTD01CPxxx_Manometer pressure sensors	Function check; replace if necessary						x
HTS01AP051_PH pump	Function check; replace if necessary Test / compare Ph value with measuring strips						x

Maintenance work
carried out on: _____

Responsible person: _____

Fig. 49 - Condenser maintenance table, page 2/3

Complete solution for heat insulation and flue gas cleaning		Condenser					save energy
General	Check the general plant infrastructure: make sure stairs, ladders, platforms and railings are undamaged and fixed in place.						x
	Check the electrical equipment: damage and safe laying of cable, defective covers.					x	
	Check the compressed air: hoses are laid safely and are not bent/twisted or damaged.					x	
	Check the hydraulics: hoses are laid safely and are not bent/twisted or damaged.					x	
	Check the screw connections and the welded joints for corrosion and correct fixture.						x
	Check the control panel for alarms		x				
	Check the function of the chemical handling. Order the required chemicals in a timely manner to prevent faults.			x			
	Check the chloride content of each process water container. The chloride content must not exceed 150 ppm			x			
	Check the system pressure at the central pipe of the distributor pipe. The minimum permissible pressure is 1.5			x			
	Check the air filter in the control cabinet. Clean when necessary				x		
	Lubricate the bearing of the fan and the pumps if they have lube nipples						x
	Clean the condenser						x
Detailed information is contained in the documents of the respective components !!							

Maintenance work carried out on: _____ Responsible person: _____ 3/3

Fig. 50 - Condenser maintenance table, page 3/3

12.2.2 Maintenance table - water treatment system

Complete solution for heat
insulation and flue gas cleaning

Water treatment

save energy

Components	Maintenance and repairs	D	W	3M	6M	Y
HTM01A0xx_Valves	Function check; replace if necessary					x
HTM01AA311_Ball tap	Function check; replace if necessary					x
HTM01AA731_Backpressure valve comp	Function check; replace if necessary					x
HTM01AN031_Compressor	Check piping and screw connections for leaks and tight seating and re-seal/re-tighten when applicable Check terminal box and cable inlet openings for leaks and re-seal when applicable.			x		
	Clean the control valve, ventilation slots of the machine and the motor cooling fins			x		x
HTM01AT131_Suction filter comp	Clean / replace filter cartridges				x	
HTM01AP0x1_Diaphragm pump	Remove, clean the inside parts and replace if necessary	x				x
HTM01AP041-SF backflush pump	Check the sludge pump for leaks Clean and check condition				x	
HTM01AP051_Return feed pump	Check motor for leakages Clean and check condition	x			x	
HTM01AP071_Condensate pump	Check motor for leakages Clean and check condition	x			x	
HTM01CLxxx_Suspended float switches	Check motor for leakages Function check; replace if necessary	x				
HTM01CLxxx_Mini float switches	Clean Function check; replace if necessary			x	x	
HTM01CP51x_Pressure reduction valve	Clean Recommended cleaning of the containers and inspection openings made of polycarbonate with an alkaline solution (soap suds). Do not use any solvents Blow out the water from the two compressed air water separators			x		
HTM01KA0x1_Anti-vacuum valve	Function check; replace if necessary					x
HTM01KTx31_Filter sand	The sand should be loose and easily churned					x

Maintenance work
carried out on: _____

Responsible person: _____

1/2

Fig. 51 - Water treatment system maintenance table, page 1/2

Complete solution for heat insulation and flue gas cleaning		Water treatment					save energy	
General	Check the general plant infrastructure: make sure stairs, ladders, platforms and railings are undamaged and fixed in place.							x
	Check the electrical equipment: damage and safe laying of cable, defective covers.						x	
	Check the compressed air: hoses are laid safely and are not bent/twisted or damaged.						x	
	Check the hydraulics: hoses are laid safely and are not bent/twisted or damaged.						x	
	Check the screw connections and the welded joints for corrosion and correct fixture.							x
	Check the control panel for alarms			x				
	Check the water treatment system for leaks and unusual noises from the pumps			x				
	Check the water levels in the containers: - The lamella separator containers must be full during normal operation of the condenser. - The water level in the sand filter should always be at the same level as the discharge to the condensate tank as long as the backflush is not running or about to be run. - The rinse container is normally empty except when backflushing is running					x		
	Check the function of the sand filter and other components of the water handling system by means of a manual backflush procedure						x	
	During annual inspections or revisions, the lamellas of the lamella separator should be cleaned by a high-pressure cleaner							x
Detailed information is contained in the documents of the respective components !								

Maintenance work carried out on: _____ Responsible person: _____ 2/2

Fig. 52 - Water treatment system maintenance table, page 2/2

save energy

Detailed information is contained in the documents of the respective components !!

Responsible person: _____

1/1

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12.3 Troubleshooting

No.	Report	Measure

12.4 R & I schematics

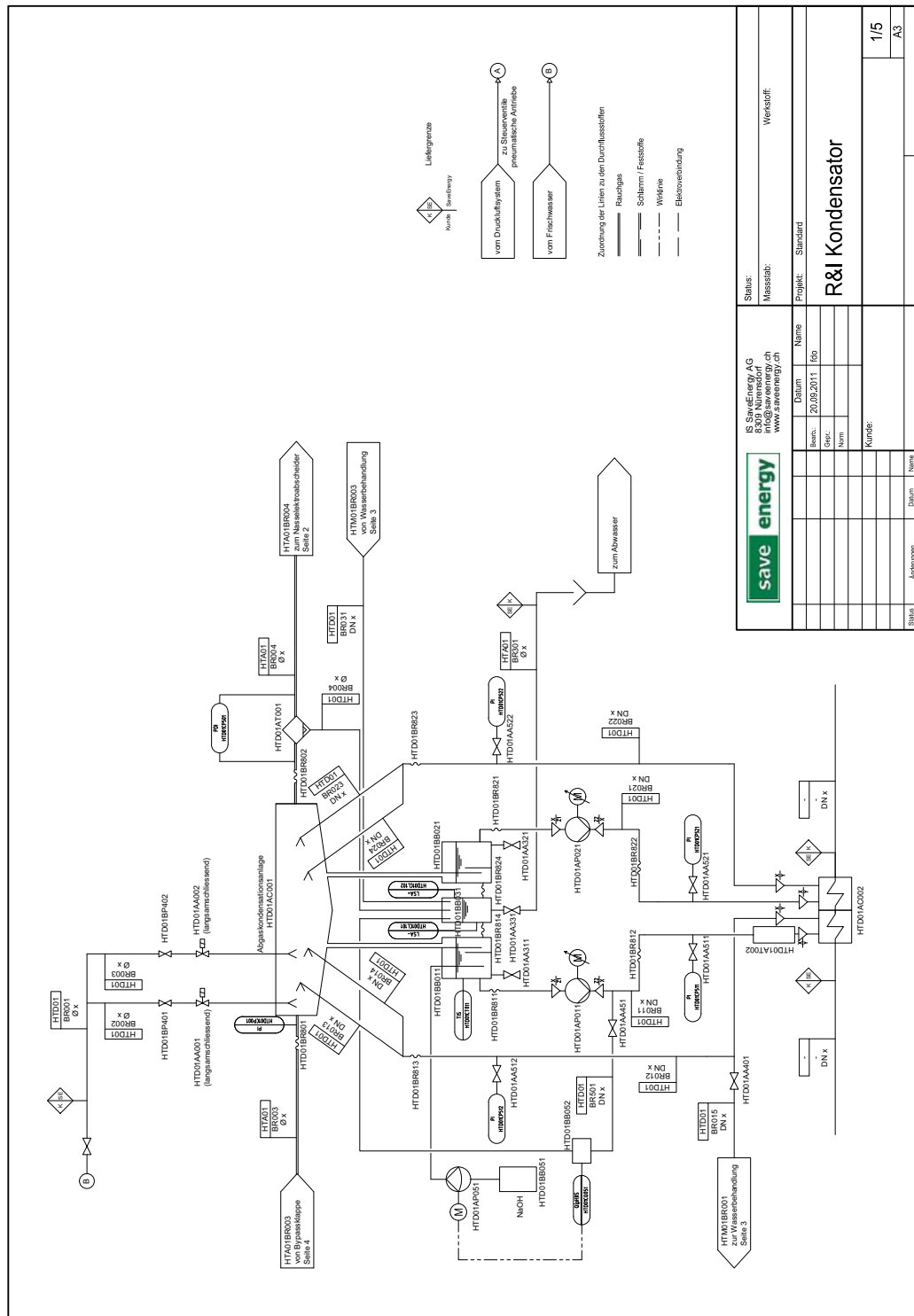
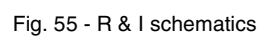


Fig. 54 - R & I schematics



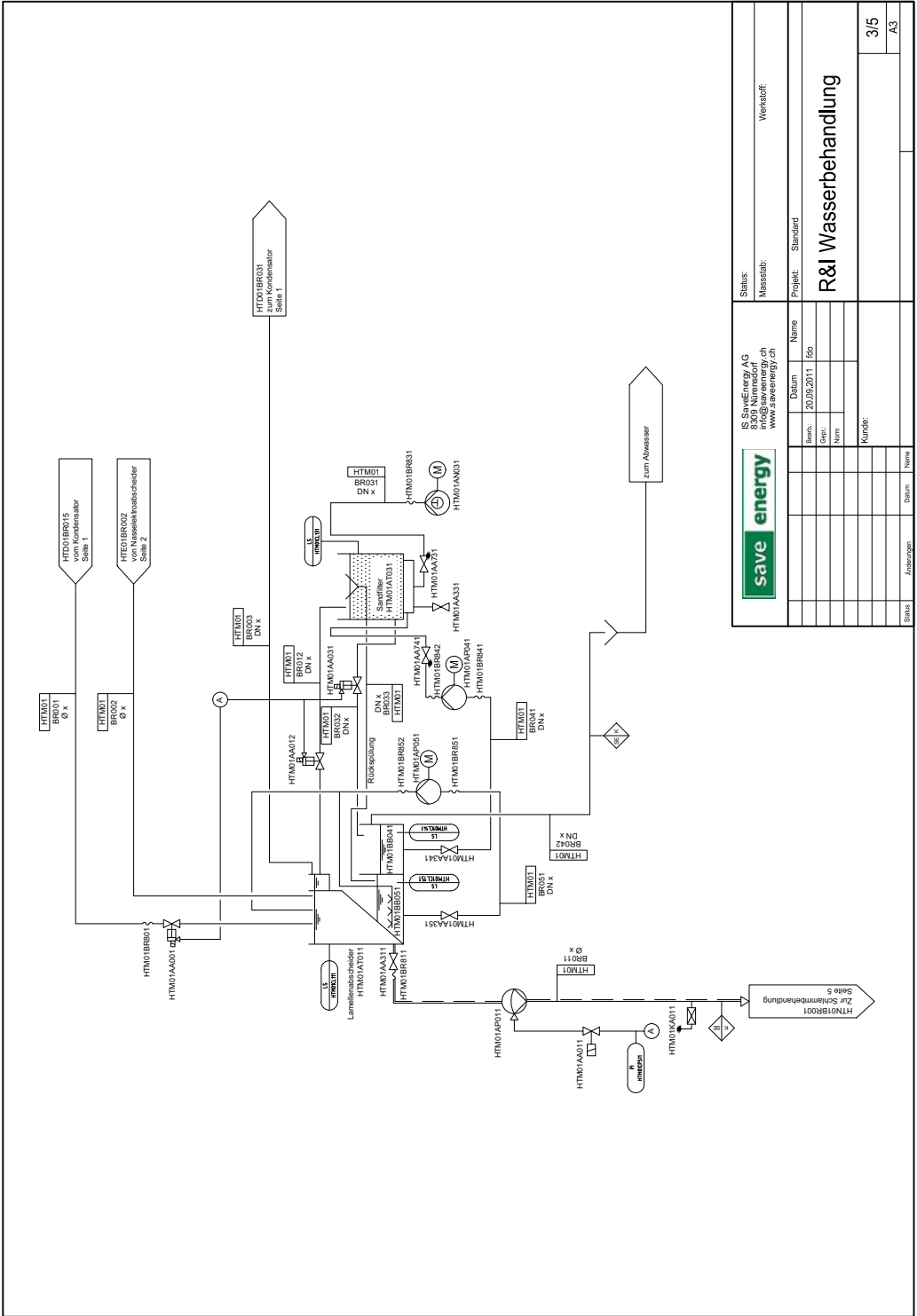
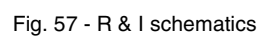


Fig. 56 - R & I schematics



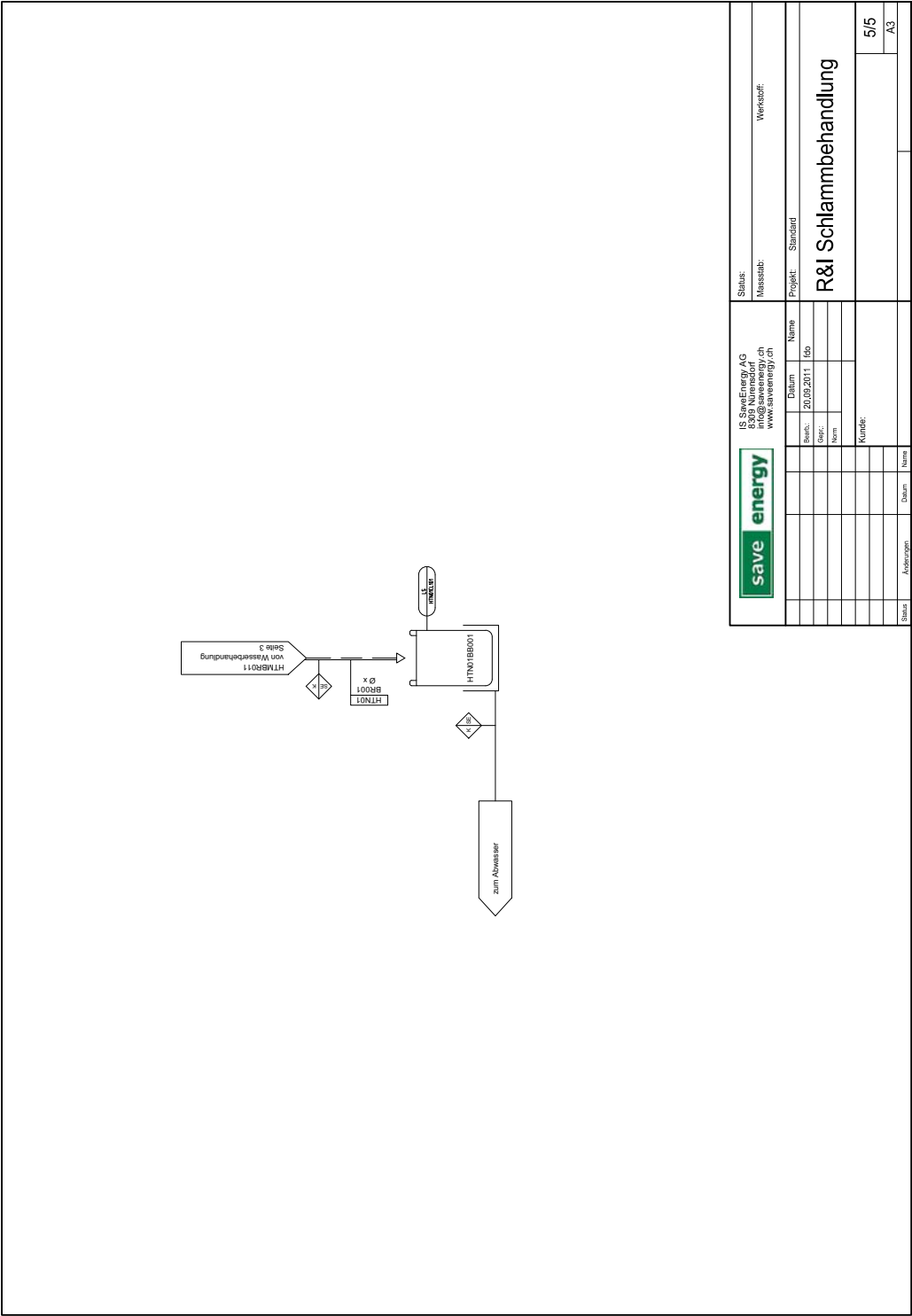


Fig. 58 - R & I schematics

12.5 Data table of operating resources

Product:	Exact name of product
Citric acid monohydrate BP 25kg sack	Citric acid monohydrate
Chloride test kit	Viso Orig.-Best. Chhlorid CL500/Pappe A.No.:915004
Chloride measuring strips	Viso Orig.-Best. Chhlorid CL Titrator Strips, type 1175
Soda lye 30% UN 1824 Sodium hydroxide solution 8, II (E)	Soda lye >= 5%
pH-Fix 6.0-7.7	
Filter sand	Quartz sand (0.7-1.2 mm); Quartz sand (3.0 - 5.6 mm);
Antifoam agent	Drewplus 2100 EFG

12.6 Lubricants

Product	Exact name of product

IS SaveEnergy AG

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CH-8309 Nürensdorf

Phone +41 43 204 20 20

info@saveenergy.ch