Strom. Wärme. Innovation.

Operating and installation Manual

A-TRON E12/30, E15/34, E20/43, E21/46
A-TRON Vario 12/30, 15/34, 20/43, 21/46
A-TRON Öko Plus 18/40

CE	A-TRON Blockheizkraftwerke GmbH Otto-Lilienthal-Str. 14 31535 Neustadt am Rübenberge	2nd Edition	September 2020

Subject to modification

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1. General information

1.1. A-TRON Blockheizkraftwerke GmbH

Since 2009 A-TRON is successfully developing & producing innovative Mini-Combined heat and power plants (CHP) from 5 to 80kW (el.).
The highly intelligent technology is helping medium sized and also bigger public and commercial properties, like hotels, residential complexes and nursing homes, to a much better economy balance and energy savings.
With inexpensive gas, which will be used for the boiler too, cheap electricity will be produced in use for the property.
The produced CHP heat will be used for the heating circuit.

On request A-TRON can offer “ready to use” heating center (boiler, fresh water, CHP, hydraulics, exhaust gases, electricity), together with qualified sub-contractors and takes over the complete applications (promotion application, BAFA, costums, gas applications, network registration). We will gladly advice you individual and personal.

With constant developments, we are satisfying the wishes of our customers. We offer different CHP models for the use with natural gas, liquid gas or biogas.
For this innovative work, A-TRON was assigned with the founder award “Plug & Work”.

1.2. The principle of cogeneration

Cogeneration plants use an internal combustion engine to drive a generator that generates electrical power. The resulting waste heat is used as heating energy (as shown in **Figure 1: Principle of cogeneration**). Such cogeneration plants are also referred to as combined heat and power (CHP) plants.

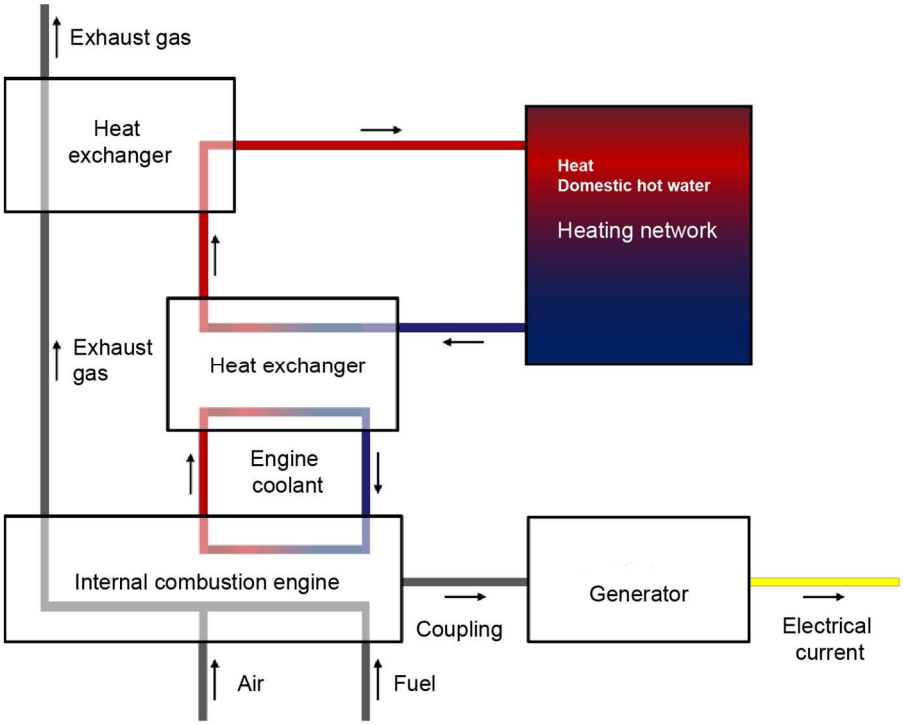


Figure 1: Principle of cogeneration

Cogeneration enables decentralised generation of heat and electricity. Although it has been in use for decades, the technology based on it has only been used to a limited extent.

The decisive step forward is the innovative control system. CHP plants with static control only adapt moderately to the change in demand parameters. Thanks to dynamic control modules, the CHP plant adapts to different load specifications. The CHP plant converts the energy contained in the gas fuel with an efficiency of almost 100 %. This enormously increases energy efficiency in the combined heat and power supply of medium-sized properties.

It can be used in buildings with an annual electricity consumption of approx. 60,000 kWh or more and an annual fuel consumption of approx. 150,000 kWh or more. These include, for example, residential complexes from approx. 18 residential units, accommodation facilities, nursing homes and senior citizens' homes, commercial properties with heating and cooling requirements, communal facilities, churches, etc.

2. Basic information

2.1. Copyright and reservation of rights

These operating instructions essentially contain information on the structure, function, assembly, commissioning, operation and maintenance of your cogeneration plant. All appendices are integral parts of the operating instructions.

Your cogeneration plant has been built in accordance with recognised safety regulations. However, improper use may endanger persons or cause damage to property.

2.2. Warranty

Non-compliance with the operating instructions shall invalidate the warranty, as shall any modification or repair to the plant without the prior written consent of A-TRON. Furthermore, A-TRON shall not be liable for damage or accidents caused by improper handling, excessive strain or force majeure.

In principle, the "Standard terms and conditions of delivery" of A-TRON apply. A-TRON grants a warranty / guarantee of 12 months on its combined heat and power plants starting from the respective commissioning date or at the latest 3 months after the delivery date.

The following conditions must be met in order for the warranty to be approved:

- All major customer services during the warranty period are carried out exclusively by A-TRON or a specialist company approved or authorised by A-TRON.
- If the plant is not put into operation within 3 months of delivery and/or notification of readiness for dispatch, a subsequent application of corrosion protection shall be necessary and must be paid for.
- The plant is not allowed to be operated beyond the maximum rated power, which is indicated for the respective type on the technical data sheet.
- The plant must not be operated with defective or improperly installed safety and monitoring devices.
- Gas engine oil approved by A-TRON must be used as engine oil. For further information, see the "Operating materials" chapter.
- The owner is not allowed to make any technical changes to the plant.
- Only genuine spare and wear parts are allowed to be used for repairs.

2.3. Liability

A-TRON is only liable for direct personal injury and damage to property on the basis of the applicable product liability law if the plant is used for the purpose prescribed in the operating instructions or for the contractually agreed use.

A-TRON shall not be liable for compensation for damage that has not occurred to the plant itself (loss of use, loss of production and profit as well as other direct or indirect losses).

2.4. Responsibilities of the owner

The CHP plant was designed and built taking into account a risk assessment and after careful selection of the harmonised standards to be complied with and other technical specifications. It thus corresponds to the state of the art and guarantees a maximum of safety.

However, this safety can only be achieved in operational practice if all necessary measures are taken. It is the duty of care of the owner of the plant to plan these measures and to check they are carried out.

In particular, the owner must ensure that

- the plant is only used for its intended purpose
- the plant is only operated in perfect, functional condition and the safety devices in particular are regularly checked for their functionality
- the necessary personal protective equipment is available to the operating, maintenance and repair personnel, and is used
- the operating instructions are always available in a legible condition and complete at the place of use of the plant
- only sufficiently qualified and authorised personnel operate, maintain and repair the plant
- this personnel is regularly instructed in all applicable questions of occupational safety and environmental protection and is familiar with the operating instructions and in particular with the safety instructions contained therein
- no safety and warning notices attached to the plant are removed and all of them remain in a legible condition
- a risk assessment (within the meaning of Article 5 of the Occupational Health and Safety Act) is carried out to determine the other hazards arising from the special working conditions at the location where the plant is to be used
- all further instructions and safety instructions resulting from the risk assessment of the workplaces at the plant are summarised in one operational instruction (in the sense of Article 6 of the Work Equipment Usage Ordinance).

2.5. Standards and directives

The plant has been designed and built in accordance with the currently valid technical rules and recognised safety regulations. The basic safety requirements, standards and guidelines were applied in the design of the plant.
The safety of the plant is documented by the declaration of conformity.

All safety data refers to the currently valid regulations of the European Union. In other countries, the applicable laws and regulations must be observed. In addition to the safety instructions in these operating instructions, the accident prevention regulations for power-operated working machines as well as the generally applicable regulations for environmental protection must be observed and adhered to.

Instructions, ordinances and laws

2006/42/EC	EC Machinery Directive
2006/95/EC	Low-Voltage Directive
2004/108/EC	Directive on Electromagnetic Compatibility
BImSchv	German Federal Immission Control Ordinance
MFeuVo	Model firing ordinance of the federal states FeuVo

Fundamental standards

DIN EN ISO 60204-1	Safety of machinery; Electrical equipment of machines
DIN EN ISO 12100	Safety of machinery; Basic concepts, general principles for design
DIN EN ISO 13857	Safety of machinery; Safety distances to prevent hazard zones being reached by upper and lower limbs
DIN EN ISO 13850	Safety of machinery; Emergency stop function - Principles for design
DIN EN ISO 13732	Ergonomics of the thermal environment; Methods for the assessment of human responses to contact with surfaces
DIN EN 547	Safety of machinery; Human body measurements
DIN EN 574	Safety of machinery; Two-hand control devices
DIN EN 614	Safety of machinery; Ergonomic design principles
DIN EN 626	Safety of machinery; Reduction of risk to health from hazardous substances emitted by machinery
DIN EN 894	Safety of machinery; Ergonomics requirements for the design of displays and control actuators
DIN EN 953	Safety of machinery; Guards - General requirements for the design and construction of fixed and movable guards
DIN EN 981	Safety of machinery; System of auditory and visual danger and information signals

DIN EN 1037	Safety of machinery; Prevention of unexpected start-up
DIN EN 1127-1	Explosive atmospheres; Explosion prevention and protection, Part 1: Basic concepts and methodology
DIN EN 12828	Heating systems in buildings - Design of hot water systems (replacement for DIN 4751)
DIN EN 12831	Heating systems in buildings
DIN EN 13849	Safety of machinery; Safety-related parts of control systems
DIN EN 14336/2005	Heating systems in buildings
DIN EN 14868/2003	Protection of metallic materials against corrosion
DIN EN 60529	Degrees of protection provided by enclosures (IP Code)
DIN EN 61310-2	Safety of machinery; Indication, marking and actuation, Part 2: Requirements for marking

Product-dependent standards

ISO 8999	Reciprocating internal combustion engines, graphical symbols
DIN EN ISO 13407	Human-centred design processes for interactive systems
DIN EN ISO 6826	Reciprocating internal combustion engines, fire protection
DIN ISO 8528 ff.	Reciprocating internal combustion engine driven alternating current generating sets
DIN EN 1679-1	Reciprocating internal combustion engines; safety, Part 1: Diesel engines
DIN EN 12601	Reciprocating internal combustion engine driven alternating current generating sets; safety
DIN 1988	Codes of practice for drinking water installations (TRWI)
DIN 3380	Gas pressure regulators for supply pressures up to 100 bar
DIN 3386	Gasfilters having a maximum working pressure of less or equal to 5 bar - Requirements and testing
DIN 3398-3	Pressure cut-off switches for gaseous substances; requirements and testing
DIN 4751	Safety requirements for heating installations with flow temperatures up to 110 °C → replaced by DIN EN 12828
DIN 6280-14	Generating sets; Reciprocating internal combustion engines driven generating sets, Part 14: Combined heat and power system (CHPS) with reciprocating internal combustion engines; basics, requirements, components, application and maintenance

Other basic regulations

BGV A8	Safety and health marking at the workplace
TRF 1996	Technical rules for liquid gas
ATV – Worksheet A251	Introduction of condensation water from gas and oil-operated firing plants in public sewage and small-scale water treatment plants (edition Nov. 1998, GFA Verlag für Abwasser, Abfall und Gewässerschutz)
VDI 2035	Water treatment for heating systems

2.6. Notes on the representation of symbols and signal words

DANGER

Warning of personal injuries that are already acute at the moment of the warning.

Warning of dangerous situations which, if not avoided, will result in serious injury or death.

WARNING

Warning of personal injuries that depend on behaviour.
Warning of dangerous situations which, if not avoided, can result in serious injury or death.

CAUTION

Warning of damage to property which cannot result in personal injury.
Warning of dangerous situations which, if not avoided, could result in minor to moderate injury.

IMPORTANT

Provides information on how to avoid damage to property or misuse.
Draws attention to possible damage to property and other important information.

NOTICE

Information about the handling of the machine and activities to be carried out on or with it.

2.7. Service addresses

A-TRON Service GmbH
Otto-Lilienthal-Str. 14
31535 Neustadt a. Rbge.
Tel. +49 (0) 5032 91 294-0
Fax: +49 (0) 5032 91 294-22
E-Mail: service@a-tron.de

3. Safety

3.1. Basic safety instructions

3.1.1. Observance of the operating instructions

The operating instructions must be read and understood by the personnel and must be observed during all work. For this reason, always keep the operating instructions handy in the immediate vicinity of the plant.

The owner of the plant is responsible for the training and safety of the operating personnel. It is therefore very important that these operating instructions are actually handed over to the persons concerned.

The owner and the operating personnel of the plant are obliged to observe and comply with the instructions given in these operating instructions. Operating personnel who work with the transport, installation, operation, maintenance or repair of the plant, must have read and understood these operating instructions.

The owner must specially instruct operating personnel who cannot read and draw attention to the dangers involved in handling the plant. The plant is only allowed to be operated by persons who have been instructed and informed about the dangers. It is recommended that service personnel be consulted for instruction.

3.1.2. Qualification of the personnel, duty of care of the owner

Only instructed personnel are allowed to operate and maintain the plant. It is the responsibility of the plant owner to ensure the minimum qualification of personnel to operate the plant.

IMPORTANT

All work that goes beyond the operation of the plant is only allowed to be carried out by authorised specialist personnel.

Specialist personnel is defined as persons who, due to their technical training, knowledge and experience as well as knowledge of the relevant standards, are able to assess the work assigned to them and recognise possible hazards (based on the definition in EN 60204-1).

3.2. Safety markings on the product

DANGER

To avoid danger and damage, observe the general safety instructions and the information in the associated operating instructions.

WARNING

Warning of dangerous voltage present at the equipment.

WARNING

Warning of hot surfaces with a temperature above 60 °C.

WARNING

Substances with this marking must be disposed of in an environmentally friendly manner.

3.3. Safety markings in this manual

3.3.1. DANGER marking

DANGER

COMPLY WITH THE GENERAL SAFETY INSTRUCTIONS!

To avoid hazards and damage, observe:

- **the safety instructions in chapter 2**
- **the information in the relevant chapters**
- **the information in the associated operating instructions**

The danger warning must be observed. The danger must be counteracted with the necessary care (e.g. protective clothing) or caution. Work on or with the plant should be carried out with the utmost caution.

3.3.2. WARNING marking

WARNING

Warning of hand injuries!

Attention, keep your hands away from areas bearing this warning sign! There is a risk that hands may be crushed, pulled in or otherwise injured.

WARNING

Warning of slipping hazard!

Care must be taken when walking, running or climbing because of the danger of slipping on traffic routes (in exceptional situations, e.g. after cleaning work or in the event of hazards caused by icy or slippery roads in entrance areas of buildings).

WARNING

Warning of tripping hazard!

In the case of undetectable tripping points in traffic routes (height differences of more than six millimetres, e.g. between workplaces due to steps or temporary tripping points, such as cables or other lines), look at the floor in order to detect the danger point and overcome it without difficulty.

WARNING

Warning of hot surface!

Hot surfaces, at a temperature of 45 °C or more (coagulation of protein), which can cause burns in humans, should not be touched without protective gloves.

WARNING

Warning of environmental hazards!

Substances with this marking must be disposed of in an environmentally friendly manner.

WARNING

Warning of flammable substances!

In work rooms (e.g. storage rooms) or in the vicinity of storage cabinets with hazardous contents, do not carry out any work that causes the substances to ignite.

Warning:
Falling objects

WARNING

During transport with lifting equipment, injuries may result from falling objects.

WARNING

Warning:
Suspended load

During transport, there is a risk of injury from falling or slipping objects. **Never step under suspended loads!**

WARNING

Warning: Danger of electric shocks!

Electrical hazards to persons due to direct contact with live parts. Elements likely to present an electrical hazard must be positioned or protected in such a way that they cannot be touched by personnel.

Electrostatic discharge when touching the plant. The plant and machine parts must be earthed so that potential differences can be compensated.

When handling products such as machines, tools, etc., contact with live parts can lead to dangerous body currents. If the rules of conduct are not observed, this can result in serious physical damage, including loss of limbs or damage to property. Persons who carry out work on or with the product should do so with great care.

3.3.3. CAUTION marking

Caution

Caution: Use hand protection!

Due to the risk of injury, hand protection must be worn. Read the operating instructions before using the hand protection! The operating instructions describe the right type of protective glove and where it should be used.

Caution

Caution: Use foot protection!

Safety shoes must be worn to protect the feet from foot injuries. Foot injuries can be caused by tools or workpieces falling over or down, incorrectly attached loads, jamming of the foot as well as the penetration of nails or metal chips into the sole.

3.3.4. IMPORTANT marking

IMPORTANT: Use hand protection!

If there is a risk of injury to arms and hands, protective gloves should be worn.

IMPORTANT: Use hearing protection!

If high sound levels (noise) occur in an area, hearing protection must be worn in this area.

3.4. Waste disposal

WARNING

All work on and with the plant must comply with the regulations on waste avoidance and the proper recycling and disposal of waste. In particular during assembly, installation, maintenance and repair work as well as during decommissioning, it must be ensured that substances hazardous to groundwater such as greases, oils, antifreeze agents, cleaning fluids containing solvents, etc. cannot enter the ground or the sewerage system. These substances must be collected, stored, transported and disposed of in suitable containers. The product data sheets are available from A-TRON Service (for service address, see chapter 1.7). They must be observed during disposal.

3.5. Intended use of the plant

3.5.1. General

- The plant is only allowed to be used for its intended purpose.
- The plant is only allowed to be operated in a faultless, safe working condition.
- The plant is only allowed to be operated by persons expressly authorised to do so.
- The safety and monitoring devices must be easily accessible and regularly checked for completeness and function.
- When operating the plant, the general accident prevention regulations for power-driven machines apply.
- Warning and instruction signs must not be removed and must always be in a legible condition.
- Protective devices must not be modified or dismantled. They must be checked regularly for function.

The CHP plant is a compact, ready-to-connect plant for the utilisation of natural gas, liquid gas and sewage / biogas. The energy contained in the fuel gas is converted into electrical and thermal energy by combustion. The electrical power is transferred to the low-voltage system at the installation site. The resulting heat is dissipated into the heating system of the building. The CHP plant serves exclusively this purpose.

The CHP plant is only allowed to be operated with the prescribed fuel gas. More detailed information can be found in chapter 3.7.1 Fuel variants.

The plant is only allowed to be used in a technically faultless condition and in accordance with its intended use, paying attention to safety aspects and potential hazards. Any other or more extensive use shall be deemed improper. The manufacturer can accept no liability for damage resulting from improper use. Expansions and conversions by third parties are only allowed to be carried out in consultation with A-TRON.

The intended use also includes reading all operating instructions of the plant and observing all instructions contained therein - in particular the safety instructions. This also includes carrying out all inspection and maintenance work in the prescribed time intervals.

3.5.2. Possible misuse

Any use other than the intended use is not permitted.

Possible improper applications include non-compliance with safety equipment, safety regulations and current accident prevention regulations. A-TRON is not liable for damage resulting from improper use.

The possible consequences are shown below.

3.5.3. Fire hazard / fire fighting

DANGER

Keep materials at risk of fire and explosion away from hot surfaces.
Ensure that there are no naked flames in the work area. Only use suitable extinguishing agents for extinguishing fires. There is a risk of fire and explosion when cleaning with cleaning agents which can lead to fire and explosion.

3.5.4. Mechanical hazards

WARNING

Warning of hand injuries!

Attention, keep your hands away from areas bearing this warning sign! There is a risk that hands may be crushed, pulled in or otherwise injured.

Warning:
Falling objects

WARNING

During transport with lifting equipment, injuries may result from falling objects.

Warning:
Suspended load

WARNING

During transport, there is a risk of injury from falling or slipping objects. **Never step under suspended loads!**

3.5.5. Electrical hazards

WARNING

Risk of electric shock!

Electrical hazards due to people coming into direct contact with live parts. Parts likely to present an electrical hazard must be positioned or protected in such a way that they cannot be touched by personnel.

There is a risk of fatal electric shock from live parts! Even when the main switch is switched off, electrical voltage is present at the power supply terminals in the control cabinet of the CHP plant. Before working on the plant, the power supply must be switched off and secured against being switched on again.

The electrical installation is only allowed to be carried out by a specialist electrician trained by A-TRON.

WARNING

Risk of electric shock!

Electrostatic discharge when touching the machine: The plant and machine parts must be earthed so that potential differences can be compensated.

3.6. General safety instructions

Specialist personnel
Installation, commissioning, maintenance and repairs to the CHP plant are only allowed to be carried out by qualified installers.

Maintenance
The CHP plant must be serviced and inspected at the prescribed intervals. Documentation (maintenance book) must be kept for this purpose. If the documentation is not kept, any warranty claims will lapse.

Covers
Behind the covers which can only be removed with auxiliary means (keys, tools), there are components which if touched can lead to injuries (hot and/or live parts). These covers are only allowed to be removed by specialist personnel.

Seals
It is forbidden to destroy seals. If the seals are destroyed or opened, the manufacturer's warranty will be invalidated.

Frost protection
The heating system must be protected from frost. This is only guaranteed if the CHP plant always remains in operation. If the plant is switched off, the manufacturer does not assume any warranty for frost damage.

Operating parameters
The operating instructions must be read carefully before any parameters on the CHP plant are modified. Unauthorised modification of the type-related nominal output is prohibited.

Condensate drain

If the CHP plant has been out of operation for a relatively long period of time, it must be ensured that the siphon of the condensate drain is filled with water.

Behaviour if you smell gas

- Turn off the gas valve (due to sparking, neither the light nor other electrical switches are allowed to be switched on and the all-pole disconnection point must not be switched off).
- Ventilate and notify service centre, gas supply company or recognised specialist workshop
- Do not use a telephone in the danger zone
- Do not use a naked flame (e.g. lighter, match). Do not smoke.

Behaviour in the event of fire or water damage

- Close gas valve
- Switch off all-pole disconnection point
- Notify service centre.

Operation with propane gas

Only propane gas with a motor octane number (MON) of at least 92 is allowed to be used! In the event of non-observance, the manufacturer does not assume any warranty for damage which does or may result from this.

Contamination during the building phase

If the CHP plant is installed during the building phase, the electronics and the air filter must be checked and cleaned after completion of the construction.

Installation and adjustment

For your own safety, please note that installation, adjustment and maintenance of the unit are only allowed to be carried out by A-TRON or authorised service partners. This also applies to the inspection and repair of the unit as well as changes to the set gas quantity.

Modifications

You must not make any changes

- to the unit,
- to the supply lines for gas, supply air, water and electricity,
- to the exhaust gas line,
- to the discharge pipes and to the safety valves for the heating water.

The prohibition on modifications also applies to structural conditions in the vicinity of the unit, insofar as these may have an influence on operational safety.

Ventilation

Ventilation slots must always be kept free. Do not cover ventilation openings with clothing or similar items.

Units with extract air ducting

Do not install any additional units with extract air ducting (e.g. fans, tumble dryers or cooker hoods) in the vicinity of the unit. Consult with the manufacturer before doing so.

Tight-sealing windows
When installing tight-sealing windows, you must ensure, in consultation with the manufacturer, that there is still a sufficient supply of combustion air to the unit.

Explosive or highly inflammable substances
Do not use or store explosive or highly inflammable substances (petrol, paint, paper) in the installation room of the unit.

Inspection
The CHP plant must be serviced and inspected at the prescribed intervals, otherwise all claims under warranty are invalidated. The unit must be inspected annually. Maintenance must be carried out in accordance with the regulations after a maximum of 6,000 operating hours or at the latest after one year.

Improper use
Any use that goes beyond that described above shall be deemed to be improper use. No liability is assumed for damage caused by the non-observance of these operating instructions.

Corrosion protection
Do not use sprays, solvents, chlorine-based cleansing agents, paints, adhesives etc. in the proximity of the unit. Under unfavourable circumstances, these substances can lead to corrosion - including in the exhaust gas system.

Filling the heating system
For filling and refilling the heating system, tap water / drinking water is usually sufficient.
In exceptional cases, however, the water quality can deviate greatly (strongly corrosive or very hard water). The water must be treated accordingly under these circumstances.

Checking the water level
Check the water level of the heating system regularly.

Emergency generator
The unit was connected to the mains supply during installation. If you wish to keep the unit ready for operation with an emergency generator in the event of a power failure, its technical values (voltage, frequency, earthing) must correspond to those of the mains supply and at least match the power consumption of your unit.

3.7. Special safety instructions

3.7.1. Fuel variants

The CHP plant is a compact plant which is shipped ready for connection. Depending on your requirements, the plant can run on the following gaseous fuels:

- Natural gas
- Liquid gas
- Biogas or sewage gas

The energy contained in the fuel gas is converted into electrical and thermal energy by combustion. The electrical power is transferred to the low-voltage system at the installation site. The resulting heat is transferred to the heating system and used for heating and/or drinking water heating of the building connected to the supply.

The CHP plant consists of a water-cooled 4-stroke gas engine and a water-cooled asynchronous generator. It generates three-phase current (400 V, 50 Hz) and hot water with a standard temperature spread of 20 K - flow temperatures up to 90 °C and return temperatures up to 70 °C (optional 95 °C flow and 80 °C return). The CHP plant can be operated both thermally (heat-guided) and electrically (current-optimised).

3.7.2. Generator protection

When asynchronous motors are operated parallel to the mains, the mains parameters are the same as the generator parameters. Therefore, a short-circuit current (Ik) and adjustable overload protection are provided for the generator. In addition, it is protected against reverse power (drive of the generator from the mains in mains-parallel operation), which can occur, for example, if the gas supply is interrupted.

3.7.3. Coolant tank with safety closure

A coolant tank is integrated into the engine coolant system.

If the pressure of the coolant system rises above 1.5 bar, the engine coolant is drained by means of an overpressure valve.

3.7.4. Temperature monitoring

The temperature is monitored with analogue temperature sensors (PT1000). The temperatures of the engine coolant circuit, the heating circuit of the CHP plant, the oil temperature, the exhaust gas temperature and the temperature of the generator winding as well as the generator bearings are monitored. The control unit stops the plant when the set maximum value is exceeded.

3.7.5. Integrated network and plant protection

The NA protection prescribed by VDE AR-N 4105 is designed as integrated NA protection for the CHP plant. If the set values are exceeded or not reached, the ATROMATIC triggers two independent disconnection points which disconnect the CHP plant from the mains. These disconnection points are implemented in the form of the soft starter installed to start the generator and two separate contactors.

3.7.6. CO sensor (optional)

For an additional charge, A-TRON offers an emergency shutdown of the CHP plant via a CO monitor. This has a service life of 5 years and covers a measuring range up to 500ppm.

3.7.7. Base group with frame

The base group consists of a torsionally rigid steel section design for housing the engine, generator, control panel and coolant heat exchanger. The base frame is equipped with corresponding openings for transport with a forklift or lift truck.

The engine / generator unit is flexibly mounted on the base frame by means of rubber-metal pads which have been calculated so as to provide the necessary cushioning. The pads are secured with wooden wedges at the factory. This transport protection must be removed before initial commissioning.

3.7.8. Driveline

The driveline consists of the gas-fuelled internal combustion engine and the generator. Power is transmitted between these two components via a rigid disc coupling.

A flange is connected to the combustion engine on one side and the generator on the other. The flange is attached to the base group in a flexible arrangement via the unit carrier and with damping elements.

3.7.9. Gas engine

The gas engine is a 4-stroke internal combustion engine operating according to the Si process, with ƛ = 1. The mixture is ignited with electronic control by means of external ignition with spark plugs. The exhaust gas is purified by a three-way catalytic converter.

3.7.10. Generator

A water-cooled three-phase asynchronous machine is used in the CHP plant. This three-phase machine functions as a starter for starting up the internal combustion engine. Following start-up, the three-phase machine generates three-phase current. The water is cooled by the heating water.

3.7.11. Lubricating oil supply

The engine is lubricated by means of forced-feed lubrication. The lubricating oil is cleaned by an oil filter cartridge in the main flow.

The oil level is monitored by liquid level switches. It can also be checked visually at the level indicator.

The lubricating oil supply is ensured by an external, electrical diaphragm pump. This pump pumps oil into the engine oil circuit from the oil reservoir tank when required, ensuring a constant volume of oil.

An automatic oil change takes place every 2000 operating hours. A second external electric pump is responsible for extracting the used oil from the engine. This used oil is then pumped into a used oil canister in the CHP plant.

3.7.12. Gas line

The gas is supplied by means of a modular safety gas line. All components of the gas line are approved in accordance with the DVGW (the German Technical and Scientific Association for Gas and Water). The gas line is permanently mounted. The gas is mixed with the combustion air in the gas / air mixer.

The main components of the gas line are:

A fine gas filter to protect downstream elements from contamination

A double solenoid valve designed as a gas safety valve, closed without current,

A zero pressure regulator to release the gas inlet pressure to atmospheric pressure so that the gas-air mixer mixes at the same pressure (zero or equal pressure principle).

The gas pressure is monitored during the entire operation.

An upstream gas pressure regulator switches off the plant if the gas pressure falls below 10 mbar.

3.7.13. Heat exchanger system

The heat exchanger system consists of several components which absorb heat at several points in the overall system and dissipate it again elsewhere. The main components are the exhaust gas heat exchanger, plate heat exchanger and the exhaust manifold.

The **exhaust gas heat exchanger** has been specially designed for transmitting heat from the exhaust gases of the gas engine to the heating water circuit. The exhaust gases emerging from the catalytic converter flow through the cooling ribs and dissipate heat to the heating water.

The exhaust gas heat exchanger is designed as an aluminium casting.

The **plate heat exchanger** transmits the heat from the engine coolant circuit to the heating water circuit. The plate heat exchanger consists of soldered copper plates.

The **exhaust manifold** admits the exhaust gases emerging from the engine, collects them together and directs them to the catalytic converter. Part of the heat is extracted from the exhaust gases at this stage by a water jacket that has heating water flowing through it.

Figure 2: Hydraulic diagram shows how the individual components are arranged in the overall system. The generator is also part of the system. Cooling the generator windings with heating water extracts additional heat from the system.

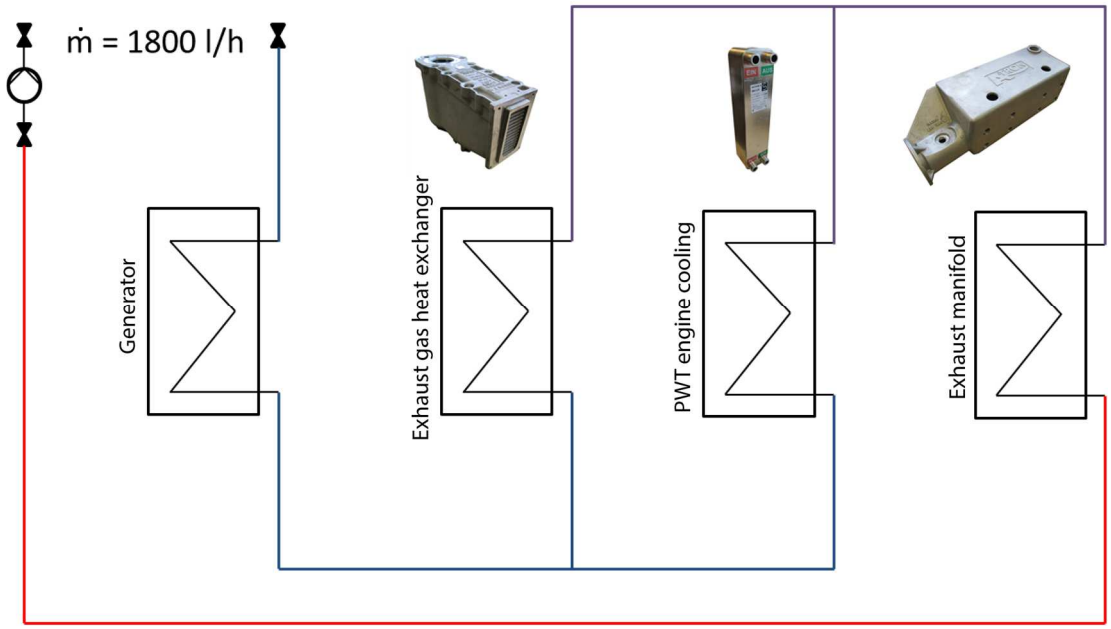


Figure 2: Hydraulic diagram

3.7.14. Power factor correction

In order to generate the plant's electrical power, reactive energy and the necessary reactive current are required. As these boxes are established and dissipated continuously during the alternating voltage cycle, the energy continuously fluctuates between the generator and consumer. This cannot be used, i.e. converted into another form of energy, but it puts a strain on the power supply system, and under certain circumstances may be charged by the grid operator.

By using an output capacitor directly on the plant, it is possible to reduce the load on the transmission devices because the necessary reactive power is no longer supplied by the power system but by the capacitor instead. In electrical engineering terms, as can be seen in Fig. 3, angle f is reduced and the cosine of the angle (power factor) approaches 1. Our unit corrects approximately to a power factor of 0.95 at an output of 20 kW. The amount of reactive power drawn from the power system is low.

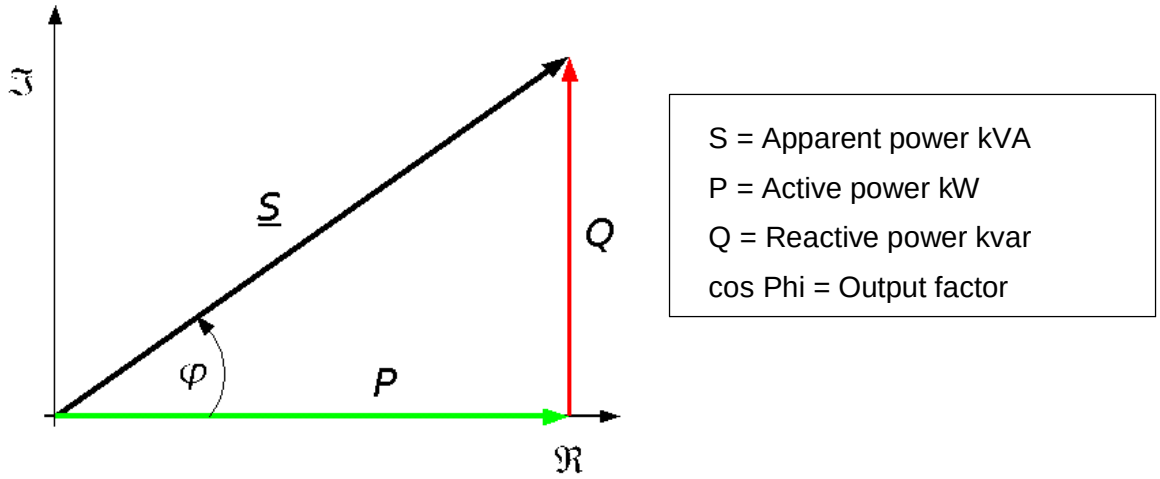


Figure 3: Reactive power diagram

4. Technical documentation

4.1. Technical documentation

Our highly efficient combined heat and power (CHP) plants for the energetic conversion (combustion) of natural gas, liquid gas or biogas (sewage gas) into thermal and electrical power are characterised by their easy-to-connect, compact design.

The basic modules of our combined heat and power plants consist of an electronically controlled Volkswagen industrial engine with coupled asynchronous generator (water-cooled) for power generation in parallel operation with the grid and an easy-to-operate, highly intelligent ATROMATIC control unit.

Various system components, such as coupling, gas control line, primary coolant circuit and highly developed safety systems ensure maximum ease of operation and maintenance.

The user manual included in the scope of delivery allows the installer to perform a quick and easy installation. In particular, the manual describes the connection options of our CHP plants to the power grid, the operation of the ATROMATIC control unit, as well as basic and optional control functions.

A-TRON combined heat and power plants are ready for operation ex-works and are equipped with the following features as standard:

- Compact and powder-coated substructure in 3-chamber system for fresh oil tank, acoustic insulation and fresh air supply as well as equipment carrier
- Electronically controlled industrial engine from Volkswagen, 4-cylinder, 2.0 l
- Water-cooled asynchronous generator in completely encapsulated design with vibration decoupling for generating electricity in operation parallel with the mains
- Condensing heat exchanger in compact design made of aluminium / silicone casting, comprising a water-cooled chamber system. This system contributes to high thermal efficiency
- Plate heat exchanger (soldered), pressure-resistant up to 25 bar, temperature-resistant up to 185 degrees Celsius
- Exhaust mixing pipe, manufactured using the high-grade aluminium sand-casting process, resistant to corrosion and pressure, with integrated lambda control system
- Catalytic converter technology in the form of a three-way catalytic converter, oxidation-resistant, easy to clean, pollutant emissions < TA Luft 2002 (German Technical Instructions on Air Quality Control), results in very low pollutant emissions
- Automatic oil change / replenishment function, consisting of a fuel pump group and fresh and used oil collecting tank
- Heating circuit distributor consisting of pump group, flow and return, and integrated temperature displays
- Easy-to-remove thermoacoustic housing, rust-resistant and powder-coated, with 50 mm insulation fleece. (sound level < 50 dB at 1 m distance)
- Gas control line with electronic actuator and zero pressure regulator
- Condensate system with filling and drain device, suitable for DN 80 PPs exhaust system
- Control panel with ATROMATIC control system, powder-coated and with cushioned lifting device for inexpensive maintenance

- ATROMATIC control system complete with output section and cooled 3-pole soft-starter; user-friendly and clearly laid out with multilingual touchscreen display; main switch on/off, assembled ready for operation with the standard modules for monitoring when the mains power is switched off
- User manual with installation instructions

Our ATROMATIC control unit is equipped with a remote monitoring system via the Internet. The remote monitoring system can be individually adapted depending on the communication network available. Optionally, all available additional functions in the ATROMATIC control unit can be retrofitted later.

The electrical and thermal output levels offered by the A-TRON combined heat and power plants can be both manually and automatically adapted to meet individual energy requirements. In particular, the heat demand can be adapted to the seasonal variations, thereby guaranteeing low standstill times with optimum electricity yield, and also offering ease of maintenance.

The combined heat and power plants are assembled ready for operation and are subject to a thorough quality test (approx. 30 hours) prior to delivery. After the test run has been completed successfully, there is a final inspection including an acceptance report.

Depending on the local conditions of the customer, our combined heat and power plants can be dismantled into smaller subassemblies, then assembled and filled at the customer's premises.

All of the following performance and efficiency information is based on a return temperature of 35 °C, the use of optional equipment and natural gas operation (calorific value Hi = 8.8 kWh/m³ under normal conditions). The values relate to a relative air humidity of 30 %, an air pressure of 1013.25 mbar, a room temperature of 30 °C at a room height of 1.5 m and an intake air temperature of 25 °C. Deviations are possible if there is a different gas quality and other air values.

The technical data are listed for standard reference conditions in accordance with ISO 3046-1 (DIN 6271) with a tolerance of +/- 5 %.

4.2. Transport and installation

4.2.1. Safety

The following safety instructions must be observed when transporting the plant - this will prevent fatal injuries to persons and other damage to property.

- The transport work is only allowed to be carried out by qualified persons in compliance with the safety instructions - the following special qualifications are required: specialist personnel for transport, specialist personnel for load securing.
- Observe the transport instructions on the packaging.
- Observe the prescribed storage conditions (e.g. temperature, air humidity).
- Only use original packaging.
- The plant is only allowed to be lifted at the holding points provided.
- The specified position for the transport of the plant must be adhered to exactly.
- Only the specified load-bearing and slinging equipment is allowed to be used to transport the plant.
- When selecting suitable load-bearing equipment, the total weight of the plant or plant components must always be taken into account.
- The transport route must always be secured by a third person.
- The transport routes must be cordoned off and secured in such a way that no unauthorised persons can enter the danger area.
- Observe the permissible floor load for the transport route.
- The packaging material must be disposed of properly.
- The transport protection is only allowed to be removed after complete installation, during commissioning.
- Please also read chapter 2 "Safety instructions".

4.2.2. Transport

A lift truck for Euro pallets is best suited for transporting the CHP plant. The base frame is designed in such a way that the lift truck forks fit exactly into the recesses and the CHP plant can be lifted in this way.

4.2.3. Storage conditions

The plant and the associated components, which cannot be set up immediately at the place of installation, are protected in their packaging against weather and external influences.

The following storage requirements apply:

- Leave the plant and the associated components in their original packaging until the start of installation and place them in a weatherproof place.
- Cover the plant and its components so that they are protected from intense sunlight, dust, moisture and frost.

Liability for possible storage damage shall be governed exclusively by the supply contract.

4.2.4. Installation

The CHP plant can be transported from the unloading point to the installation location along the ground, dismantled or also by means of a load crane. Please contact A-TRON regarding disassembly for transport to the installation location.

When using a load crane, the CHP plant must be lifted as shown in Fig. 1. M10 threads are provided for the four mounting points of the brackets. In order to mount the brackets, the M6 reducers must first be unscrewed.

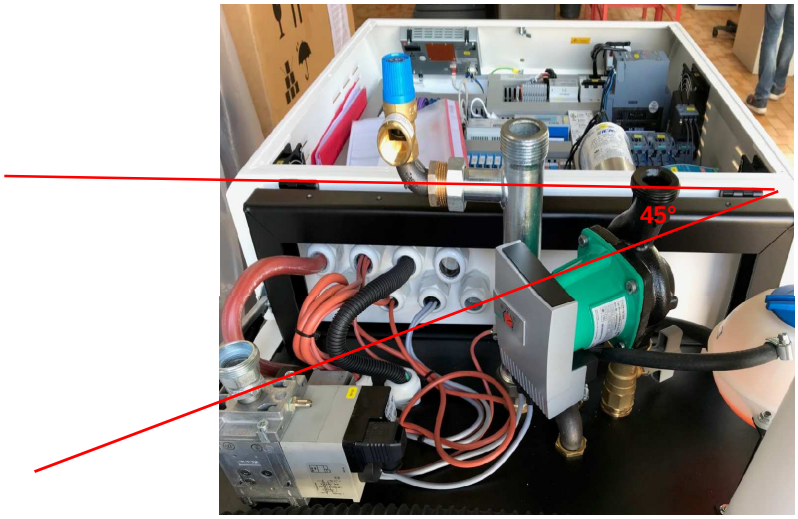
Figure 1

4.3. Assembly and installation

1. **Remove the packaging** (cardboard box and foil bag)

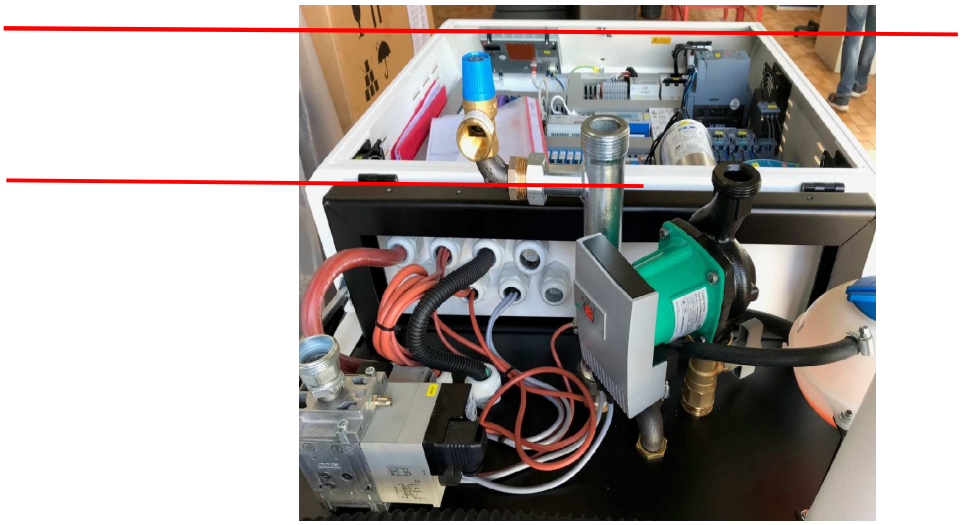
2. **Assembly of the heating circuit pump**
   Please screw the heating circuit pump (1) onto the connection according to the picture with seal (2). (Observe flow direction of the pump!)

3. Please mount the **Wilo heating circuit pump** at a 45° angle:
   (cables are permanently connected)



4. **Assembly of the heating circuit return connection.** Please screw the heating circuit return onto the connection according to the picture with seal:

Please mount the heating circuit return so that it runs parallel to the casing: (Please handle the sensor cable with care, do not expose it to any loading/do not damage it).

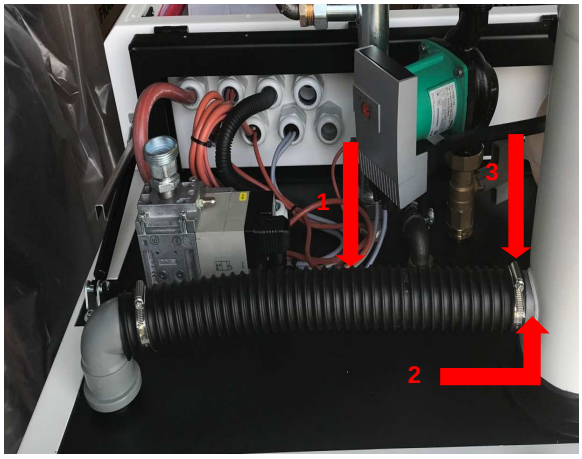


5. **Assembly of the pre-silencer.** For this purpose, please remove the left casing covering and mount the pre-silencer (1) on the lower connection (2) (for easier mounting of the pre-silencer, apply “lubricant for plug-in socket systems” to the inner rubber seal). Please hold the lower connection (2) firmly with one hand to avoid damaging it during assembly!

6. **Assembly of the condensate trap.** For this purpose, please mount the condensate trap (1) on the pre-silencer (2) (for easier mounting of the condensate trap, apply “lubricant for plug-in socket systems” to the rubber seal (3)).

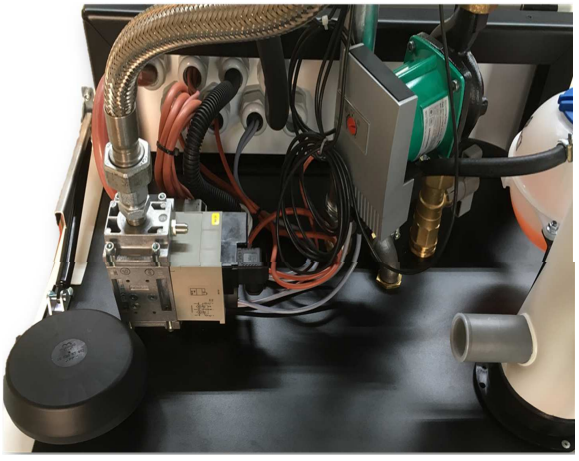
Please align the condensate trap so that the siphon points to the rear and secure it with 4 countersunk screws M5 x 16mm.

7. **Assembly for C62 installation (room air independent).** For this purpose, please push the corrugated suction hose (1) onto the connection at the condensate trap (2) and secure it with the hose clamp (3).



8. **Assembly for B23 installation (room air dependent)**

   No further assembly is required.



4.4. Installation and connection conditions

The installation conditions shown here must be complied with. Installation is only allowed to be performed by specialist personnel.

1. Prior to commissioning, the CHP plant must be placed on the sound insulation underlays included in the scope of delivery. See Fig. 2

Figure 2

2. The outlet of the heating circuit safety valve must be discharged behind the CHP plant into a suitable drain. See Fig. 3

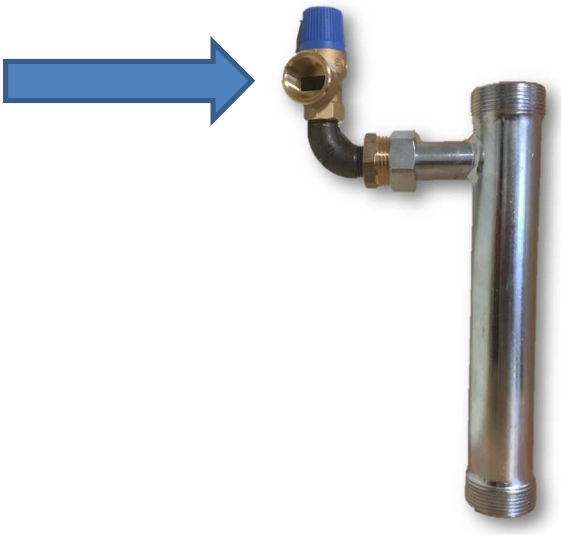


Figure 3

The following particular hazards are to be expected when installing the plant:

- Incorrectly placed or improperly fastened plant parts can fall down or overturn.
- There is a risk of injury on still open and accessible sharp-edged plant components.
- Live cable ends and components can lead to injuries from electric power.
- Loose parts lying on top of each other can slip and fall down.
- Lines that are laid incorrectly (e.g. with insufficient bending radius) can cause smouldering or cable fires.
- Leaking lubricants, solvents, corrosion protection agents, sprays, etc., can cause burns if they come into direct contact with the skin.
- Electronic components can be damaged by electrostatic processes.
- Incorrect tightening torques for the screws can cause severe injuries and damage to property.

WARNING

Danger of accidents!

- Do not remove guards and covers!
- Check protective devices for completeness and proper fastening before each time the plant is switched on.
- After completion of installation or maintenance work, all protective devices and covers must be properly reinstalled.
- Damaged protective devices must be replaced.

4.4.1. Installation conditions of the cogeneration plant

For the operation of the A-TRON combined heat and power plants, the relevant standards must be observed.

4.4.2. Combustion air

The necessary engine combustion air is drawn in either depending on or independently from the room air. For example, air from the machine room can be drawn in as combustion air for the gas engine. Corresponding ventilation of the boiler room must be ensured by the customer. The machine room ventilation in a A-TRON combined heat and power plant must be designed in such a way that an opening of at least 30 x 30 cm to the outside ensures the necessary air exchange. Also, any baffles required over the ventilation openings must be installed on site.

There must be no sources of pollutants in the machine room (ammonia compressors for refrigeration or similar). The combustion air must meet the following requirements:

- Free from pollutants (in particular, free from ammonia and chlorine)
- Air temperature as constant as possible within the range 10 °C - 35 °C with low temperature fluctuations.

CAUTION

Engine damage!

Ammonia and chlorine in the intake air can damage the engine and shorten the service life of the lubricating oil. No air containing ammonia or chlorine may be sucked into the intake line.

If the air from the interior does not meet these requirements, the intake line must be moved to the outside. The power of the plant is inversely proportional to the temperature of the combustion air and the altitude of the machine location (in metres above sea level).

NOTICE!

Fresh air ducting

The outside air flow must not be led directly to the front of the air filter, so that the cold outside air can be mixed with the warmer air in the machine room at low outside temperatures.

4.4.3. Extract air

The extract air emitted by the plant is technically clean air. The values of CO and CO2 in the exhaust gas of A-TRON combined heat and power plants are CO max. = 120 ppm, CO2 = 11,80 %.

Please contact the A-TRON technicians if the exhaust gas values are out of range!

The exhaust gases from the gas engine are directed away in the exhaust system under positive pressure. The mass flow is approx. 85 m³/h (at 20 kW_{el}).

The exhaust line must be capable of dealing with condensate and positive pressure to the full extent and approved for exhaust temperatures up to 120 °C. These requirements are best met with a polymer exhaust line made of polypropylene (PPs) in fire category B1 according to DIN 4102.

A-TRON offers an exhaust system certified for its plants as an accessory. If several modules are connected to a shared exhaust line, each exhaust line must be equipped with an exhaust pressure monitor and a backflow preventer which closes the exhaust line in question if the CHP plant is shut off. Each exhaust branch must be con d separately with a condensate drain.

A calculation in accordance with EN 13384 is required for the design of the entire exhaust system.

NOTICE

An arrangement with the responsible district chimney sweep (at least concerning the line routing) must be reached before the exhaust line is installed. Regarding the exhaust line routing, the applicable legal regulations must be taken into account

4.4.4. Condensate

Combusting the fuel gas / air mixture produces water vapour, carbon dioxide and nitrous oxides. When the water vapour condenses in downstream components, these nitrous oxides are converted into dilute nitric acid and sulphuric acid.

The largest quantities of condensate are formed during starting and stopping. As a result, the ratio between operating hours and starts should be at least 3:1. In order to achieve condensate formation in normal and partial load operation, it is desirable for the temperature in the exhaust system to drop below the dew point (exhaust temperature < 80 °C). This is achieved by a corresponding heating return temperature.

Condensate which forms must be drained away continuously. A condensate drain with water trap must be provided at the bottom end of the vertically routed exhaust line for draining the condensate that forms in the exhaust line of the CHP plant. The horizontal part of the exhaust system must have a slope of minimum 3° to 5cm/1m for the purpose of draining condensate.

Exhaust condensate must never drain into the soil. The local authority in charge of waste water will decide on whether it is possible to drain the condensate via the public sewers. If necessary, it is possible to use neutralisation systems.

NOTICE

The plant is often run in condensate mode, at least during the start-up process! The condensate drain must be able to drain water quantities of up to 5 litres per hour.

4.4.5. Gas connection

The gas supply line (20 - 65 mbar) must be sized in such a way that a gas pressure of at least 20 mbar is still present at the inlet of the gas control line at a maximum consumption rate of 8,1 m³ natural gas/h per module (16,2 m³/h for a two-module system).

A gas valve for every CHP is necessary.

NOTICE

The cogeneration plant should have a separate gas meter.

4.4.6. Electrical integration

A cable must be routed from the system attachment point to the CHP plant in order to connect to the electrical system of the building. The cable cross section must be 5 x 16 mm² for lengths up to 10 metres. If the cable lengths are longer, the electrician performing the work must calculate the specific cross section and notify the power utility company about this. The connection is made to the 50 Hz, 3 x 400 V~ power system with a corresponding fuse (3 x 63 A NH 00). The size of the cable must be selected so that the CHP plant's continuous output (20 kW/CHP plant or 40 kW for a double-module plant) can be transmitted on a continuous basis. The building's own SLS switch must have the "C" characteristic.

The CHP plant is started by the generator in three-phase soft-starting. The maximum starting current corresponds to the technical connection conditions (TAB) of the BDEW.

4.4.6.1. Electricity meter

The measuring point sovereignty is regulated in the German Combined Heat and Power Act (KWKG) and since 01.01.2016 has been the responsibility of the respective grid operator.

4.4.7. Hydraulic integration into the heating system

4.4.7.1. Sample application: Individual CHP plant

The integration of the CHP plant into the heating circuit of the building takes place via the coupling to the buffer storage tank. This is heated by the CHP plant with priority. If the required system temperature can no longer be reached in the buffer storage tank, the gas boiler is switched on. The buffer storage tank can be individually stratified using the optionally available tank filling level control. The circulation pump for circulating water in the heating circuit is already integrated in the unit. See Fig. 4

4.4.7.2. Diagrams for connection example of an individual plant

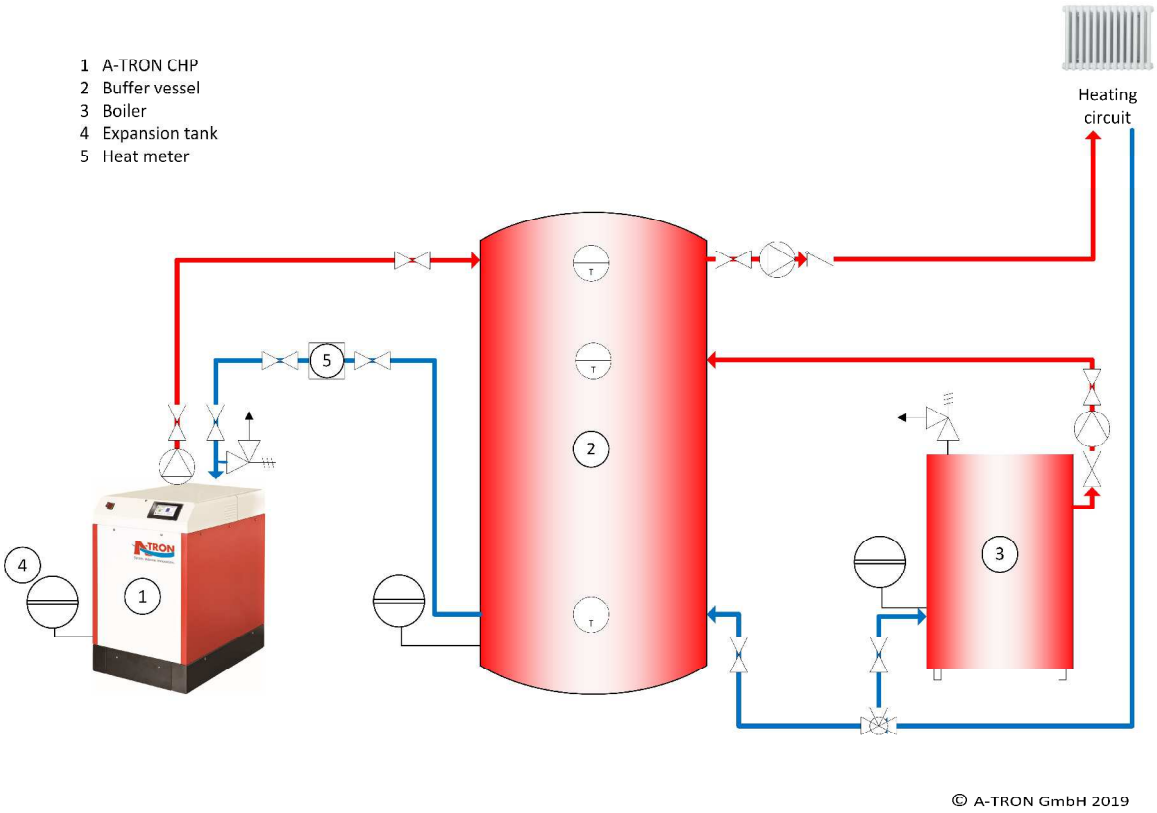


Figure 4: Individual CHP plant

4.4.7.3. Sample application: CHP cascade plant

The integration of the CHP cascade plant into the heating circuit of the building takes place, as in the sample application of the individual plant, via the coupling to the buffer storage tank. The CHP plant modules are connected in parallel to each other.

In this example too, the buffer is heated by the CHP plant with priority. The boiler is only switched on when the required plant temperature in the buffer can no longer be guaranteed by the CHP plant. See Fig. 5

4.4.7.4. Diagrams for connection example of a cascade plant

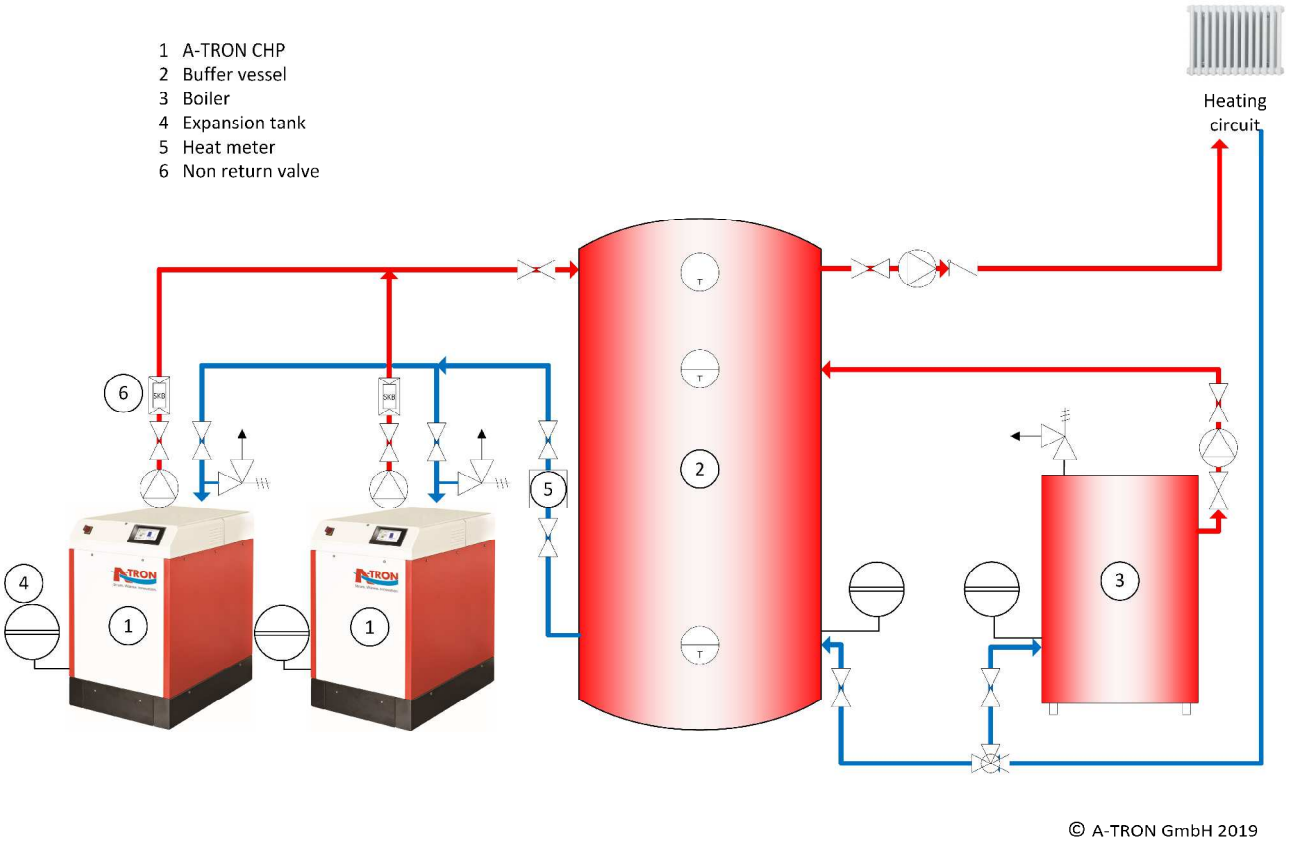


Figure 5: CHP cascade plant

NOTICE

On the heating circuit water side, a filter must be provided in the unit inlet to retain suspended particles. The requirements of DIN 4751 (heat generation plants, replaced by DIN EN 12828) and DIN 4747 (heating water-operated district heating systems) must be complied with. Non-observance will void the warranty.

The CHP plant is connected to the supply and return lines via sufficiently sized pipes, in which case a common, larger pipe can be used for multi-module plants up to the unit division. For an individual plant with a pipe length of up to 5 m, a pipe cross-section of DN 25 is used as a guideline value for the inlet and outlet pipes.

Shut-off valves (1" female thread) for the CHP plant supply and return lines must be installed on site. The coupling to the unit is carried out by means of flexible hoses, which are supplied by A-TRON and can also be installed on site.

NOTICE

When operating the CHP plant, it must be ensured that a heating water flow of at least 1.8 m³/h always flows through the CHP plant. This prevents overheating and possible damage to the plant.

For filling the CHP plants, an outlet tap with connection to the drinking water network in the unit installation room as well as a wash basin must be provided.

4.4.8. Dimensions and weight

Length x width x height:	1300 mm x 800 mm x 1300 mm (can be brought to site disassembled)
Weight	approx. 710 kg

CAUTION

Check the hoist for the required design and the permissible load

CAUTION

Never step under suspended loads!

Warning:
Suspended load

4.4.9. Floor and base

The CHP plant is a stationary plant. The floor condition must be aligned and determined according to the weight of the installation. The base must be level and dust-free.

4.4.10. Installation diagram

The installation of the plant is carried out in accordance with A-TRON's specifications. All plant and electrical supply lines must be placed and installed in accordance with the installation plan or A-TRON's specifications.

An open area (working area) is required for all work on the CHP plant, in particular installation, maintenance and service. For work in front of the CHP plant (front), a larger clearance is required in order to be able to remove and insert the equipment set (engine and generator). The room height should be at least 2,000 mm. Deviations from the specified minimum dimensions may involve additional work and are only possible after consultation.

Please also refer to the **Figure 6: Installation diagram** for the defined dimensions for determining the total space requirement. The dimensions and weights of the individual plant components can be found in the manufacturer's specifications in the technical documentation.

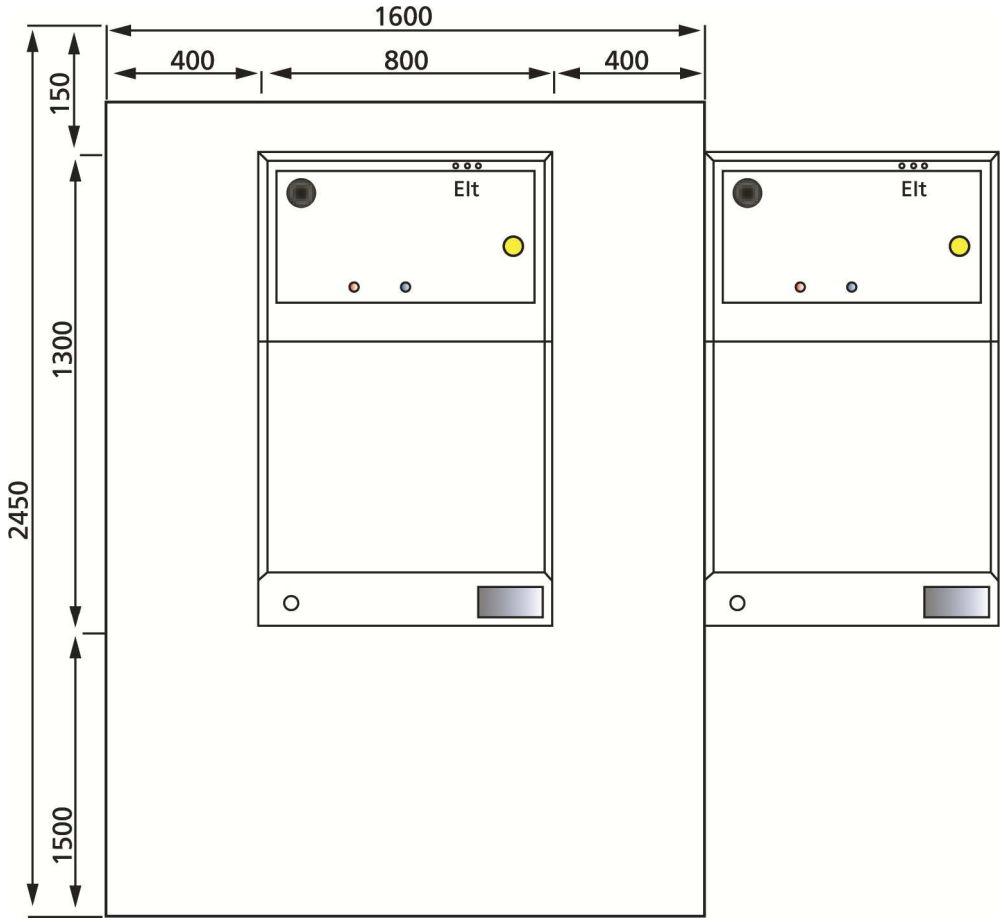


Figure 6: Installation diagram

The dimensions are given in "mm" and depend on the external dimensions of the CHP plant.

4.4.11. Connection conditions

The connection conditions shown here must be complied with. Connection is only allowed to be performed by specialist personnel.

Heating circuit	
Flow connection	DN 25, 1" female thread DIN 228-1
Return connection	DN 25, 1" female thread DIN 228-1
Flow rate	approx. 1.8 m³/h at Δt = 20 K
Pressure drop	approx. 0.4 bar
Water pressure	Maximum 4 bar (safety devices in the secondary circuit must be provided on site according to the local conditions. DIN EN 12828 and DIN 4747 must be complied with.)
Water quality	VDI 2035
Fuel system	
Gas connection	DN 20, 3/4" external thread, conically sealing
Flow pressure	2.0 to 6.0 kPa (20 to 60 mbar on the unit)
Methane number	Minimum 65
Exhaust system	
Exhaust gas connection	DN 80, PPs type B
Exhaust gas temperature	Maximum 120 °C
Counterpressure	Maximum 150 bar at exhaust system test port
Electrical system	
Connections	5 x 16 mm² flexible
Protection	3 x 63 A type NH00 or SLS characteristic C
Communication	
Port release	Port 8998 UDP incoming / outgoing via DHCP or fixed IP assignment with DNS
Bandwidth	GSM min. 3G or landline min. 2000 kB down/250 kB up
Data volume	With GSM min. 6GB, optimally 10GB. Flat-rate Internet for landline

Table 1: Connection conditions

CAUTION

The room temperature of the CHP plant installation location must not exceed 40 °C.

4.4.12. Connection diagram

WARNING

Check whether mains voltage and frequency correspond to the specifications on the type plate!

All installation work and all subsequent maintenance work on electrical components are only allowed to be carried out with express permission and by trained specialist personnel. The electrical connection must be made to a mains supply with functional earthing.

See technical information of the individual plant components.

The connection diagram contains the location and routing of the connections for the heating water system with supply and return flow, the gas and exhaust gas connections as well as the electrical connection and the condensate drain. When installing the connections, the installation plan for the CHP plant must also be taken into account, especially with regard to the minimum free surfaces to be observed.

RT	**Heating return** Connection DN 25 1" female Shut-off valve with integrated pressure gauge included in the scope of delivery.
FL	**Heating flow** Connection DN 25 1" female Shut-off valve with integrated pressure gauge included in the scope of delivery.
G	**Fuel line** Connection DN 20 ¾" female and external Gas connection hose 500 mm included in the scope of delivery, therefore the gas connection can be made variably between 1620 mm and 1870 mm from the top of the floor. Shut-off valve is provided on site.
T	**Exhaust system** Connection DN 80 / DN 125 Exhaust gas routing from the condensate system takes place on site.
Elt	**Electrical line** Connection 5 x 16 mm² Flexible supply provided on site.
K	**Condensate drain** Connection DN 40 Drainage line from the condensate system takes place on site.

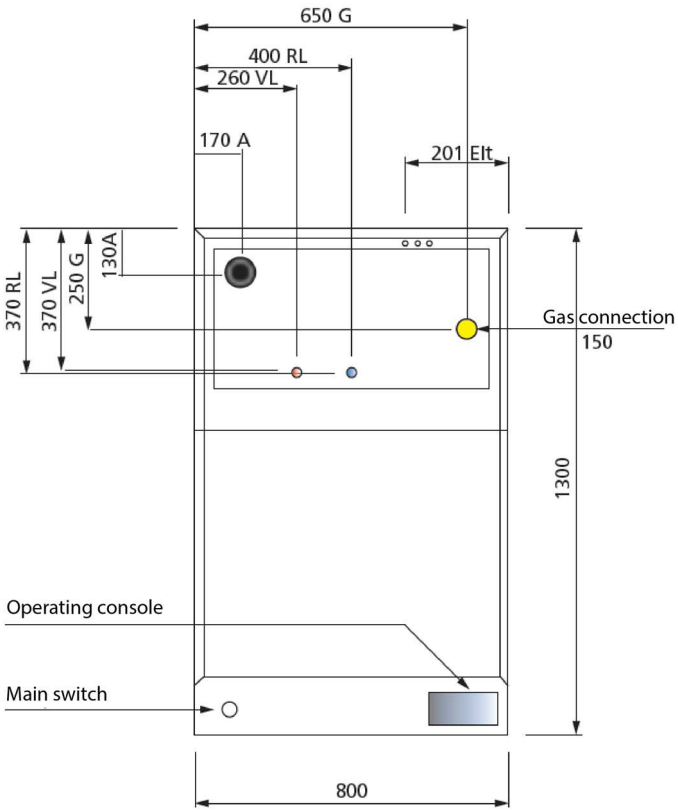


Figure 7: Connection diagram 1

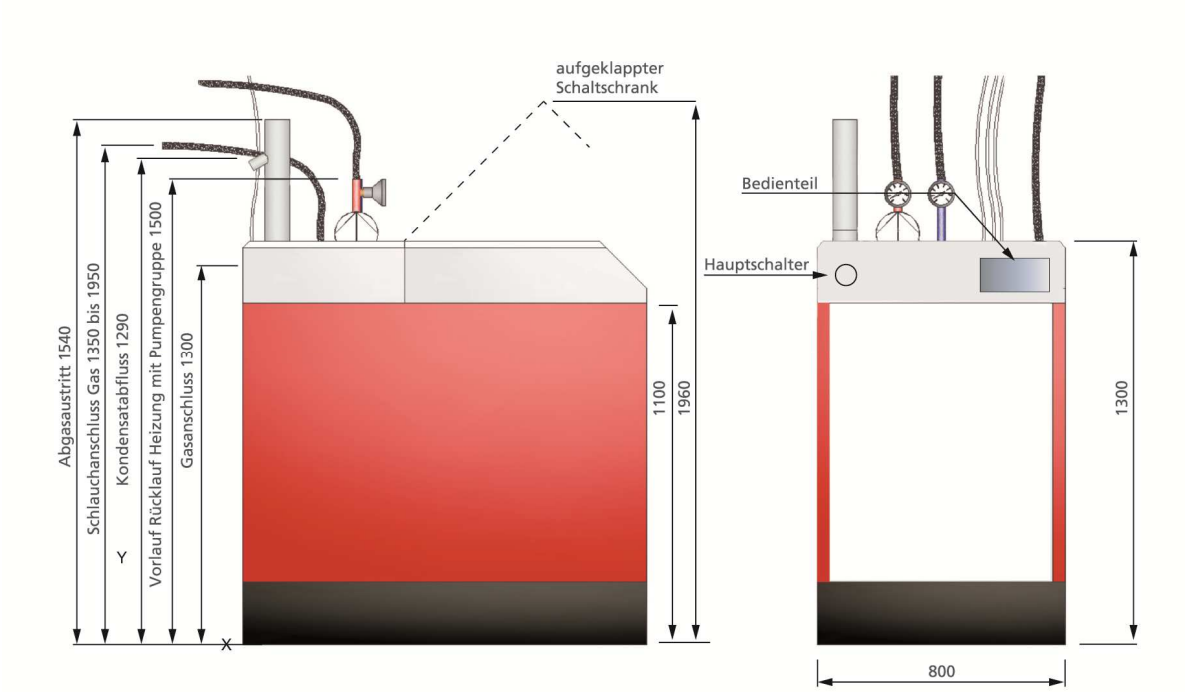


Figure 8: Connection diagram 2

The dimensions are given in "mm" and depend on the external dimensions of the CHP plant.

4.4.13. Power supply

Circuit diagram for full supply

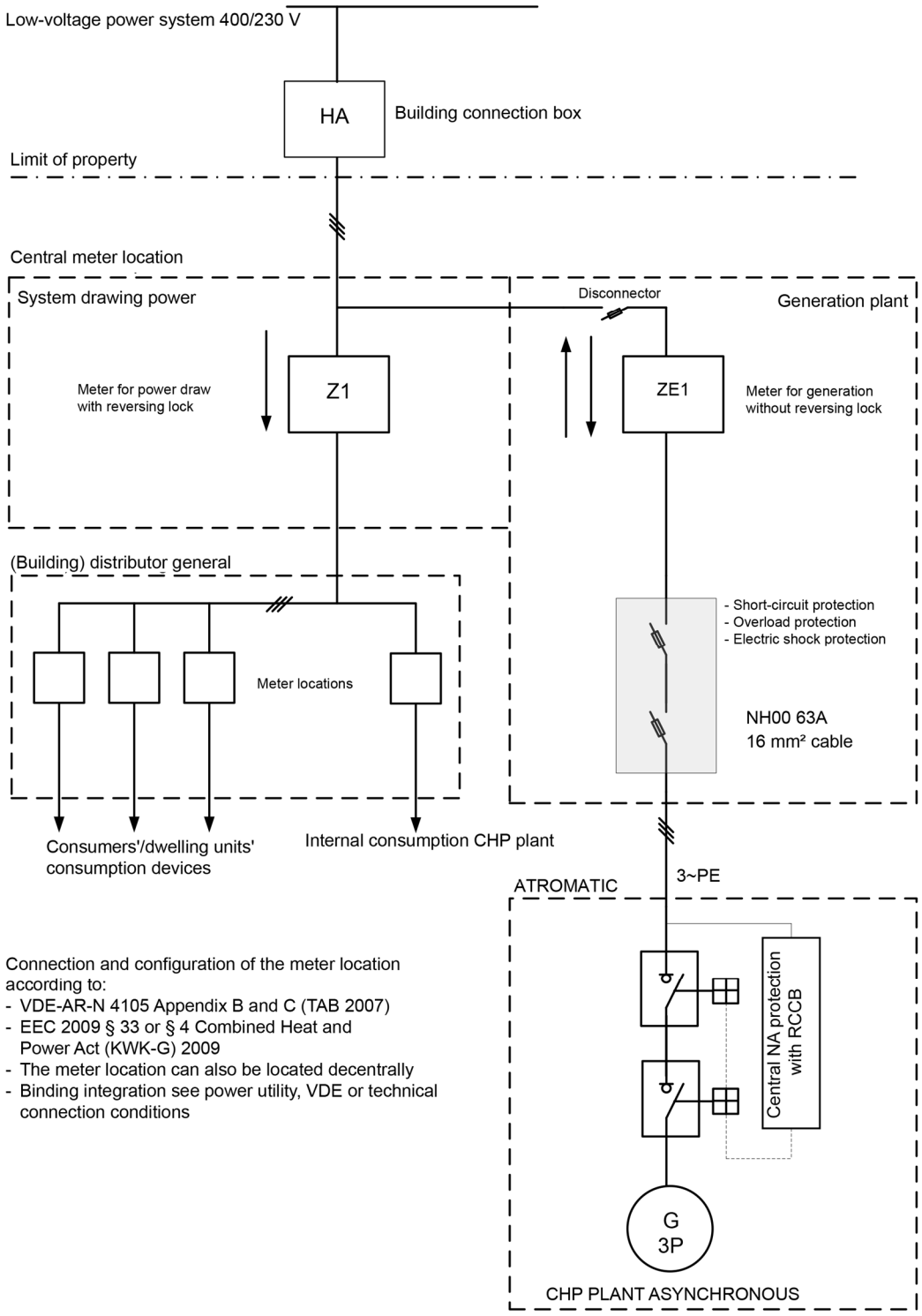


Figure 9: Circuit diagram for full supply

4.4.14. Power Supply plant cascade

Circuit diagram for full supply plant cascade

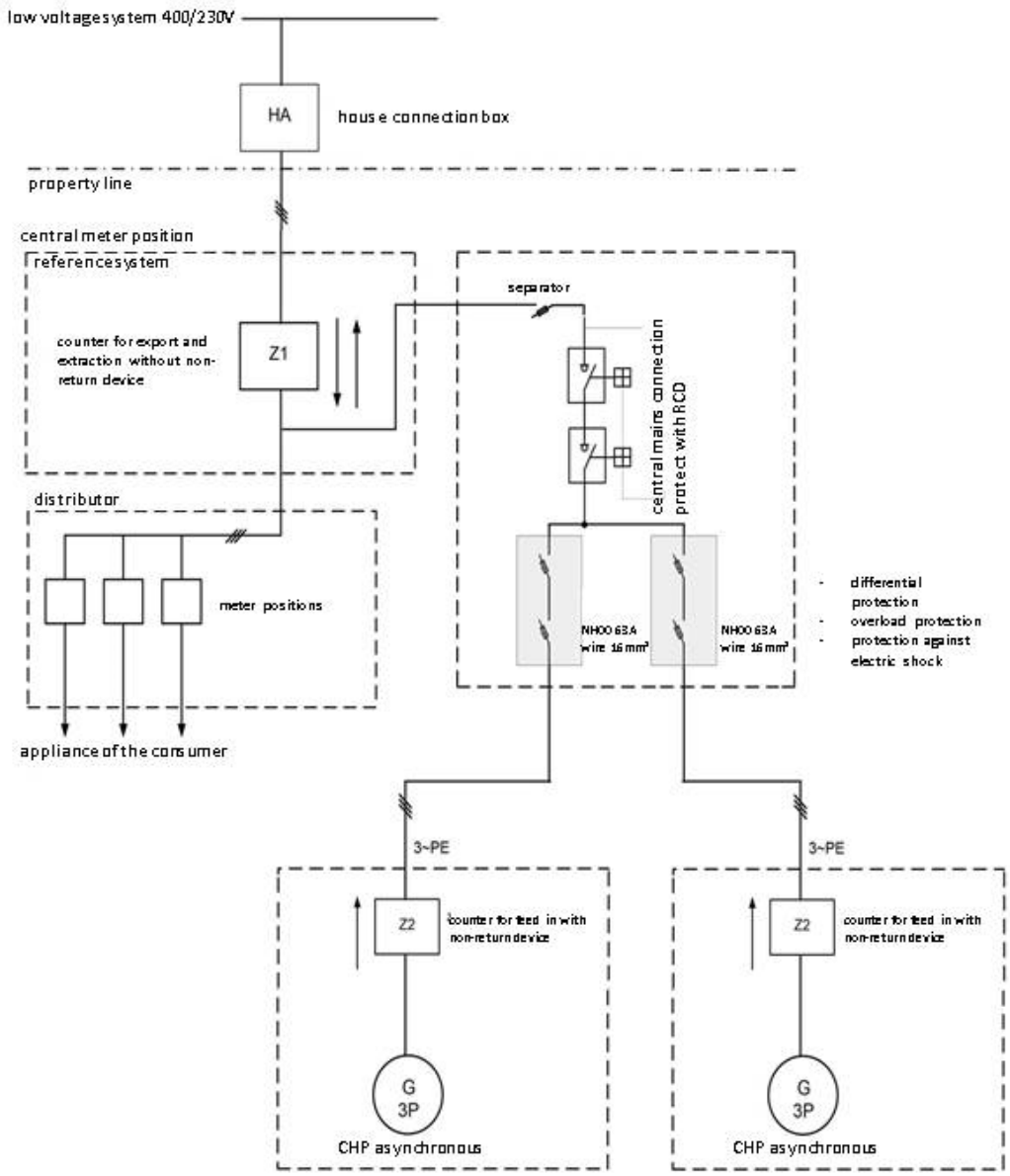


Figure 10: Circuit diagram for full supply plant cascade

5. Commissioning and decommissioning

The following important points must be observed during installation of the CHP plant!

Electrics: It is essential to read the circuit diagram. Failure to do so could result in serious damage to property and personnel injury.

Heating: After connecting the CHP plant to the heating system, a minimum volume flow of 1.8 m³/h must flow through the CHP plant. The hydraulic system of the heating circuit must be provided on site.

A sludge filter is highly recommended. Otherwise there is a risk of damage to the individual components of the CHP plant, which must be replaced subject to payment!

IT: If there is no functioning communication connection between the CHP plant and the remote maintenance system then commissioning will not be possible. A continuous connection via DSL (LAN) or wireless modem (GSM) is therefore essential. The data volume of the GSM connection must cover at least 6GB per month.

5.1. Commissioning

5.1.1 Safety

Operation, set-up and installation of the CHP plant are only allowed to be carried out by trained and, if necessary, authorised specialist personnel in compliance with all assembly and installation regulations.

Perfect function and operational reliability of the CHP plant depend to a large extent on correct installation on site. Any warranty is excluded for the consequences of faulty assembly of the CHP plant by third parties.

The following safety instructions must be observed when installing the CHP plant. This prevents life-threatening injuries, damage to the CHP plant and other damage to property.

- The installation work, such as assembly and installation of the CHP plant, is only allowed to be carried out by qualified persons in compliance with the safety instructions.
- Ensure that a permissible floor load is guaranteed at the installation site of the CHP plant. The total weight of the CHP plant must be taken into account.
- Before installation work starts, the CHP plant must be inspected for transport damage.
- The completeness of all delivered CHP plant parts is to be checked.
- Ensure that only authorised persons are present in the working area and that no other persons are endangered by the installation work.
- Proper handling of hazardous substances must be ensured.
- All plant connections (cables, hoses and pipelines) must be laid in such a way that they do not cause any tripping hazards.
- When laying cables, hoses or pipelines, the prescribed bending radii in accordance with DIN must be observed.
- The specified tightening torques of the bolted connections must be observed.
- The handling instructions (e.g. earthing, ...) for electrostatically sensitive components must be observed.
- Wear personal protective equipment.

5.1.2. Assembly and installation

The CHP plant must be installed proficiently by specialist personnel according to the setup diagram. Comply with the description of the electrical equipment and electrical diagrams.

5.1.3. Preparatory work for installation of the CHP plant

- Check the delivery and the installation diagram to ensure they are complete.
- Check the infrastructure on site (to see if all electrical and compressed air supply lines and also the network connection can be connected correctly).
- Make sure that all people and companies involved have received safety training. If required, check the authorisation certificates for the companies in question.
- Make sure that the local environmental regulations are complied with (including for disposing of oils and greases).
- Make sure that all people involved are familiar with the local fire regulations.
- Dispose of all waste according to the applicable environmental regulations.
- Make sure that you have all necessary tools and auxiliary equipment (lifting gear) available on site.
- Make sure that all subassemblies and components have been supplied within the specified tolerances and specifications. If there are deviations, immediately inform the people responsible.

5.1.4. Installing the CHP plant

Make sure that all preparatory steps have been completed and that all components and subassemblies of the CHP plant are installed in the specified sequence. Make sure to comply with the specified tightening torques for the connections in question!

5.1.5. Connecting the CHP plant

Make sure that all connections of the infrastructure are established by the relevant specialist personnel. Make sure that the relevant main switches are turned off and secured with a lock before connecting the electrical and compressed air supply lines.

5.1.6. Connection work

Once the maintenance work has been completed, the following points must be complied with before starting the plant:

- Once again, check all screw connections that have been unfastened previously to ensure that they are firmly tightened
- Check whether all previously removed protective devices, covers, etc., have been reinstalled correctly
- Make sure that all tools, materials and other equipment used are removed from the working area afterwards
- Clean the working area and remove any liquids and similar substances that may have leaked out according to the product datasheet
- Make sure that all safety equipment of the plant once again functions correctly.

5.1.7. Start-up

5.1.8. Preparing for initial commissioning

Before commissioning the CHP plant, it is necessary to ensure that there are no foreign bodies such as tools in the CHP plant and that all electrical components including the safety devices have been connected.

The following points must be observed before carrying out commissioning:

- Switch on the central electrical power supply at the main switch.
- Make sure that the lifting gear and load handling equipment required for the work are available.
- Cordon off access to the working area of the CHP plant and make sure that no unauthorised persons are in the working area of the plant.
- During commissioning, a commissioning log must be completed and signed.

5.1.9. Carrying out initial commissioning

Initial commissioning is only allowed to be performed by specialist personnel.

- An employee of A-TRON or a service partner must be present at the time of initial commissioning.
- The CHP plant and all its peripherals must be fully installed.
- The CHP plant must be equipped with all necessary service products.
- All lines must be vented.
- A-TRON must have released the CHP plant for commissioning.
- The specified properties of the service products must be guaranteed.
- The default values specified by A-TRON must be set.
- Prior to switching on the control voltage, check that all tools and auxiliary equipment has been removed from the machine room.
- Carry out a visual inspection of the CHP plant, subassemblies and components.
- Switch the main switch on.
- Check all electrical protective devices according to the wiring diagram.
- Put the protective devices into operation.

CAUTION!

The engine oil must be changed after a downtime of more than one year. Before starting the engine, it must be turned clockwise by hand on the crankshaft.

5.2. Decommissioning, corrosion protection and disposal

5.2.1. Special notes for decommissioning

The following safety instructions must be observed when decommissioning the CHP plant. This prevents life-threatening injuries, damage to property and also environmental pollution.

CAUTION

Comply with all safety information!

The plant is only allowed be decommissioned by qualified personnel.

- The machine parts should be disposed of by specialist companies.
- Ensure that fuels, lubricants and auxiliary materials are disposed of in an environmentally friendly manner. The regulations for proper waste recycling and disposal must be complied with.
- The CHP plant is only allowed to be lifted at the holding points provided.
- Only approved load lifting and slinging equipment is allowed to be used to lift the CHP plant.
- When selecting suitable load-bearing equipment, the total weight of the CHP plant must always be taken into account.
- Observe the permissible floor load when transporting away.
- Please also read chapter 7 "Installation, connection and initial commissioning".
- Please also read chapter 2 "Safety".

CAUTION

Risk of injury!

To avoid damage to the plant or life-threatening injuries during decommissioning of the CHP plant, secure the working area for decommissioning over a wide area and ensure that the equipment is disposed of in an environmentally sound manner. Please also read the "Safety" chapter.

5.2.2. Final decommissioning and disposal

Entrust the final disposal of the CHP plant to a qualified specialist company. The final decommissioning and disposal also requires the complete deinstallation of the entire power supply system.

DANGER

Danger of fatal injury!

The electrical equipment of the CHP plant and the internal supply lines must only be uninstalled by trained electricians!

5.2.3. Corrosion protection

Measures for corrosion protection are necessary if the CHP plant is shut down for a period of more than six weeks or is not put into operation within six weeks of delivery or indication of readiness for shipping.

The following activities must be carried out to provide corrosion protection to the CHP plant:

- Clean the CHP plant thoroughly. If using a high-pressure cleaner, the ignition system and other electronic components should be covered.
- Add a suitable corrosion protection oil to the lubricating oil (see manufacturer's information regarding the mixing ratio). The engine should then be operated at idling speed for about ten minutes.
- Drain the coolant, do not close the drain holes again.
- Close the intake and exhaust lines.

5.2.4. Waste disposal

If scrapping is planned, the various materials used must be taken into account. The CHP plant consists of various metals such as steel and aluminium as well as copper wire as part of the electrical system. The CHP plant must be completely dismantled for disposal. The assemblies and components must be sorted according to the materials they contain.

WARNING

Warning of environmental hazards!

Comply with all local environmental regulations!

The parts to be scrapped must be taken to the appropriate collection points for recycling in accordance with the legal regulations of the country of installation.

- Metal parts must be sorted by type of metal and made available for shredding or scrapping.
- Plastics must be separated and disposed of for recycling.
- Electrical components (motors, switches, cables, etc.) must be disposed of in accordance with regulations.

In the event of final decommissioning, A-TRON will take back all plant components. Fuels are excluded from this commitment. The owner is responsible for their recycling or disposal.

6. ATROMATIC operating instructions

6.1. Introduction

These operating instructions are intended to help you understand the process of your CHP plant control unit. We recommend that you read this manual carefully before operating your control unit and changing settings.

In order to avoid misunderstandings, pay particular attention to the notes marked as follows:

Notice:

6.2. Menu structure

The controller has a 7" touch panel that enables you to navigate through the menu structure intuitively. You can quickly obtain the required information about the system status, current settings, energy values and the history.

The menu structure is divided into main menus and the corresponding submenus. In addition, the ATROMATIC 7.0 control unit includes several user levels that are protected by corresponding password entries.

There is no need for a password to view the main screen and the details that lead to additional views.

1. Details
    - 1.1. History
        - 1.1.1. Year data
        - 1.1.2. Electrical power
            - 1.1.2.1. Today
            - 1.1.2.2. Week
            - 1.1.2.3. Month
        - 1.1.3. Temperatures
            - 1.1.3.1. Temperatures (week)
            - 1.1.3.2. Temperatures (switch-off)
        - 1.1.4. Error
        - 1.1.5. Log history
        - 1.1.6. Warning history
    - 1.2. Power – Output – Network – Motor
    - 1.3. Temperatures
    - 1.4. Oil change / service interval
    - 1.5. System information

2. Code / setup

User level 1

- 2.1. Power curve
- 2.2. Schedule
- 2.3. Time / Date
- 2.4. LAN
- 2.5. E-mail
- 2.6. Additional functions
    - 2.6.1. Binary outputs
    - 2.6.2. Boiler block
    - 2.6.3. Cascade
    - 2.6.4. Thermal load connection
    - 2.6.5. Speed-controlled pump control
    - 2.6.6. Storage level control
    - 2.6.7. CO monitor
    - 2.6.8. M-bus

User level 2

- 2.6.9. Oil change
- 2.6.10. Service interval
- 2.6.11. Specified output
- 2.6.12. Fresh oil pumps
- 2.6.13. System operator
- 2.6.14. Serial number
- 2.6.15. Temperature configuration
- 2.6.16. Hand control
- 2.6.17. Other parameters
    - 2.6.17.1. Automatic mode
    - 2.6.17.2. Control
    - 2.6.17.3. Statistics
    - 2.6.17.4. Others
- 2.6.18. Save / load parameters

- 2.6.19 Stop mode / error
- 2.6.20 Error list
- 2.6.21 Warning

6.3. Main screen

The main screen contains an overview of the most important information. In addition, it is your starting point to access the further setting options and further information. The main screen shows 10 areas.

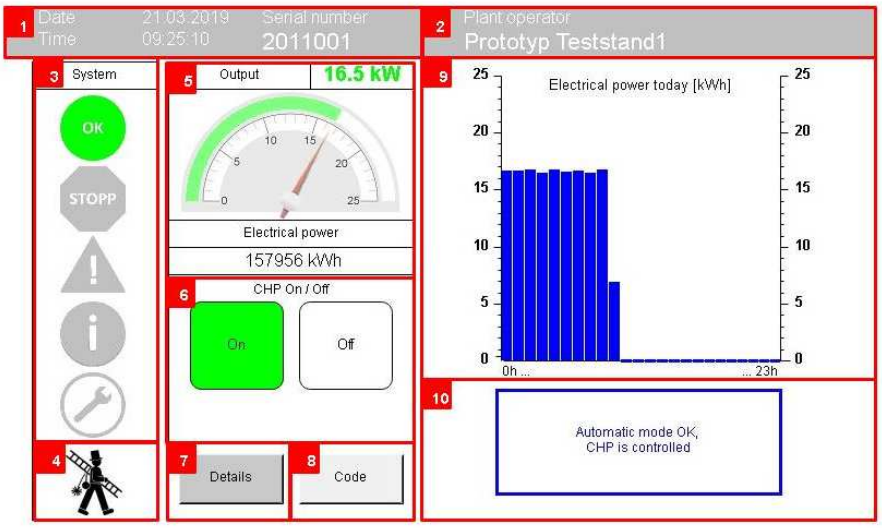


Figure 11: ATROMATIC main screen

1. At the top left is the current date and time.
2. In this area you can see the individual serial number of the CHP plant and the name of the system operator.
3. The system status displays the current status of the CHP plant. The current status is highlighted in colour, while the other operating statuses appear grey.

   The system status is structured as follows:

System status

OK = The CHP plant is running perfectly

STOP = The CHP plant was stopped due to an error

WARNING = Temperatures exceed a limit value

INFO = Message about service due, e-mail settings, communication

SERVICE = Manual control active, automatic oil change

4. **Chimney sweep function:** This function is used by the chimney sweep for regular exhaust gas measurements. See also section 4 – Chimney sweep function.
5. **Output / electrical power:** Displays the current electrical active power as a number and in the form of a pointer. Presents the total supplied electrical power starting from the date when the CHP plant was commissioned.
6. **Switching on and off:** Pressing the "On" button switches on the CHP plant; the machine starts up automatically and is then controlled according to the output specification. Pressing the "Off" button once switches the CHP plant off and a soft shutdown is performed. The "Hard stop" appears below the "Off" button. Pressing the "Hard stop" button switches off the CHP plant quickly (hard stop – not recommended).
7. **Details:** After pressing this button, a menu appears which provides information about the history, power, output, network, motor, temperatures, oil changes, service interval and system info.
8. **Code:** Pressing this button activates the password request. After the password has been entered, the name of the "Code" button changes to "Setup". After the button, now called "Setup", has been pressed again, the next user level opens and the User menu appears.
9. **Electrical power today:** A bar shows the quantity of energy (electricity) produced by the CHP plant per hour.
10. **Information window:** This window shows the current status of the CHP plant. You can also see what the operating mode of the CHP plant is here.

6.3.1. Chimney sweep function

For the regular exhaust gas measurements by the chimney sweep, the chimney sweep function button also allows the CHP plant to be started in standby mode. This function allows you to demand the maximum power within the adjustable time (by default 10 minutes) independent of the current nominal output (point 1). The function is automatically stopped after 10 minutes. If the measurements have been completed before, the function can also be stopped manually. Within this window, helpful data is available to the chimney sweep (point 2).

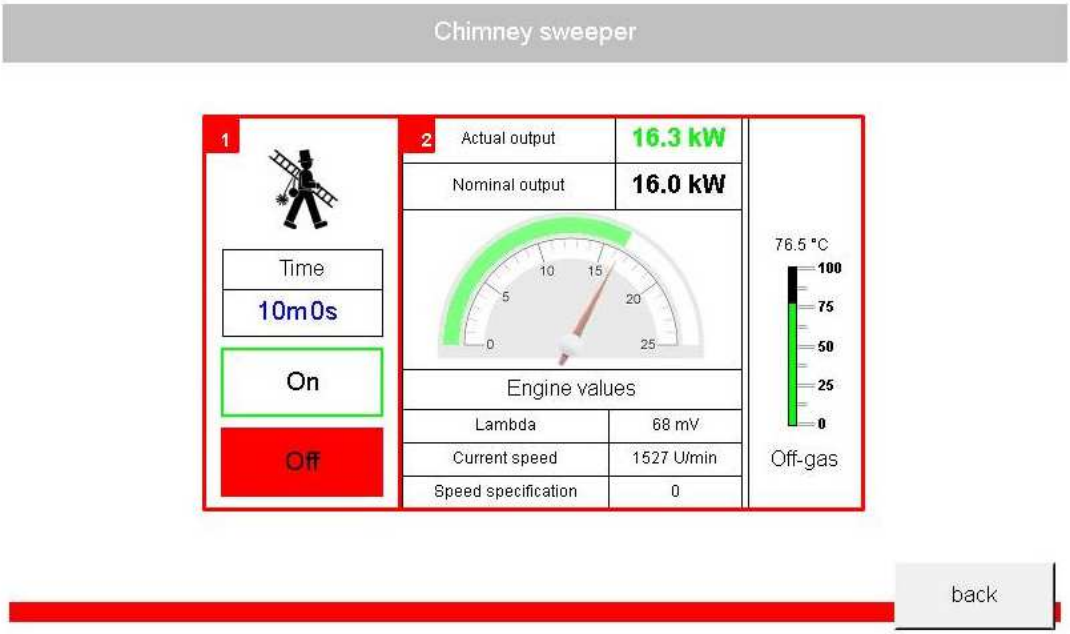


Figure 12: Chimney sweep function

Notice:

- The display must show the main screen (see section 3).
- If temperature increases above the set warning limits occur within the activated chimney sweep function, the CHP plant continues to reduce the output until the temperatures reach normal values.
- If the temperatures reach the limit value for temperature stop, the CHP plant quickly switches to standby mode or stop mode.

6.4. Details: (menu structure 1.)

When you press the "Details" button, you reach the menu structure 1 and the following window opens:

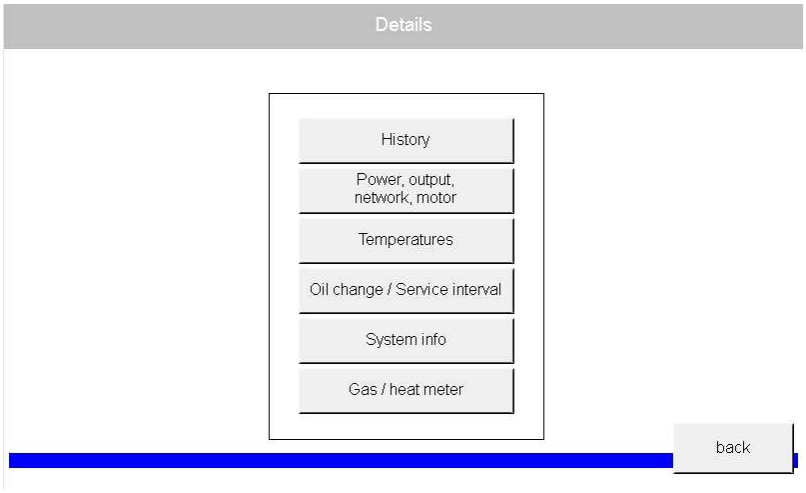


Figure 13: Menu – Details

6.4.1. History: (menu structure 1.1.)

When you press the "History" button, you reach the menu structure 1.1. and the following window opens. The history includes a collection of data, display values and information about the electrical power, temperature curves, errors, logs, warnings, etc. from the past.

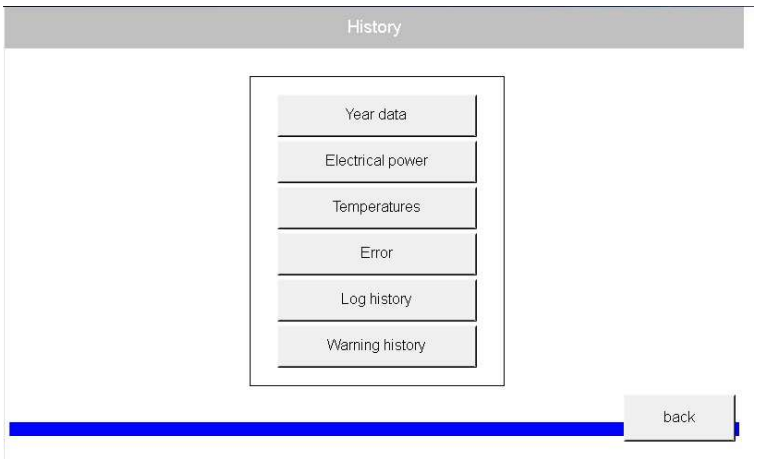


Figure 14: Menu – History

Year data: (menu structure 1.1.1.) When you press the "Year data" button, the following window opens. Use the arrow keys (see point 1 of the figure) to go to the desired year for which you want to retrieve the respective data.

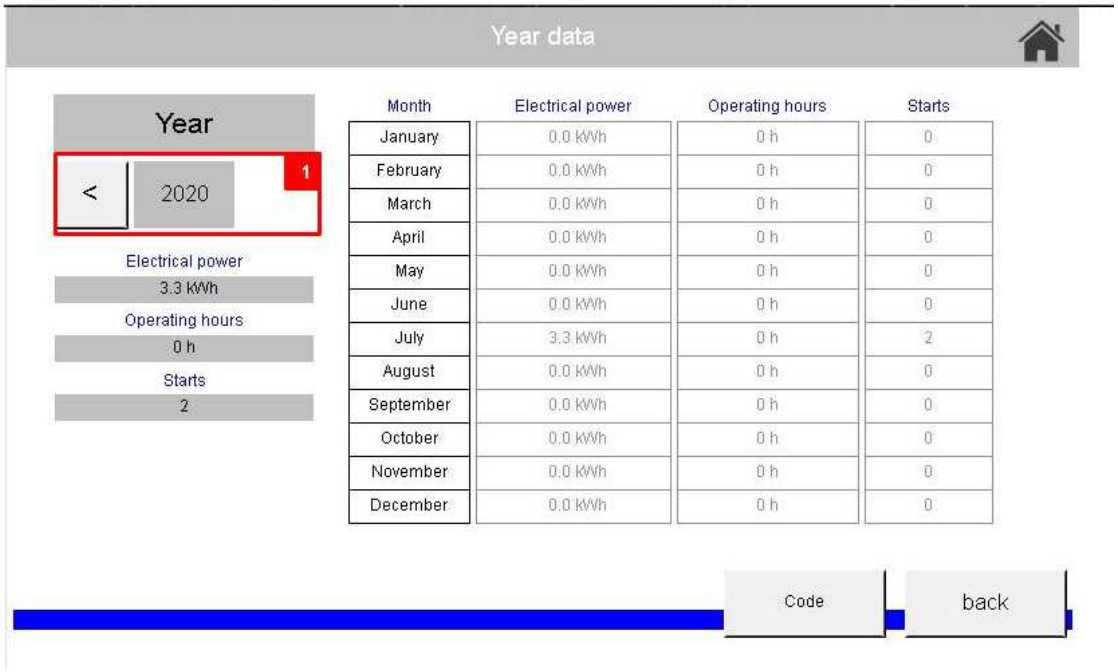


Figure 15: Menu - Year data

Electrical power: (menu structure 1.1.2.) When you press the "Electrical power" button, the following window appears, in which you can call up the display of the electrical power produced on a daily, weekly or monthly basis.

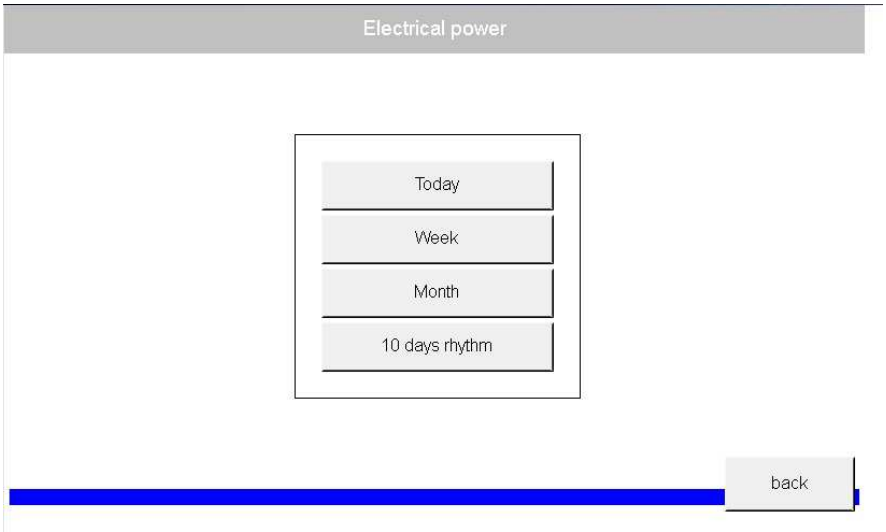


Figure 16: Menu - Electrical power 1

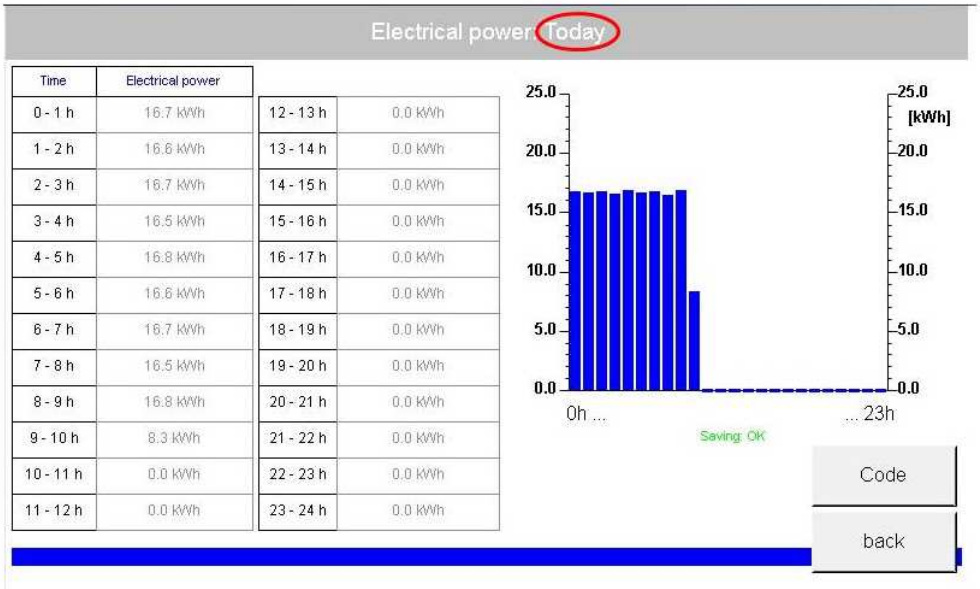


Figure 17: Menu - Electrical power 2

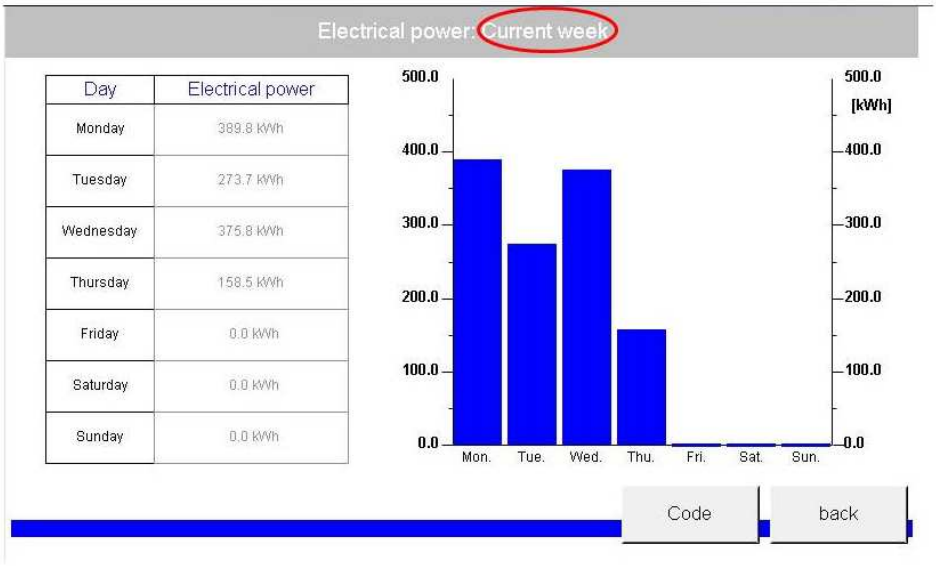


Figure 18: Menu - Electrical power 3

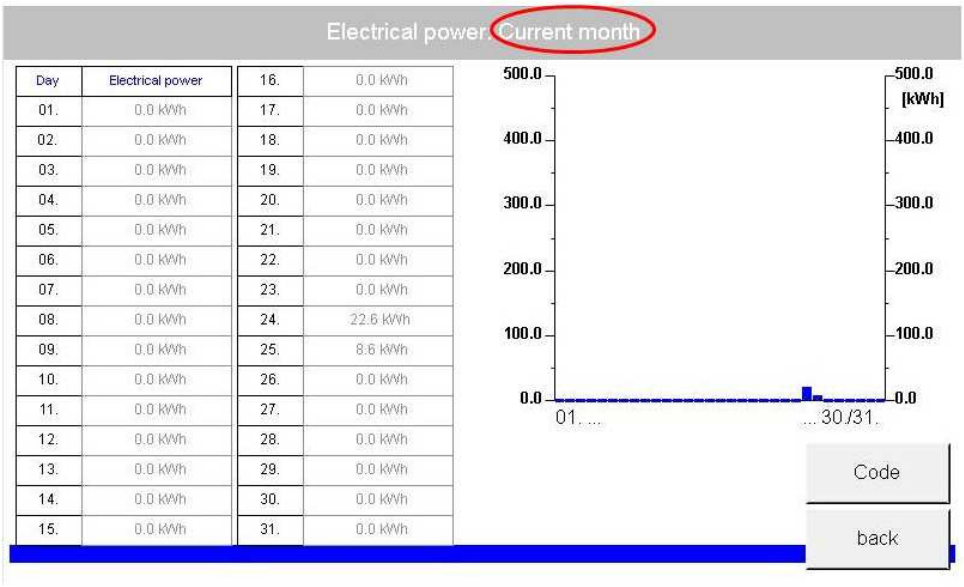


Figure 19: Menu - Electrical power 4

Temperatures: (menu structure 1.1.3.) Pressing the "Temperatures" button displays the temperature curves from the last seven days "Temperatures (Week)" of generator winding, engine oil, heating circuit return, heating circuit flow, outside temperature, exhaust gas, engine coolant inlet and engine coolant outlet.

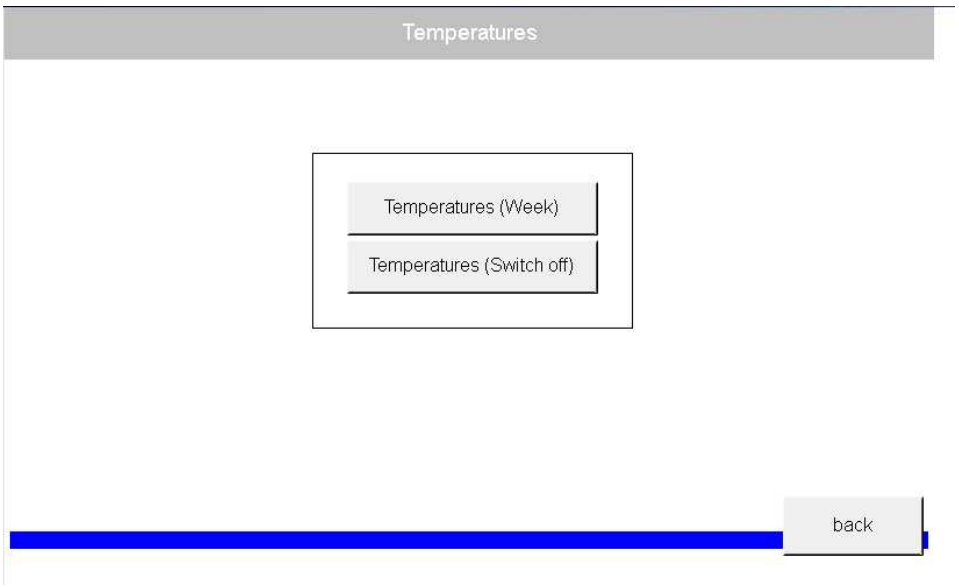


Figure 20: Menu – Temperatures 1

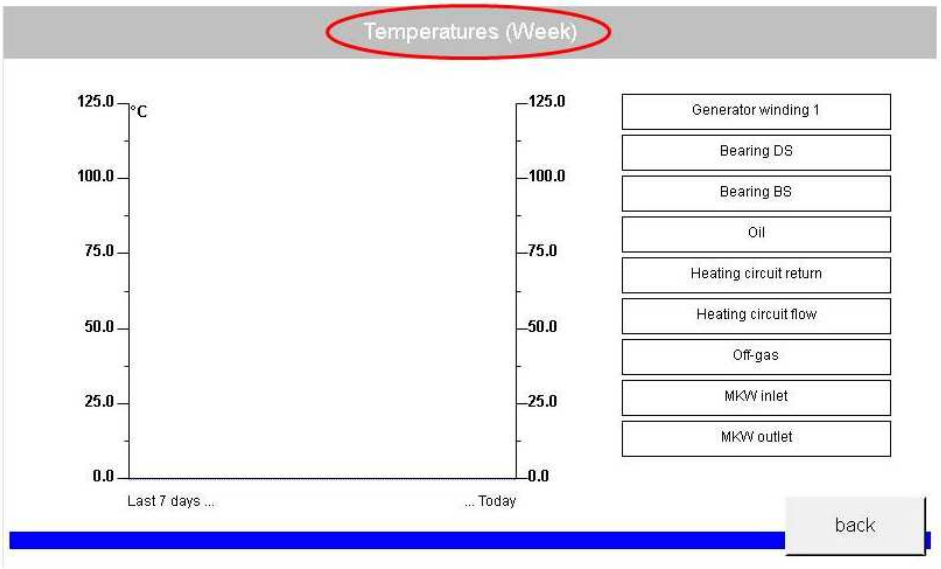


Figure 21: Menu – Temperatures 2

You can also press the "Temperatures (Switch off)" button to display the temperature curves of the last switch-off of the CHP plant.

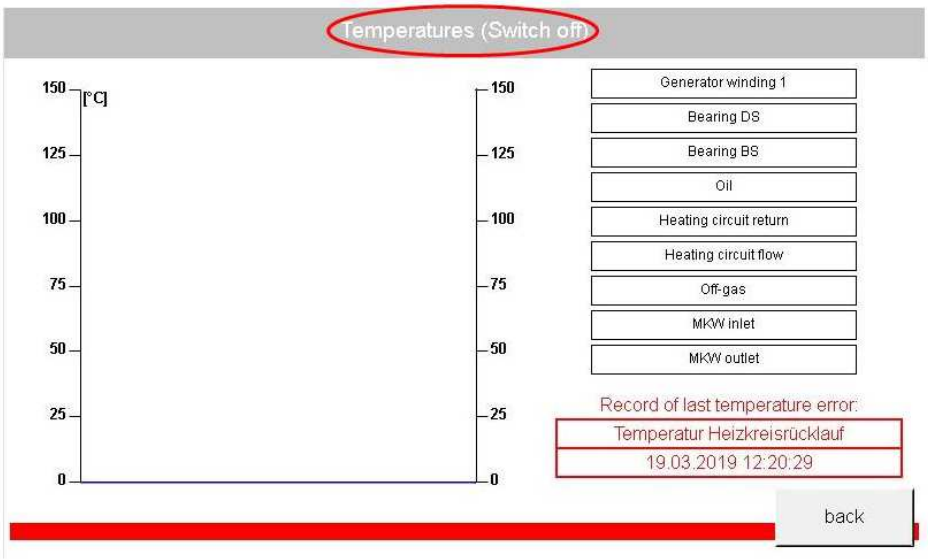


Figure 10: Menu – Temperatures 3

Error: (menu structure 1.1.4.) When the "Error" button is pressed, the following window opens. This window contains a list of the error history. The "Details" button is located to the right of the respective error message (see point 1 of the figure). When this button is pressed, the details of the respective error are displayed in order to ensure fast diagnosis or troubleshooting.

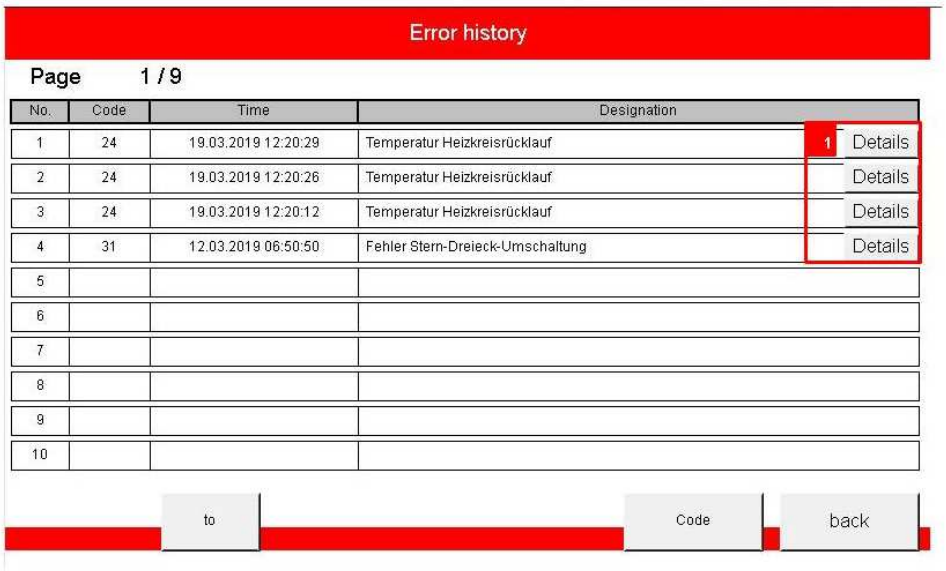


Figure 23: Menu - Error history 1

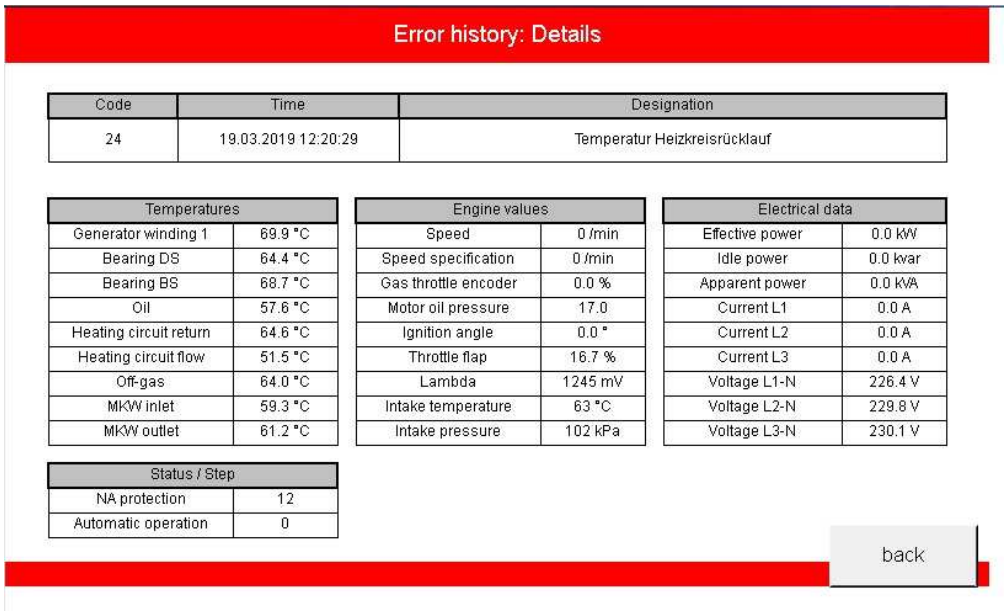
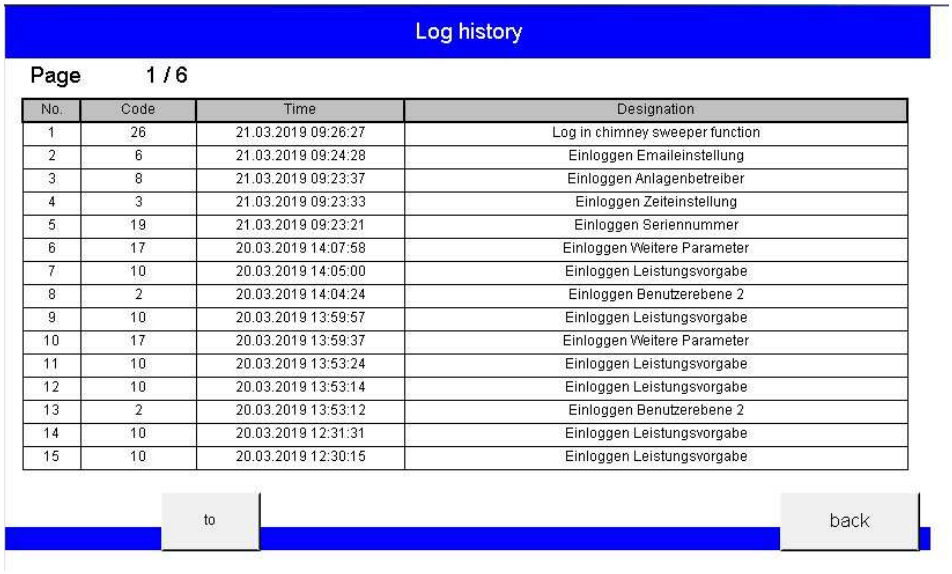


Figure 24: Menu - Error history 2

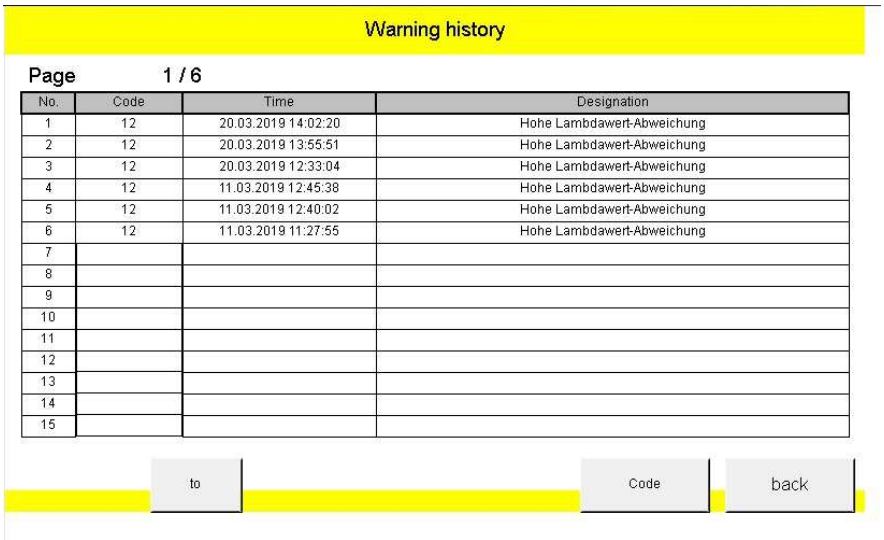
Log history: (menu structure 1.1.5.) When the "Log history" button is pressed, all manual interactions with the control unit of the CHP plant (e.g. login of user, change of parameters, emergency stop switch pressed, etc.) are listed, saved and displayed. All processes listed here are saved and can no longer be changed.



No.	Code	Time	Designation
1	26	21.03.2019 09:26:27	Log in chimney sweeper function
2	6	21.03.2019 09:24:28	Einloggen Emaileinstellung
3	8	21.03.2019 09:23:37	Einloggen Anlagenbetreiber
4	3	21.03.2019 09:23:33	Einloggen Zeiteinstellung
5	19	21.03.2019 09:23:21	Einloggen Seriennummer
6	17	20.03.2019 14:07:58	Einloggen Weitere Parameter
7	10	20.03.2019 14:05:00	Einloggen Leistungsvorgabe
8	2	20.03.2019 14:04:24	Einloggen Benutzerebene 2
9	10	20.03.2019 13:59:57	Einloggen Leistungsvorgabe
10	17	20.03.2019 13:59:37	Einloggen Weitere Parameter
11	10	20.03.2019 13:53:24	Einloggen Leistungsvorgabe
12	10	20.03.2019 13:53:14	Einloggen Leistungsvorgabe
13	2	20.03.2019 13:53:12	Einloggen Benutzerebene 2
14	10	20.03.2019 12:31:31	Einloggen Leistungsvorgabe
15	10	20.03.2019 12:30:15	Einloggen Leistungsvorgabe

Figure 25: Menu - Log history

Warning history: (menu structure 1.1.6.) When the "Warning history" button is pressed, all warnings of reached temperature limits are listed, saved and displayed. Here, too, all warning messages are stored and cannot be changed.



No.	Code	Time	Designation
1	12	20.03.2019 14:02:20	Hohe Lambdawert-Abweichung
2	12	20.03.2019 13:55:51	Hohe Lambdawert-Abweichung
3	12	20.03.2019 12:33:04	Hohe Lambdawert-Abweichung
4	12	11.03.2019 12:45:38	Hohe Lambdawert-Abweichung
5	12	11.03.2019 12:40:02	Hohe Lambdawert-Abweichung
6	12	11.03.2019 11:27:55	Hohe Lambdawert-Abweichung
7			
8			
9			
10			
11			
12			
13			
14			
15			

Figure 26: Menu – Warning history

6.4.2. Power, Output, network, motor: (menu structure 1.2.)

Back in the "Details" menu, the following window opens after the "Power, Output, Network, Motor" button is pressed. This window displays current information about the CHP plant. (see figure below).

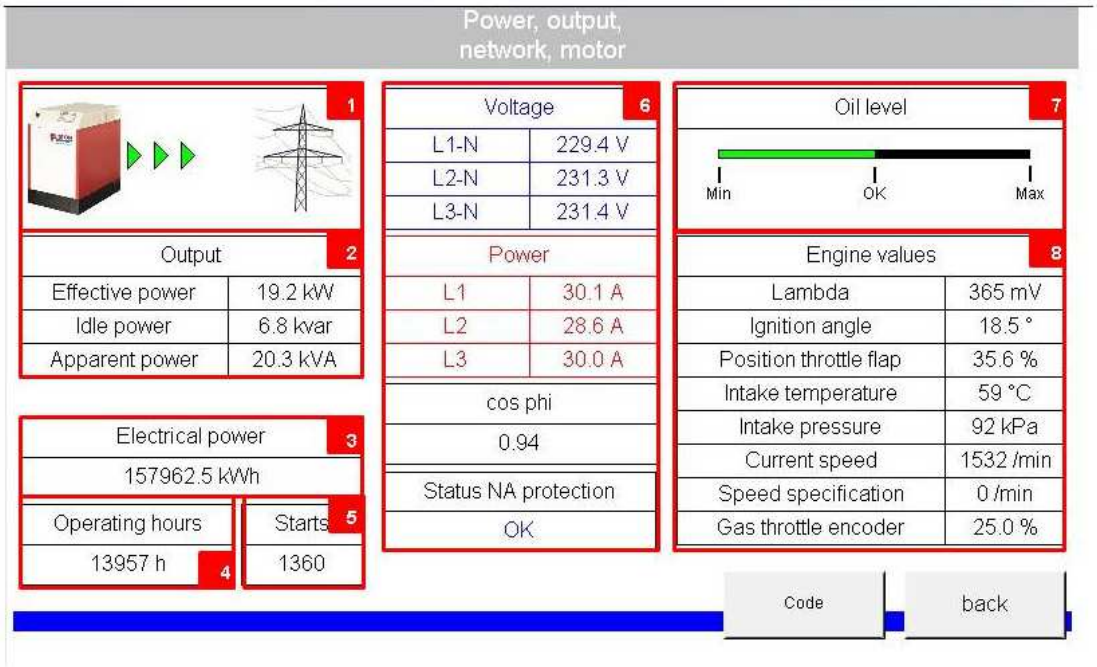


Figure 27: Menu - Power, Output, Network, Motor

1. **Feed-in:** If there is a current feed-in into the building's power system and/or the public grid, this is indicated by arrows.
2. **Output:** Display of the current active, reactive and apparent power.
3. **Electrical power:** Display of the total power (electricity) produced by the CHP plant since the time of commissioning.
4. **Operating hours counter:** Display of the total operating hours of the CHP plant (running operation) since the time of commissioning.
5. **Starts:** Display of all start processes of the CHP plant since the time of commissioning. (The ratio of starts to operating hours should not be less than 1:3).
6. **Voltage:** This area displays the current power system values of the individual phases for voltage and current as well as the cos phi. The power system and plant protection (NA protection) indicates the current status. If the power system complies with the standards, the NA protection releases the plant and displays the status "OK".
7. **Oil level:** Indication of the filling level of the oil sump at the levels: Min – OK – Max.
8. **Engine values:** This area displays the data currently sent by the engine control unit (ECU).

6.4.3. Temperatures: (menu structure 1.3.)

When you press the "Temperatures" button, the following window opens. In and on the CHP plant there are sensors which measure the current temperatures of various components such as generator winding and bearings, engine oil, heating circuit return, heating circuit flow, exhaust gas, engine coolant circuit inlet and engine coolant outlet. Pressing the respective button of the designated components displays the respective momentary values. All temperatures from the last 30 minutes are also recorded. (see figure)

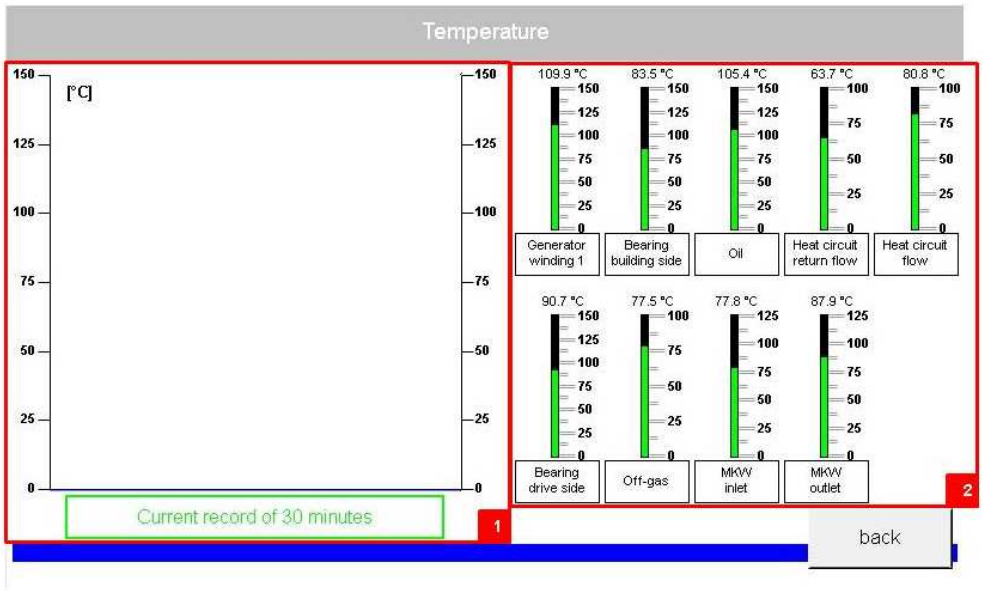


Figure 28: Menu – Temperatures (details)

1. **Recorded temperatures:** Recorded values from the last 30 minutes
2. **Current temperatures:** Click on the respective button to display the last 30 minutes of the selected temperature in the window on the left.

The following temperatures are recorded:

Generator:	Temperatures of the generator winding as well as bearings A and B
Exhaust system:	Temperature in the exhaust pipe
Oil:	Temperature of the oil in the internal combustion engine
Heating circuit return:	Temperature in the heating system return
Heating circuit flow:	Temperature in the heating circuit flow
Engine coolant inlet (MKW inlet):	Return temperature to engine
Engine coolant outlet (MKW outlet):	Flow temperature from engine

6.4.4. Oil change / service interval: (menu structure 1.4.)

Pressing the "Oil change / service interval" button opens the following window. It shows the remaining time in operating hours until the next oil change and service visit.

If the time for the oil change has expired, the CHP plant automatically changes to "standby mode" and carries out a fully automatic oil change. This involves drawing used oil out of the engine and pumping it into the used oil tank. Then, fresh oil is pumped out of the fresh oil tank into the engine. The CHP plant starts automatically after the automatic oil change has finished.

If a service visit by the maintenance technician is due, the "INFO" display lights up in the system status box (main screen). The CHP plant continues to run until the next automatic oil change is due. The CHP plant switches off automatically when the time for the oil change is reached. After the maintenance (service) has been performed by an authorised service technician, the service interval is reset and starts again.

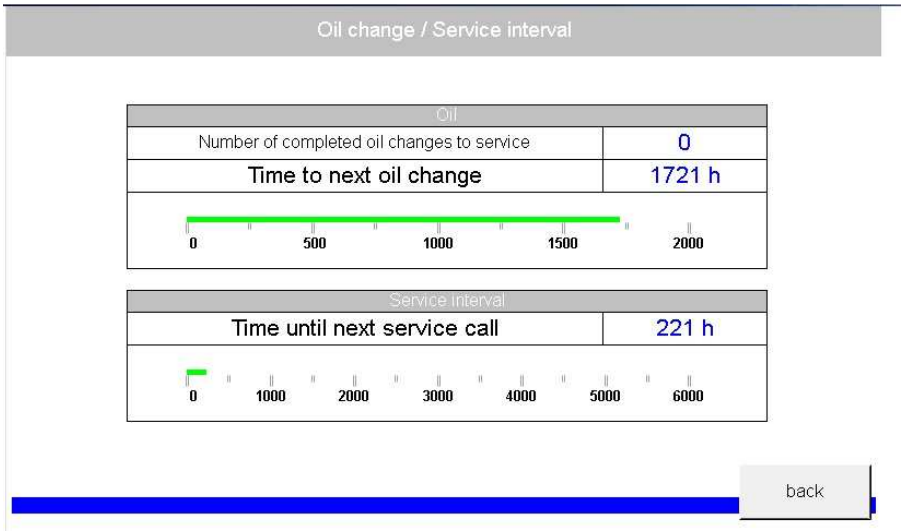


Figure 29: Menu – Oil change

6.4.5. System information / language: (menu structure 1.5.)

When the "System info" button is pressed, the window shown below opens. The components installed in the CHP plant, the serial number of the SN controller, the system software and the current software version are displayed. (See point 1 of the figure).

Furthermore, this window provides information about the currently set "Maximum effective electrical power" as well as the status of the "NA protection", the "Internal network monitoring", the "External release digital" and the "External hard stop with delay". This window also displays the "Type electric meter", the set "Type start-up process" and the "Type gas throttle".

It is recommended that these settings should not be changed, as changing individual parameters can damage the CHP plant or individual components.

In the lower area the respective – preset – national language is displayed (see point 2 of the figure).

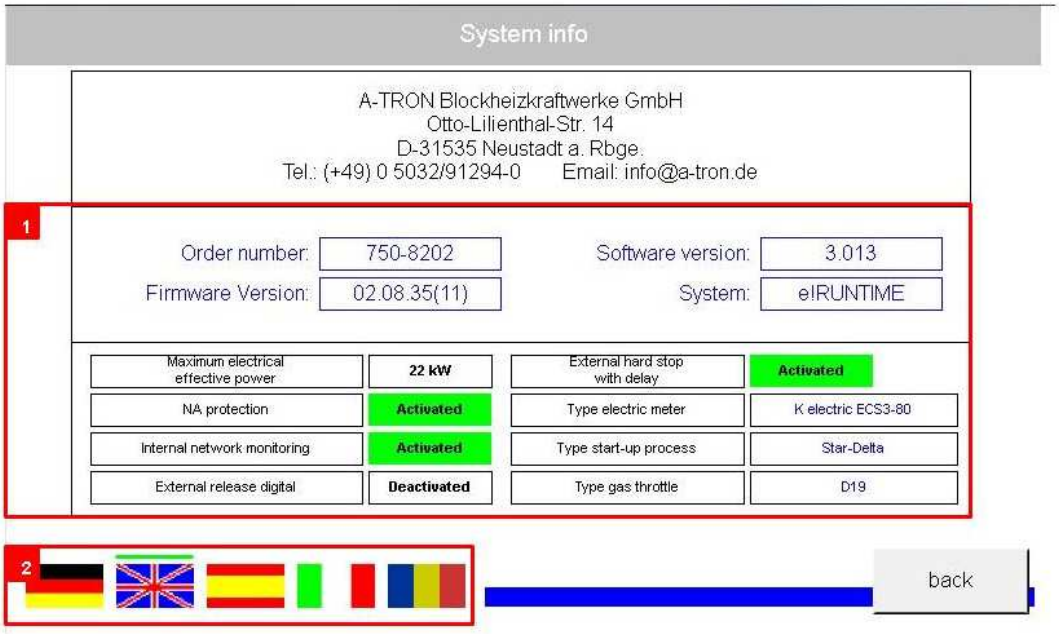


Figure 30: Menu – System information

6.5. Code / setup: (menu structure 2.)

Pressing the "Code" button on the main screen (see Figure 11: ATROMATIC main screen) calls up the password request. This is required because access to the various setting parameters is defined by the user levels.

User level 1 contains setting options that the customer / operator can carry out independently following instruction from the service technician.

User level 2 contains additional setting options for service technicians.

User level 3 is exclusively intended for works employees. This level can be used to change all basic settings of the CHP plant.

6.6. User level 1:

After you have entered your password for user level 1, the name "Code" changes to "Setup". When you press the "Setup" button again, the following menu appears:

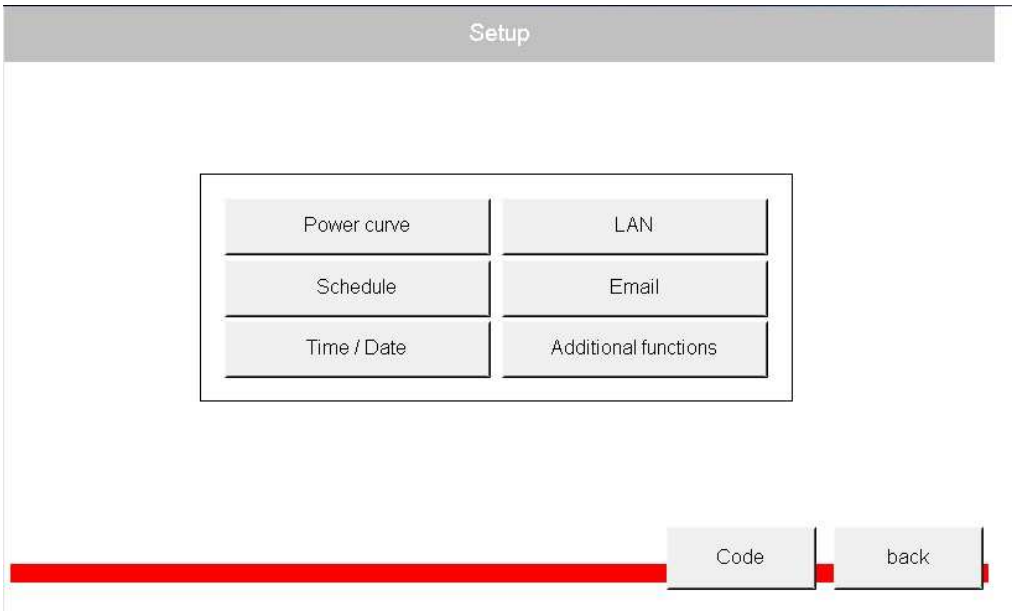


Figure 31: Menu – User level 1

6.6.1. Power curve: (menu structure 2.1.)

When you press the "Power curve" button, the following window opens:

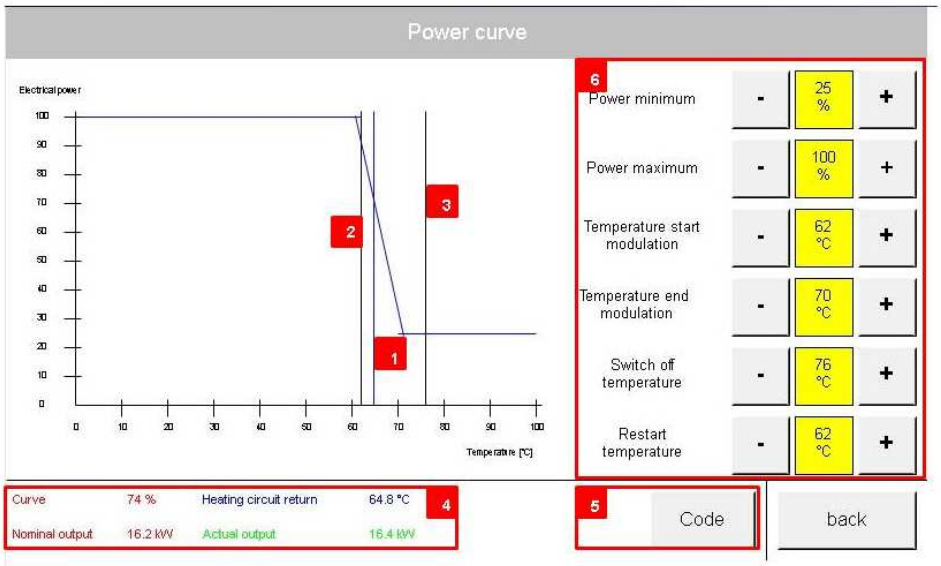


Figure 32: Menu – Power curve

The power curve can be seen in the diagram on the left. This power curve must be adapted to the power of the CHP plant as a function of the heating circuit return temperature and the associated modulation. By adapting this characteristic curve, the power of the CHP plant can be switched on and off in a modulated way depending on the heating circuit return temperature.

1. **Current temperature of the heating circuit return flow:** here 62.0 degrees Celsius pointer in diagram
2. **Restart temperature:** here 60 degrees Celsius. If the switch-off temperature is reached during operation, the CHP plant automatically switches to standby mode. The heating pump is cycled to maintain the current temperatures of the heating circuit return flow. If the temperature of the heating circuit return falls below the restart temperature, the CHP plant restarts.
3. **Switch-off temperature:** If the temperature of the heating circuit return reaches the switch-off temperature (here 76 degrees Celsius), the CHP plant automatically switches to standby mode and the heating pump is activated again.
4. **Current values:** This box shows the current parameters set for the characteristic curve, the nominal output, the heating circuit (HC) return flow and the actual output
5. **Password entry:** The switch-off temperature can be individually changed up to 75 degrees. For the switch-off temperature to be changed to above 75 degrees, a separate enable is required, which is protected by a password. In such a case, consultation with a A-TRON service technician is required.
6. **Setting options:** In this area, the power minimum and maximum individually adjusted to the building must be set. In between, the modulation start and end are set. The switch-off and switch-on temperatures allow the CHP plant to operate within these limits.

6.6.2. Schedule: (menu structure 2.2.)

The following menu opens when the "Schedule" button is pressed.

With this menu you have several possibilities to limit the maximum output of the CHP plant independent of the power curve at certain times or to set the CHP plant automatically to standby mode (see point 1 of the figure). After making the appropriate selection, you can create the respective "Daily" or "Weekly" schedule (see point 2 of the figure).

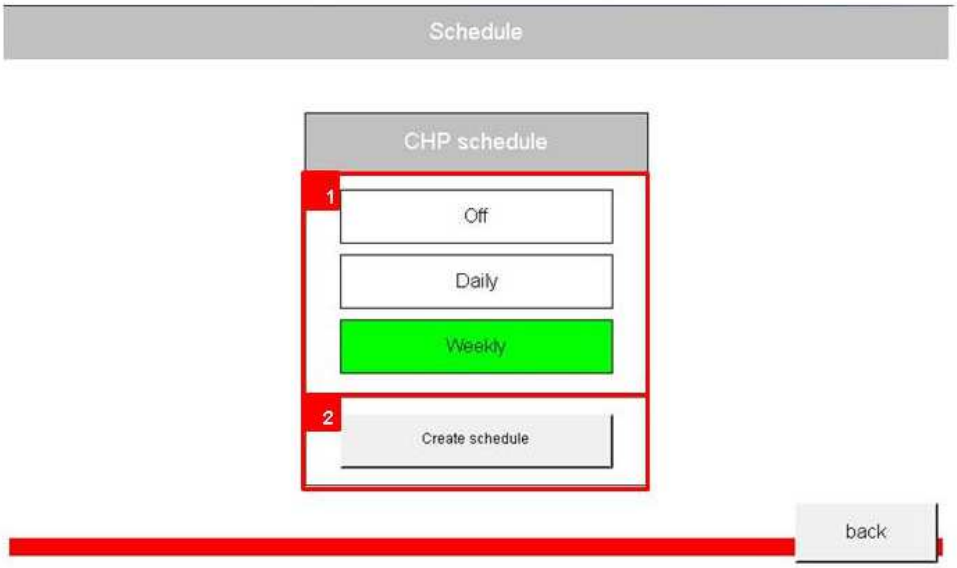


Figure 33: Menu – Schedule management

6.6.2.1. Daily:

After selecting the "Daily" schedule, press the "Create schedule" button. The following window will then open, providing you with three time windows in which the schedule is repeated daily. For setting a time window (see section 6.2.3).

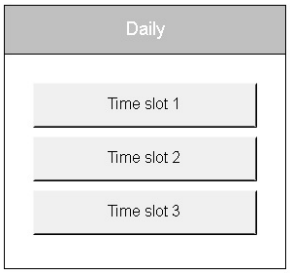


Figure 34: Menu – Schedule management 2

6.6.2.2. Every week:

If you select "Weekly", a maximum of three time windows are also available for each individual weekday. The schedule is repeated weekly. For setting a time window (see section 6.2.3 Schedule: time windows).

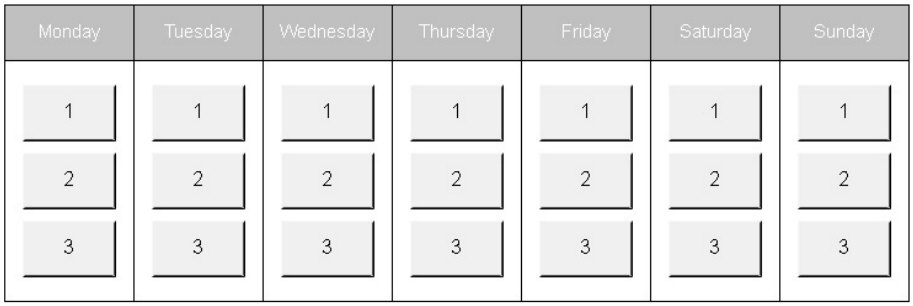


Figure 35: Menu – Schedule management 3

6.6.2.3. Setting time windows:

When a time window is activated, here in the example "Weekly->Monday->Time window 1" is selected (see point 1 of the figure), the CHP plant can be switched off (see point 3 of the figure) or a maximum power can be specified (see point 4 of the figure) within a time frame (see point 2 of the figure).

The output specification takes precedence over the power characteristic curve. If the output specification (nominal output) from the characteristic curve is higher than the maximum value set here, the output is limited to the value entered here.

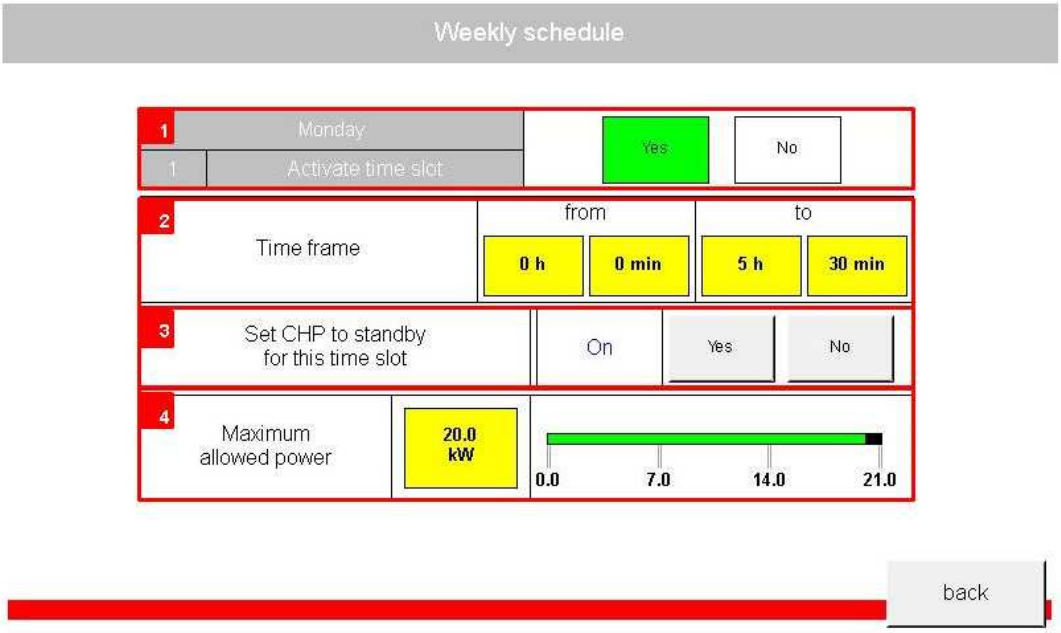


Figure 36: Menu – Schedule management 4

Notice:

- When making the settings, make sure that the times do not overlap. If the set times overlap, time window 1 has priority over the other two and time window 2 has priority over time window 3.
- When selecting the daily schedule, it is possible to select the times, e.g. from 23:00 h to 6:00 h (i.e. beyond the daily schedule 00:00 h).
- When selecting the weekly schedule, please note that the time windows can only be set between 0 h and 24 h. Time settings beyond the daily schedule 00:00 h are not taken into account.

6.6.3. Time / date: (menu structure 2.3.)

After pressing the "Time / Date" button, the following window opens.

After pressing the "Set time / date" button, the current time and date are entered in the following areas by touching the respective boxes.

Please consider the notation (example: hour – minute – second ##:##:##).

Please consider the notation (example: day – month – year ##:##:####).

If the values are only to be changed, the respective box must be ticked.

After completing your input, click "Set time" again or simply "Back".

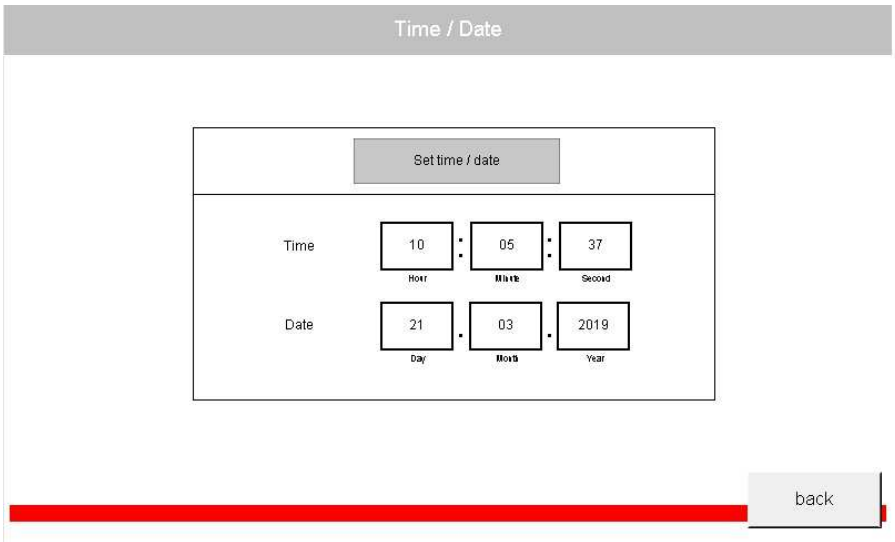


Figure 37: Menu – Date / time

6.6.4. LAN: (menu structure 2.4)

The CHP plant must be connected to the Internet for remote maintenance purposes. Remote maintenance is intended to prevent malfunctions and errors in the operation of the plant as far as possible.

In order to connect the CHP plant to customer-specific networks or new networks, the LAN settings are freely selectable. Tap the "LAN" button and the following window will open. If the information was already available to A-TRON, the following boxes will have been filled in already.

If any changes are required, tap the desired box (see point 1) and enter the new IP address. The same applies to the "Netmask" and "Gateway" boxes. Afterwards the transferred values must be saved by pressing the "Change IP" button (see point 2). The control unit only accepts the new settings once it has been restarted. Please press the "Reset" button to do this. Please make sure that the CHP plant was switched off before and is in the idle state (see point 3 and the note).

CAUTION!

If the preset addresses are changed, a connection to A-TRON remote maintenance is no longer possible!

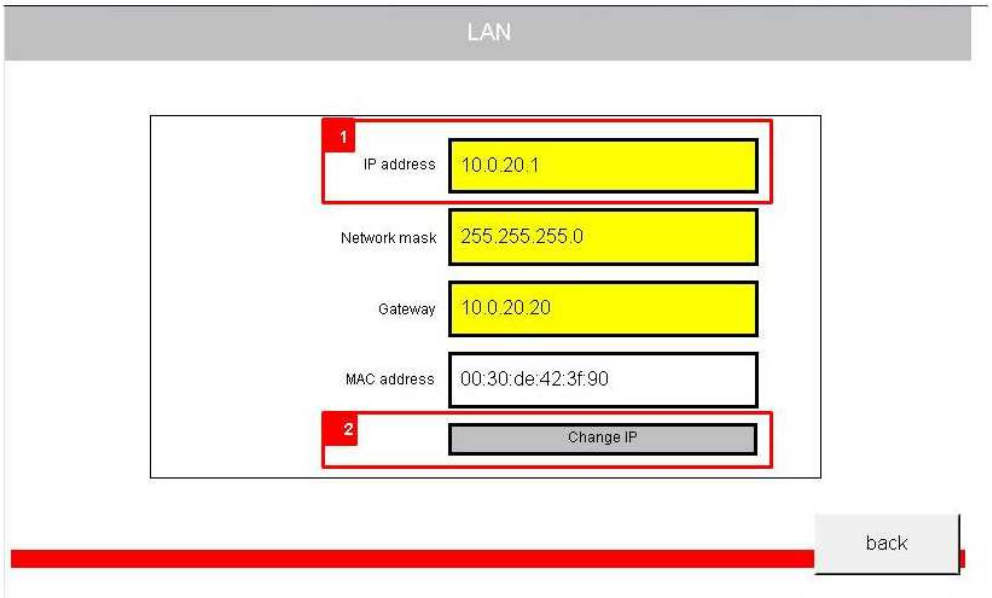


Figure 38: Menu – LAN

Notice:

- The control unit receives a fixed IP address, so there must be an area in the LAN in which the router allows fixed IP addresses and does not assign them by DHCP. If necessary, contact your IT employee or the A-TRON service technician.

- In order to be able to restart the control unit after changes (point 3), the CHP plant must be in the idle state (switched off) (main screen -> CHP plant: OFF). After restarting, the CHP plant including the control unit starts with the new values.

6.6.5. E-mail: (menu structure 2.5)

The control unit of the CHP plant offers the possibility to automatically send status messages as well as notifications via the e-mail function to various e-mail recipients.

When you press the "E-mail" button, the following window opens. In this window (under point 1) there is the possibility to enter e-mail recipients (e-mail addresses) for status messages. To do this, tap the line under "Email recipient". A keyboard will then open where you can enter your e-mail address. If several e-mail addresses are to be entered here, the respective e-mail addresses must be separated with a semicolon ";". Further e-mail recipients of status messages can also be entered in the line below "Email CC recipient".

For notifications of power messages, the "Activate email alert for supplied electrical energy" function must be activated (see point 2). The e-mail addresses of the e-mail recipients must then be entered in the respective lines (see point 3).

In the lower area (see point 4) you can select the intervals at which the power messages are sent to the registered e-mail recipients. To do this, select the respective button by touching it.

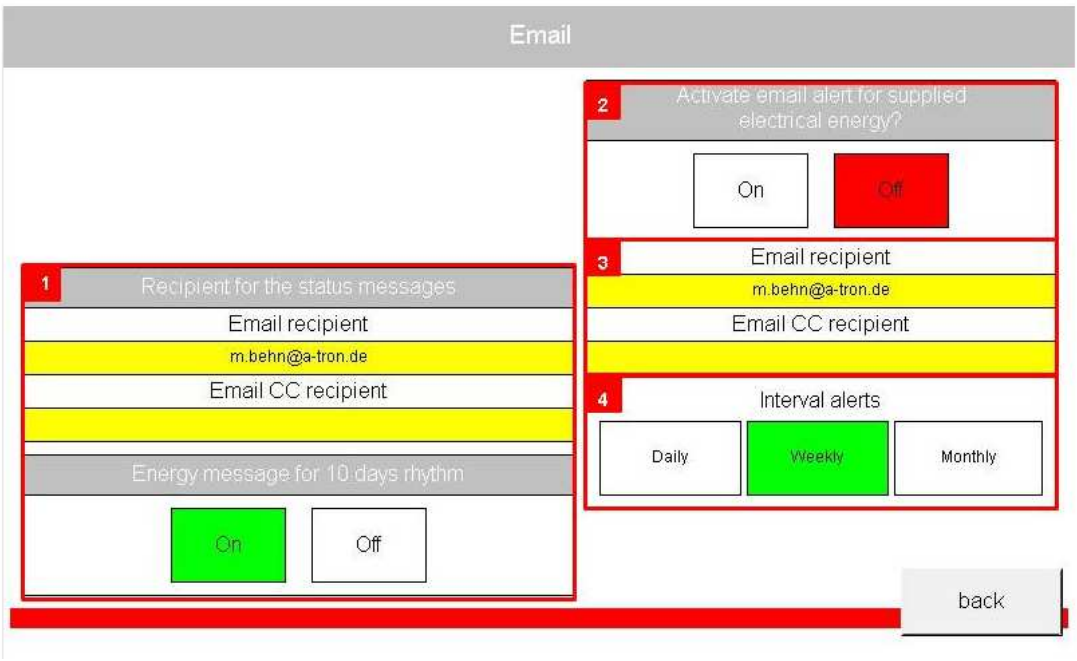


Figure 39: Menu – E-mail

Notice:

If several e-mail recipients are entered, the individual addresses must be separated by a semicolon ";" or comma ",". A line break or other characters are not allowed and lead to errors. Example: info@iqma-energy.de

6.6.6. Additional functions: (menu structure 2.6.)

The CHP plant has further additional functions which are either available as standard or can be purchased as optional additional packages.

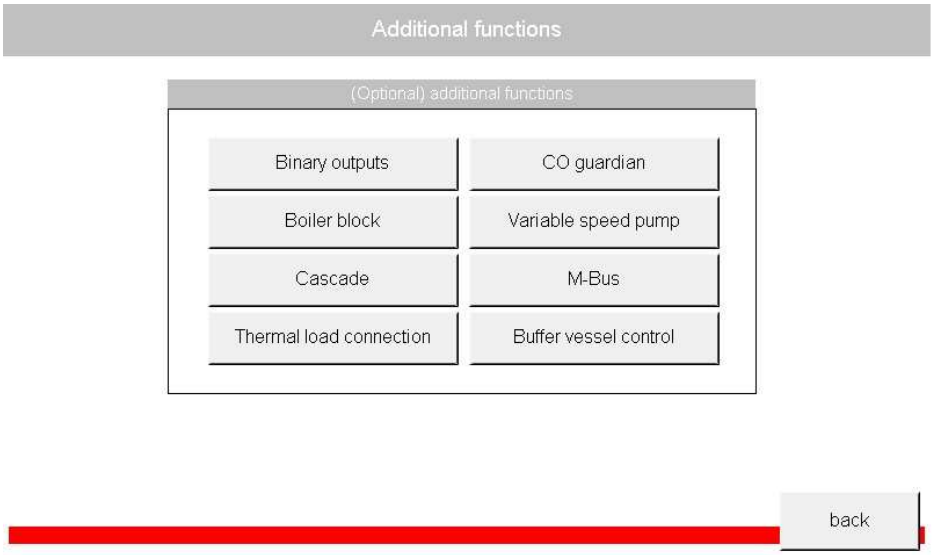


Figure 40: Menu – Additional functions

The standard equipment includes the following functions:

1. Boiler block
2. Binary outputs
3. Cascade
4. Thermal load connection

Optionally the following packages can be purchased for a surcharge:

1. CO monitor
2. High temperature control
3. M-bus interface
4. Storage level control
5. External specified output via 4-20 mA signal

6.6.6.1. Binary outputs: (menu structure 2.6.1.)

With the help of the "Binary outputs" it is possible to select different system statuses of the CHP plant in a simple way for a higher-level building control unit or a building control station.

With this option, potential-free contacts are switched which can be freely selected in the menu. Simply click the desired message, e.g. Collective fault messages on binary output 1 (point 1). All error messages are then transmitted to the higher-level control unit (BMS). It is also possible to select warning messages and/or in operation message (CHP plant running) and/or standby message (CHP plant in standby mode).

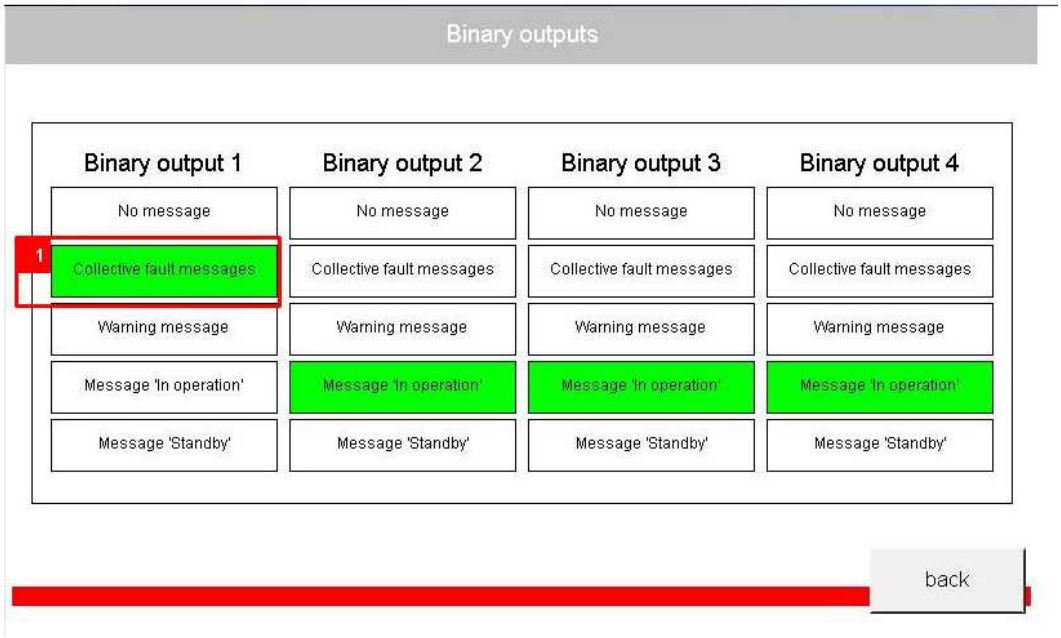


Figure 41: Menu - Binary outputs

Notice:

The connections of the contacts can be found in the circuit diagram / wiring diagram enclosed in your manual.

6.6.6.2. Boiler block: (menu structure 2.6.2.)

The boiler block is used to control a heating system connected in parallel. After pressing the "Boiler block" button, the following window opens. In order to be able to use the boiler block function, the relay for the boiler block must be connected in the control unit of the CHP plant as a normally open (NO) contact.

When the boiler block is activated (see point 1), the function checks the heating circuit return temperature around the modulation start point of the power curve.

As soon as the temperature rises above the set value for "Boiler block ON for", the boiler block is set. If the temperature falls below the set value for "Boiler block OFF for", the boiler is released and the peak load boiler should switch (see point 2). The values of the boiler block "ON" and "OFF" can be changed by pressing the respective button.

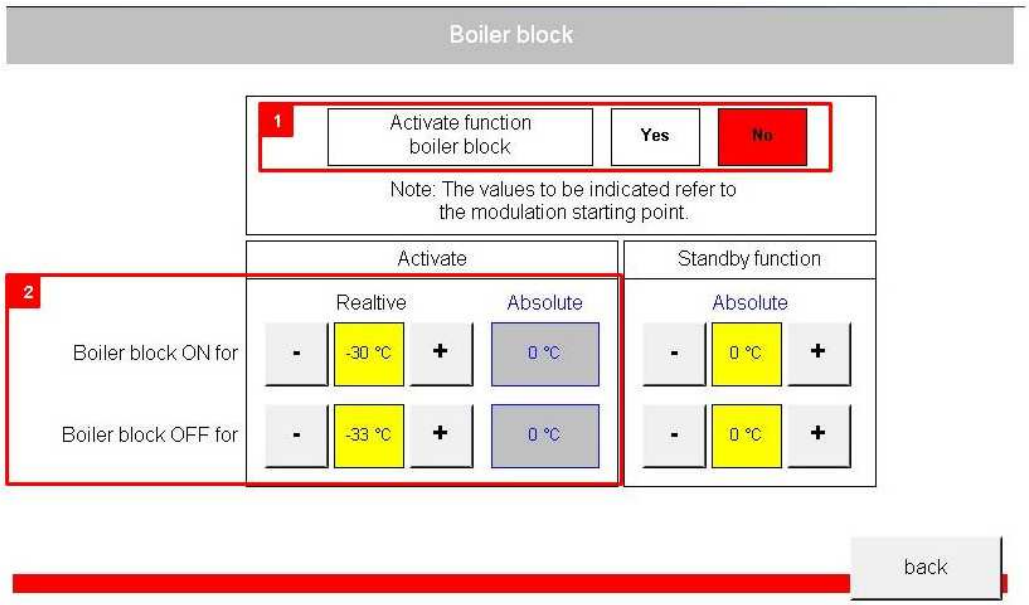


Figure 42: Menu – Boiler block

Notice: The relay for the boiler block in the control unit of the CHP plant (switch cabinet) should be connected as a normally open (NO) contact. Please contact your A-TRON service technician or your heating installer.

6.6.6.3. Cascade: (menu structure 2.6.3.)

The cascade function makes it possible to operate several A-TRON CHP plants in parallel and highly economically with the aim that only one CHP plant is in the modulation range when the heat demand decreases. The remaining CHP plants are either in standby mode or in full load mode. Consequently, it is possible to reduce the modulation range to as low as 5 kWh.

In order to obtain a balanced number of operating hours for all cascaded CHP plants, the power curves are automatically reassigned between them on a regular basis (6-hour intervals). This means that the maintenance technician can service all CHP plants at the same time after the service interval has expired, and the maintenance costs are reduced.

The prerequisite is that each CHP plant control unit is connected to the router or switch via a LAN cable, so that communication between CHP plants can be guaranteed. The respective CHP plants must also be marked either as "Master" or as "Slave".

The cascade function allows several installed A-TRON CHPs to be operated economically in parallel. The aim is to operate a maximum of only one CHP plant in the modulation range. The remaining CHP plants should either be in standby mode or run at full load.

In order to obtain a balanced number of operating hours between all CHPs, the power curves are regularly reallocated between them. This means that the maintenance technician can service all CHP plants at the same time after the service interval has expired.

Each individual control unit must be connected to a router or switch via a LAN cable and declared as either a "Master" or a "Slave".

When the "Cascade" button is pressed, the following window appears. When the cascade function is activated, the cascaded CHP plants communicate with each other.

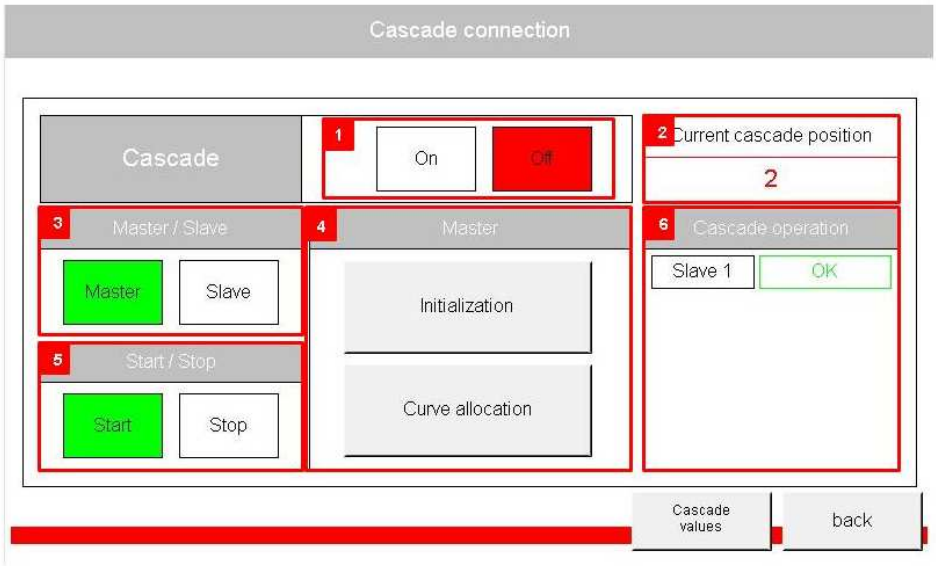


Figure 43: Menu - Cascade management 1

6.6.6.3.1. Setting as master:

The setting as master requires an initialisation with subsequent characteristic curve setting.

1. Possibility of switching the cascade function on or off.
2. Displays the cascade position. The current position in the cascade depends on the number of operating hours of the CHP plant and can be changed.
3. Possibility of setting the identification as master CHP plant or slave CHP plant.
4. If set as master CHP plant, initialisation steps must be carried out (see Initialisation). Subsequently, all characteristic curves must be entered (see Curve allocation).
5. After successful initialisation and the specifying the characteristic curves, the cascade can be started and the master CHP plant starts transferring the power curves to the respective slave CHP plants.
6. If communication exists with a slave CHP plant, OK appears here.
7. If no confirmation is sent from the slave CHP plant within a short time, an error message appears. In the event of such an error message, the master CHP plant ignores the faulty slave CHP plant and passes on the intended characteristic curve to the next available slave CHP plant.

Notice:

The power curve (under Settings->Power curve) can no longer be set manually when the cascade is activated because it is regularly overwritten.

Notice on power failure:

Caution! In the event of a power failure, the cascade control must be reinitialised and the plant errors must be rectified.

6.6.6.3.2. Initialisation:

When the "Initialisation" button is pressed, the following window appears.

For initialisation, the number of participants / slaves (non-master) must first be defined (point 1). Up to five slave CHP plants can be added to the cascade.

Example: A cascading of e.g. three CHP plants contains one master CHP plant and two slave CHP plants. Consequently, there are two participants to be entered.

The IP addresses of the individual slave CHP plants must then be entered at the master CHP plant (see point 3). The sequence indicates the identification number on the slave CHP plant. The IP number entered on the master CHP plant must match the IP number entered on the respective slave CHP plant.

Once the entry has been made, the participants can be searched for and the "Start" button (see point 2) must be pressed.

If the initialisation was successful, a confirmation appears in a green box (see point 3/4). If a slave is not connected, a specific and general error message appears.

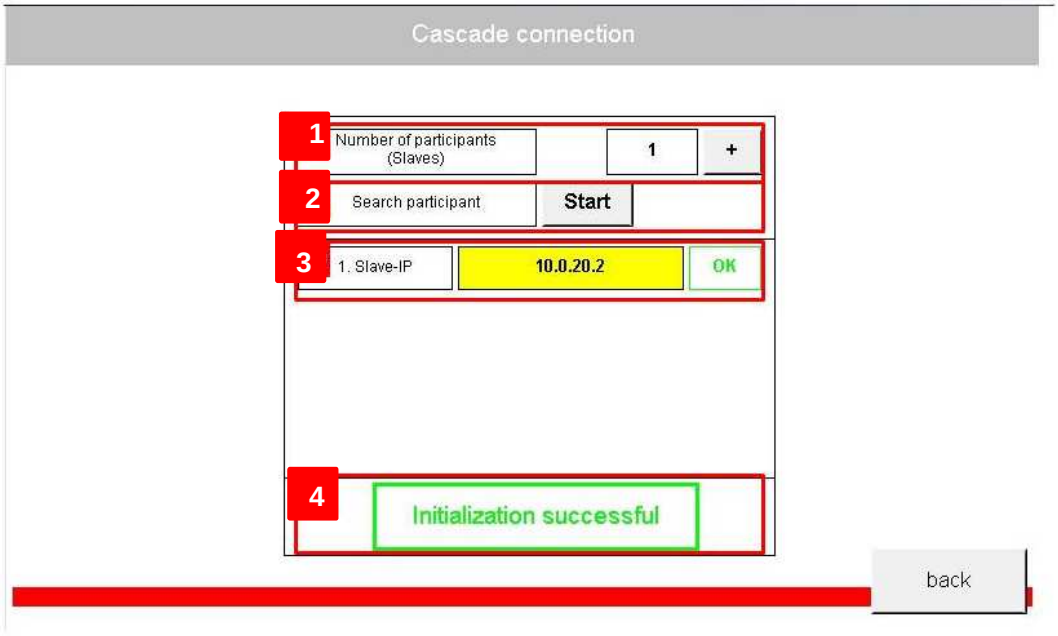


Figure 44: Menu - Cascade management 2

Notice:

The slave CHP plants must have been started before the initialisation of the master CHP plant (see section 6.7.3.2. Setting as slave).

If the initialisation is incorrect, check the LAN connection, the IP addresses and the associated slave IDs.

6.6.6.3.3. Curve allocation:

Pressing the "Curve allocation" button opens the following window.

When assigning characteristic curves, the number of characteristic curves to be set is equal to the number of CHP plants in the cascade.

The individual values can be entered in the yellow box, e.g. the modulation start point for CHP plant position no. 1 (blue box or see point 1). Differences of 5 degrees Celsius within the cascade should be taken into account. The individual values can be changed by tapping the respective box.

The assignment of the cascade position numbers and the characteristic curves to the participants depends on the number of operating hours of the respective participants and is inversely proportional. The participant with the highest number of operating hours gets the first position number and the participant with the lowest number of operating hours gets the last position number.

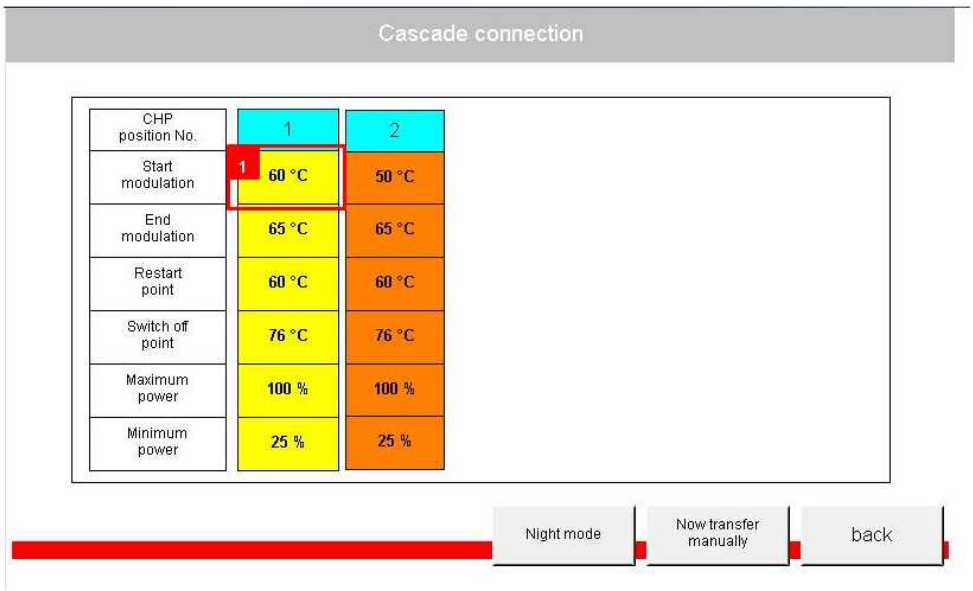


Figure 45: Menu - Cascade management 3

Notice: - Set the characteristic curves before starting the cascade.

6.6.6.3.4. Setting as slave:

In addition to the master, the remaining CHP plants must be declared as slaves. To do this, touch the "SLAVE" button in the "Cascade connection" window. The "Current cascade position", the "Master IP" and the "Slave ID" must then be entered.

Possibility of switching the cascade function on or off.

Displays the cascade position. The current position in the cascade depends on the number of operating hours of the CHP plant and can be changed.

Possibility of setting the identification as master CHP plant or slave CHP plant.

When setting as slave CHP plant, the IP address of the master CHP plant and the slave identification number (ID) must be entered.

Start or stop cascade function.

As soon as the cascade has been activated and started, the output transfer is checked. If everything is all right, an OK appears. If no specified value is sent within a certain time, an error appears and the CHP plant adopts the power characteristic stored during initialisation.

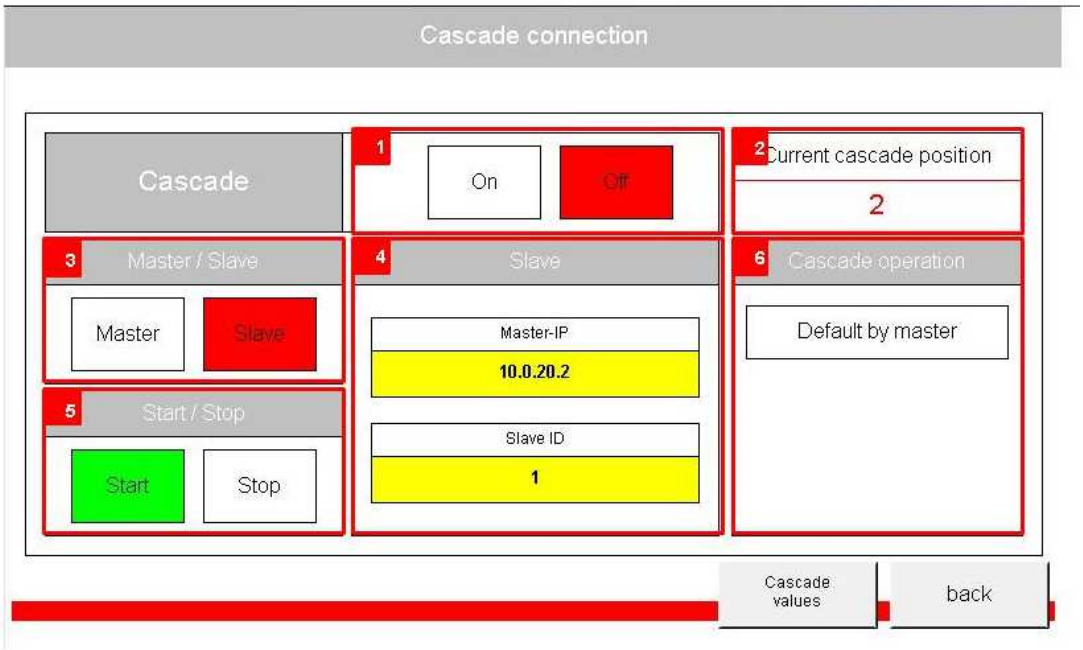


Figure 46: Menu - Cascade management 4

6.6.6.3.5. Cascade values:

If the "Cascade values" button is pressed, it is possible to view the current values / parameters of the set cascade of the respective CHP plant.

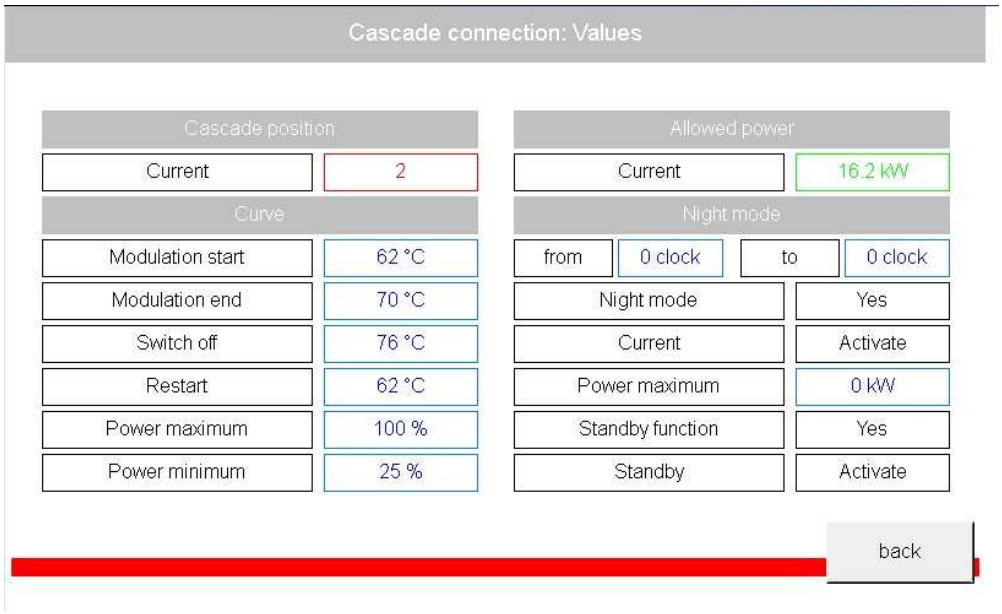


Figure 47: Menu - Cascade management 5

6.6.6.4. Thermal load connection: (menu structure 2.6.4.) (optional for biogas and/or sewage gas operation)

This function allows emergency cooling of the A-TRON Eco-Plus CHP plant to be controlled in biogas and/or sewage gas operation. This function can also be optionally used for control of another heating circuit regulation.

The following window opens when the "Thermal load connection" button is pressed.

If the thermal load connection is activated, the return temperature at which the thermal load connection is to take place is set under "Switch on at" and the period over which this function is to remain activated is specified under "Minimum duration".

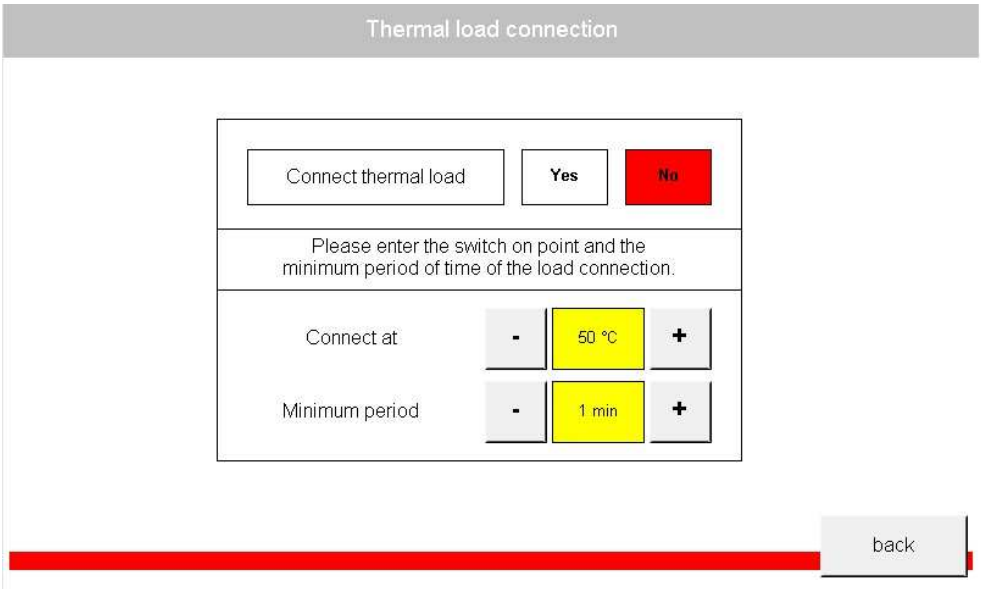
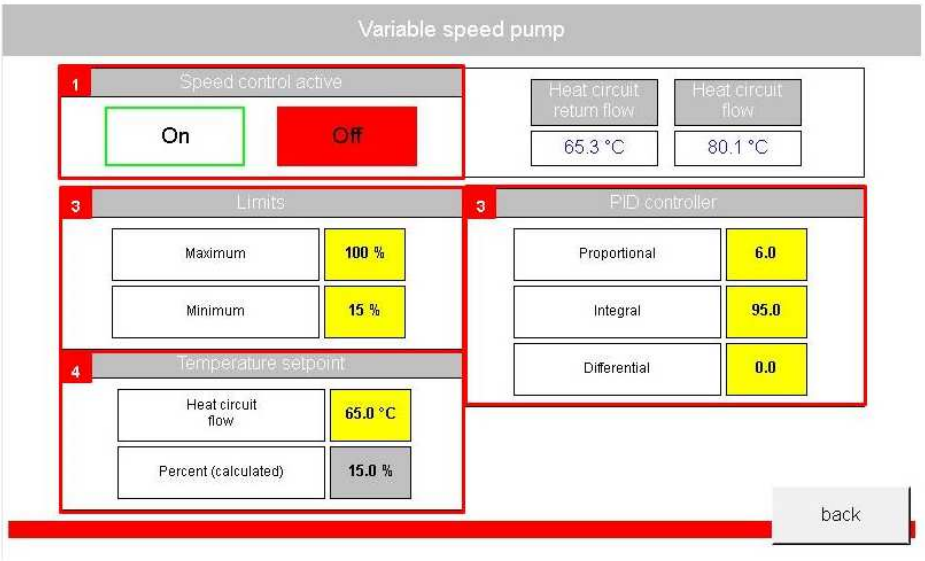


Figure 48: Menu – Thermal load connection

6.6.6.5. Speed-controlled pump: (menu structure 2.6.5.):

When the speed pump "Point 1" is activated, the CHP plant regulates according to the set flow temperature.



1. To allow the pump to be regulated according to speed, the "ON" box must be pressed in the PLC under the "Speed-controlled pump" menu and the setting wheel on the pump must also be turned to the middle position (ext.in.).
2. The temperature is then set to the setpoint.
3. Setting of the PID controller:

   P-component: 4 – 7

   I-component: 90 – 100

   D-component: Always set to 0, otherwise the pump could be controlled defectively

   Limit values: minimum 8 % maximum 100 %

The P, I components are to be adjusted on site within this framework. For very large spreads of 40 - 50 K, the controller regulates by +-5 °C. The controller regulates by +-2 °C for spreads of 30 K and less.

There is currently a safety temperature limit of 5 °C before the set warning limits. When a temperature enters this range, the pump is set to 100 % to prevent warning or emergency shutdown. This must be taken into account in the settings, especially at high temperature levels.

The values mentioned under point 3 must be adjusted according to the hydraulic system and temperature requirements.

Notice:

Higher P-component = stronger control behaviour. This also makes it possible to overshoot the nominal value. In this case, the values must be reduced slightly.

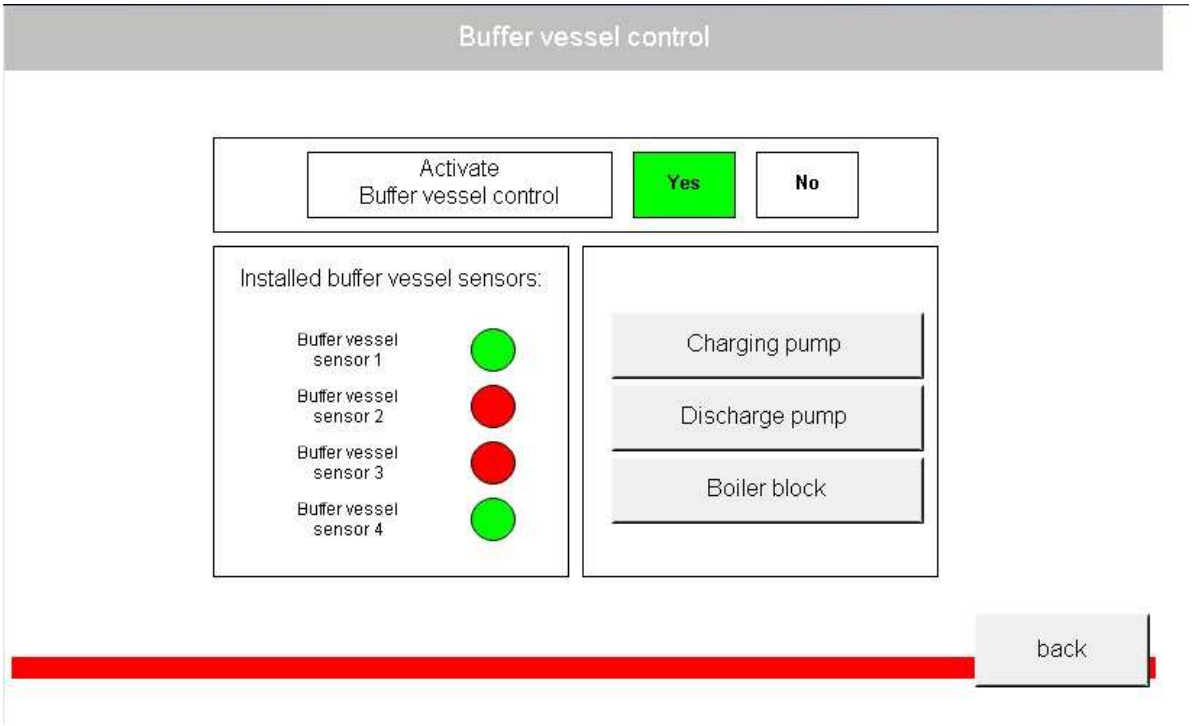
I-component = higher values make the controller sluggish. Small values can lead to an overshoot.

6.6.6.6. Storage tank filling level control: (menu structure 2.6.6.)

A-TRON offers storage tank management for an additional charge. Four PT1000 sensors are included in the scope of delivery.

To activate the storage tank filling level control, press the "Yes" button

Then select the number of installed sensors on the left-hand side.

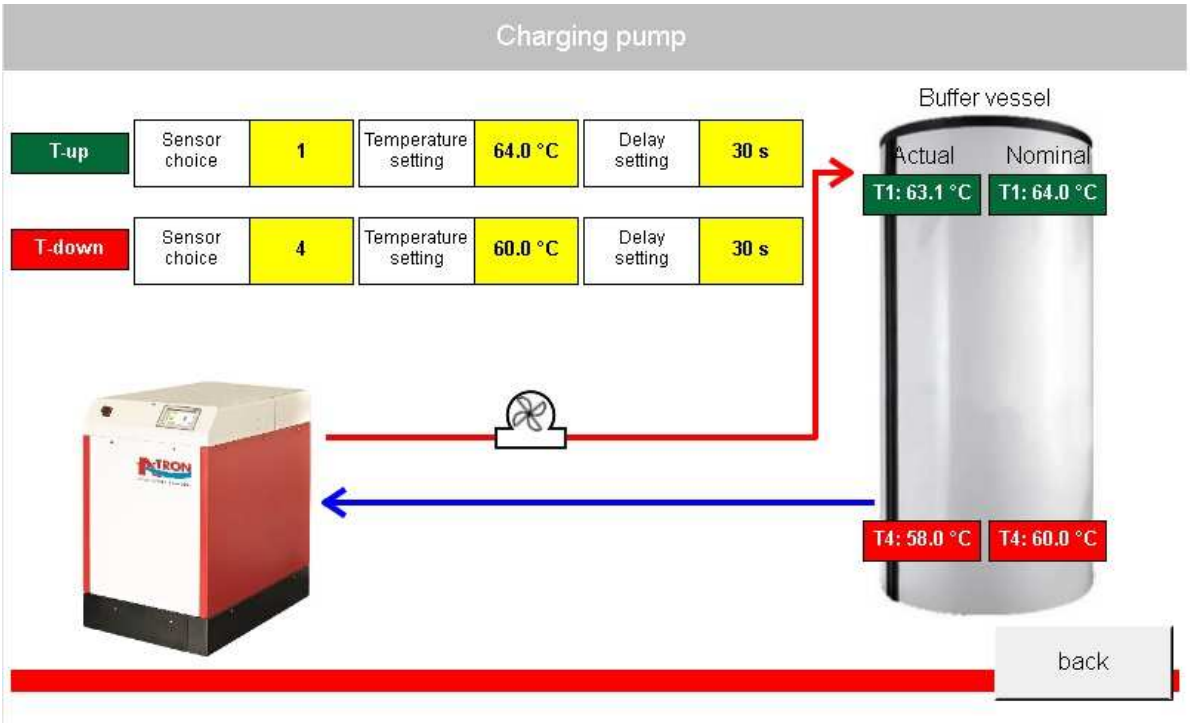


6.6.6.7. Storage tank charging pump

6.6.6.7.1. Select your required temperature setting. If the value falls below the "T-top" and "T-bottom" switching contacts, the storage tank charging pump and the CHP plant are started.

If "T-top" is exceeded, the storage tank charging pump and the CHP plant remain in operation until "T-bottom" is also exceeded. If both switching points are exceeded, the storage tank charging pump and the CHP plant switch off.

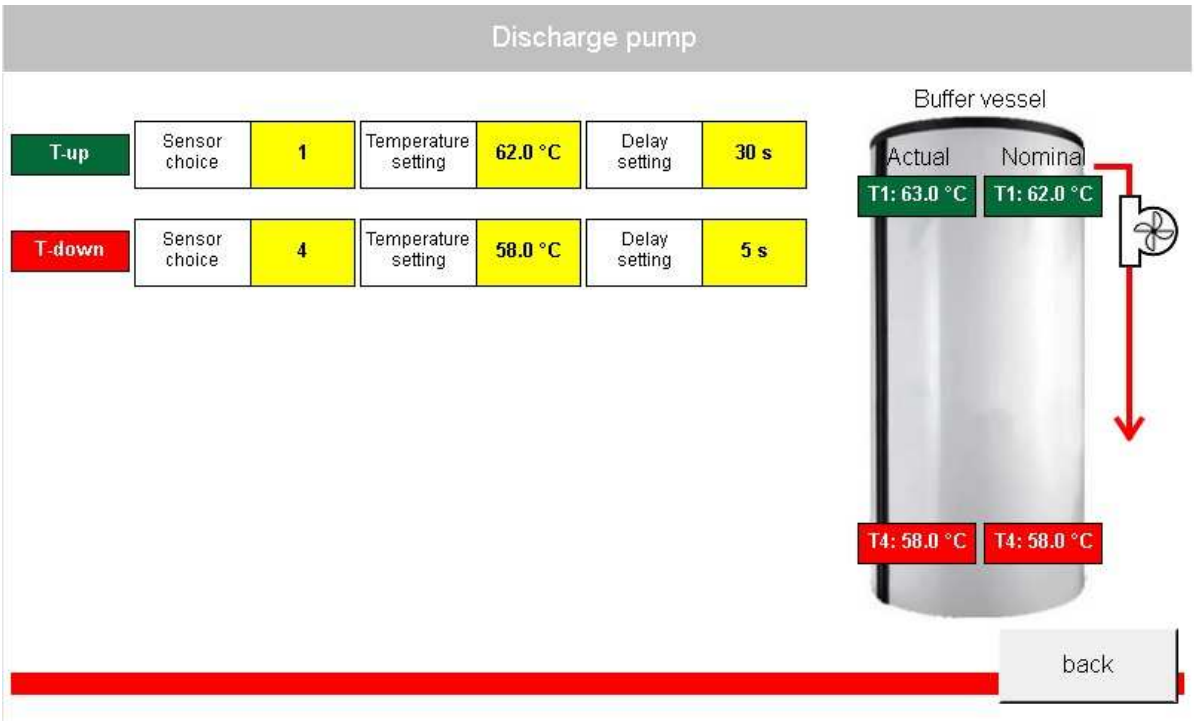
It is possible to provide the switching points with a time delay.



6.6.6.8. Storage tank discharge pump:

6.6.6.8.1. Select your required temperature setting. If the "T-top" switching contact is exceeded, the discharge pump is switched on.

If the value falls below the "T-bottom" switching contact, the discharge pump is switched off.

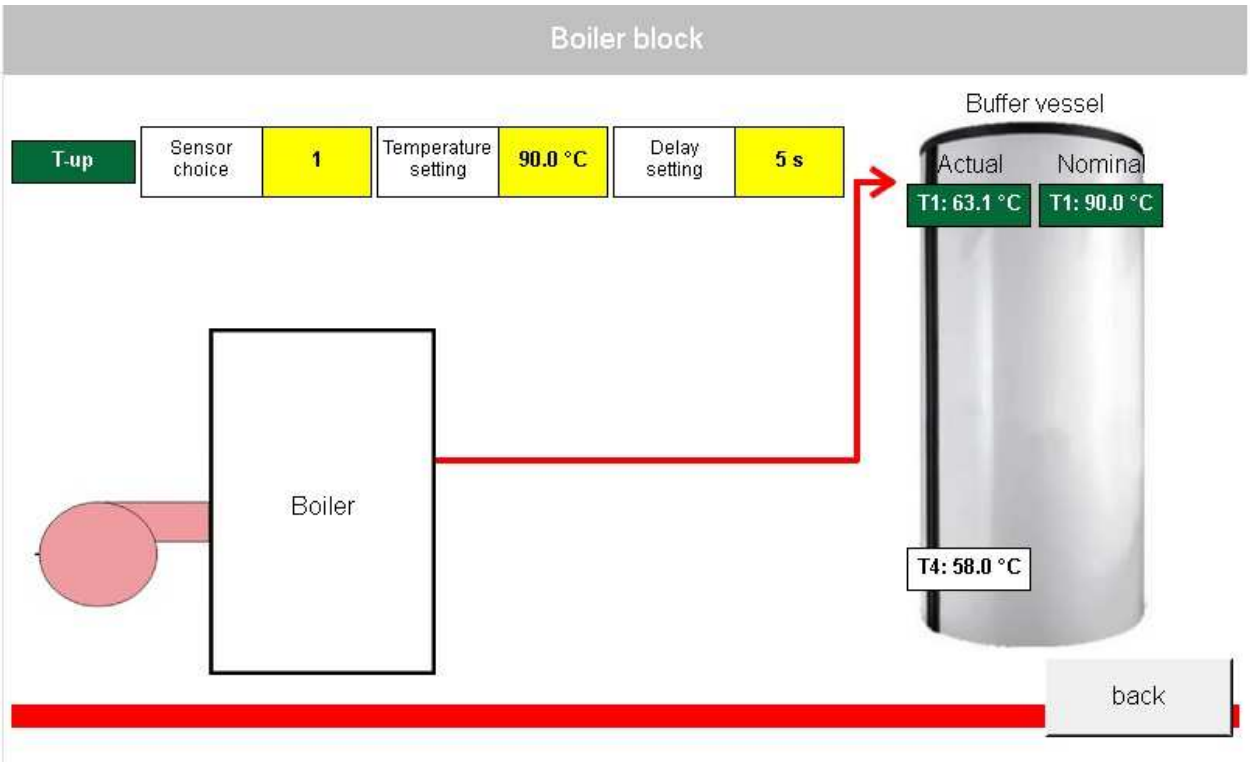


6.6.6.9. Boiler block:

6.6.6.9.1. The boiler block in the menu of the storage tank filling level control has the same physical contacts as the standard boiler block installed at the factory. The standard boiler block is automatically deactivated as soon as the storage tank filling level control is activated.

6.6.6.9.2. Select the corresponding sensor.

6.6.6.9.3. Select your required temperature setting. If the "T-top" switching point is exceeded, the boiler is blocked. If the value falls below the "T-top" switching point, the boiler is released.



Notice:

All switching contacts can be provided with a time delay.

It is recommended to select the temperature values in such a way that the CHP plant always takes priority over other heat generators.

6.6.7. CO monitor: (menu structure 2.6.7.)

A-TRON offers a CO monitor for an extra charge to protect against personal injury in the event of leakage of the exhaust system.

This is done with acoustic alarm signal and it switches off the CHP plant if the permissible CO value is exceeded.

It has a measuring range from 0 to 500 ppm and a lifetime of 5 years.

The reaction time is T63 = 35 s

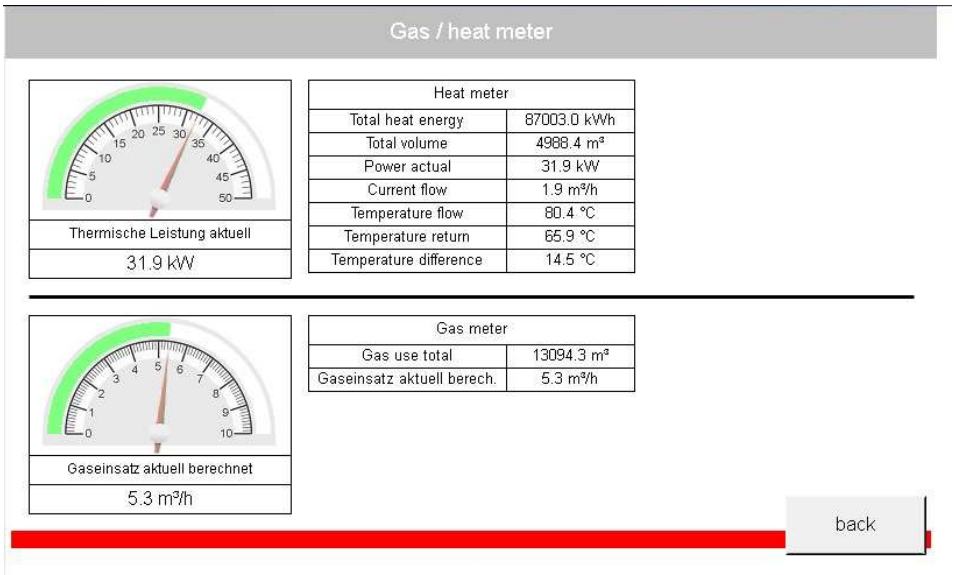
For connection to CHP plant: See enclosed circuit diagram, page 19

Notice:

Work on the CHP plant and the connection of electronic components is only allowed to be carried out by qualified personnel.

6.6.8. M-BUS: (menu structure 2.6.8.)

Interface for recording digital data from gas and heat meters in (kWh)



For connection to CHP plant: See enclosed circuit diagram, page 19

Notice:

Work on the CHP plant and the connection of electronic components is only allowed to be carried out by qualified personnel.

6.7. User level 2

After you have entered your password for user level 2, the name "Code" changes to "Setup". When you press the "Setup" button again, the following extended menu appears:

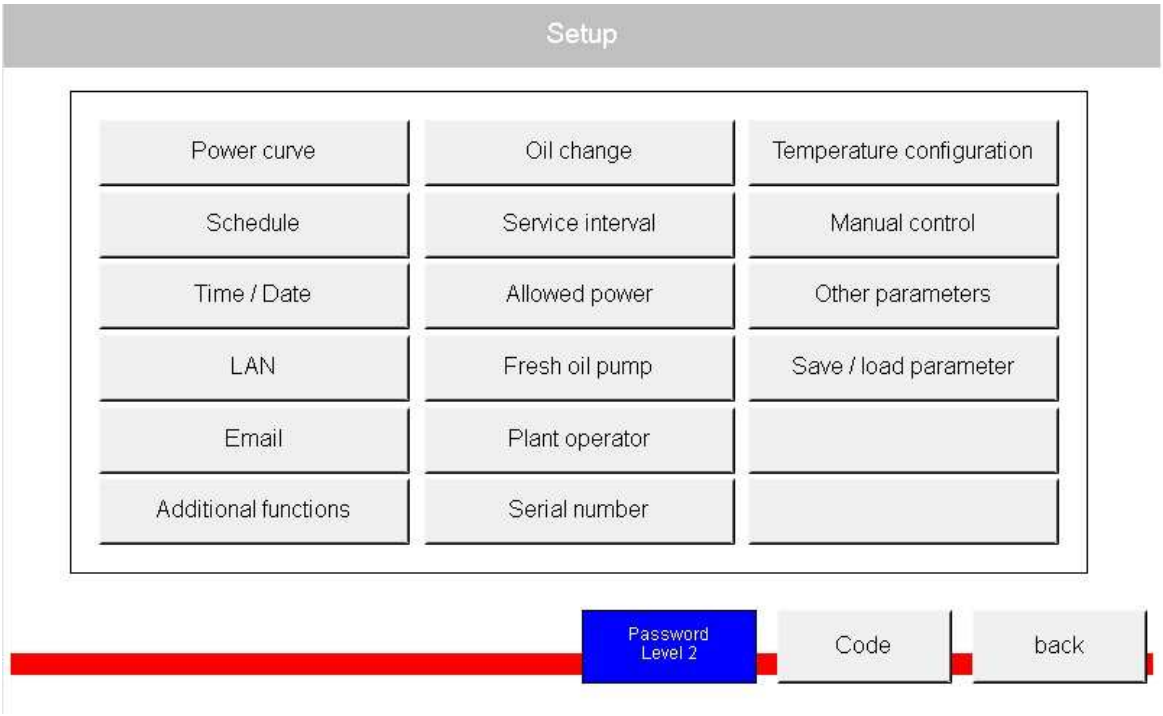


Figure 49: Menu – User level 2

6.7.1. Oil change: (menu structure 2.6.9.)

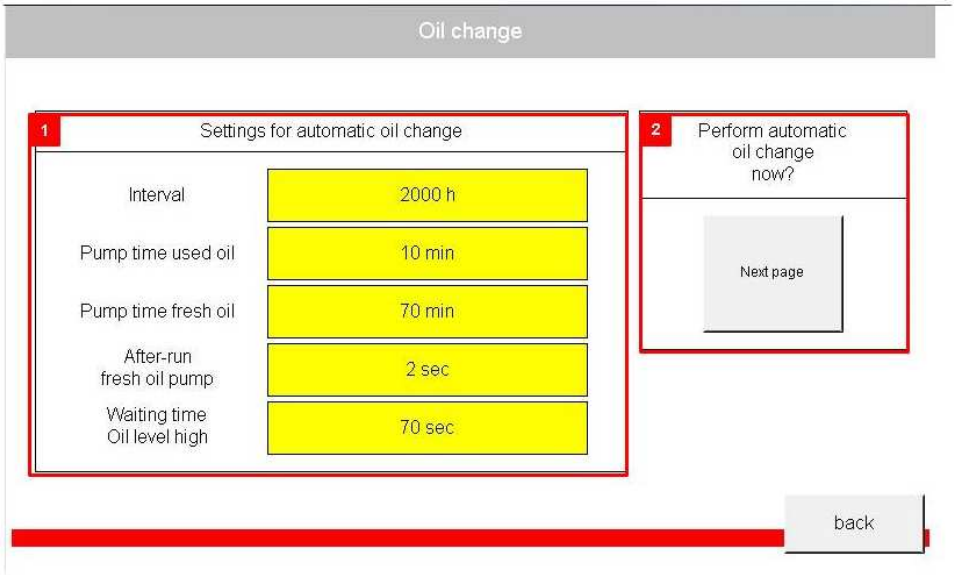


Figure 50: Menu – Oil change

1. In this area, settings for the automatic oil change can be made
2. Confirming by pressing the "Next page" button carries out the automatic oil change.

6.7.2. Service interval: (menu structure 2.6.10.)

Every regular maintenance is recorded via the Service interval menu item. An oil change must be carried out with every maintenance, which is also confirmed.

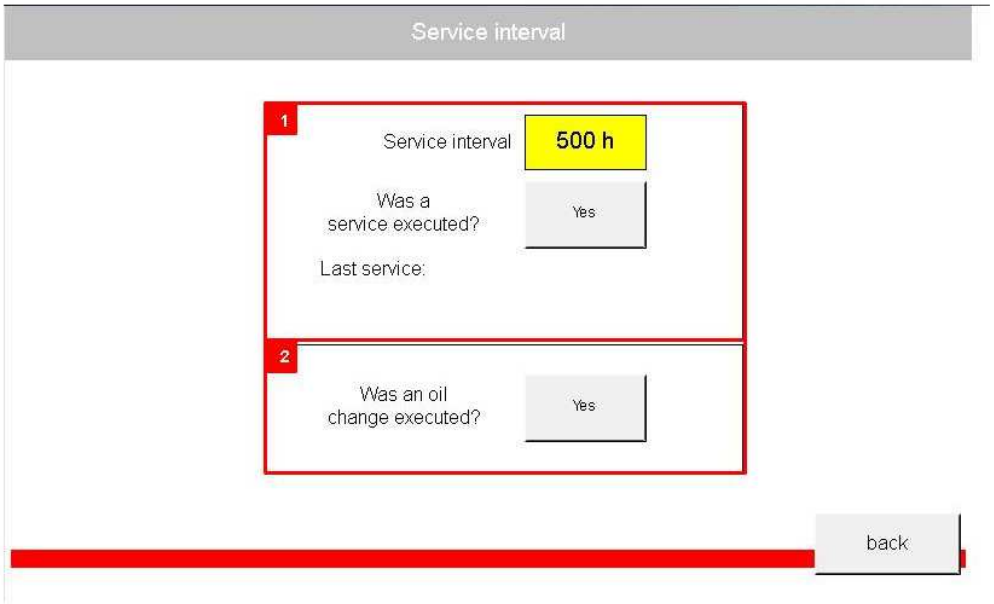


Figure 51: Menu – Service interval

1. Confirmation for maintenance
2. Confirmation for oil service

6.7.3. Allowed power: (menu structure 2.6.11.)

1. Shows the current setting of the allowed power, in this case "Curve". The CHP plant automatically regulates according to the heating circuit return temperature. The allowed power can also be changed to "Manual". This setting is for service purposes only.
2. Shows the settings of a possible ripple control receiver, which is used for a current-controlled operation mode of the CHP plant by e.g. an energy supplier or network operator.
3. Shows the settings of an input signal, e.g. from a balance point control unit, for a current-optimised mode of operation of the CHP plant by the owner.
4. It is possible to delay the switching off of the CHP plant by the external allowed power setting. The value can be set from 1 to 60000 [s].
5. These settings determine the response behaviour of the gas choke.

CAUTION:

The values in point 5 are only allowed to be changed by the manufacturer or a service technician with the agreement of the manufacturer!

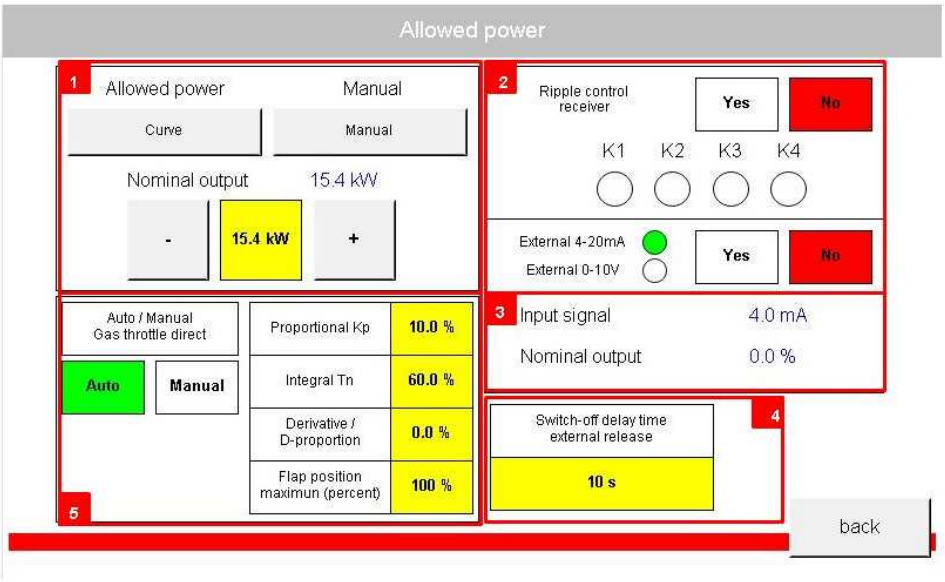


Figure 52: Menu - Allowed power

6.7.4. Fresh oil pump: (menu structure 2.6.12.)

In addition to the oil change, the level of the oil is continuously checked. If this drops to "low" during operation, fresh oil is automatically refilled. If the "middle" level cannot be reached within a test time, the CHP plant is stopped and an error message is output (error: oil level check, error code: 27).

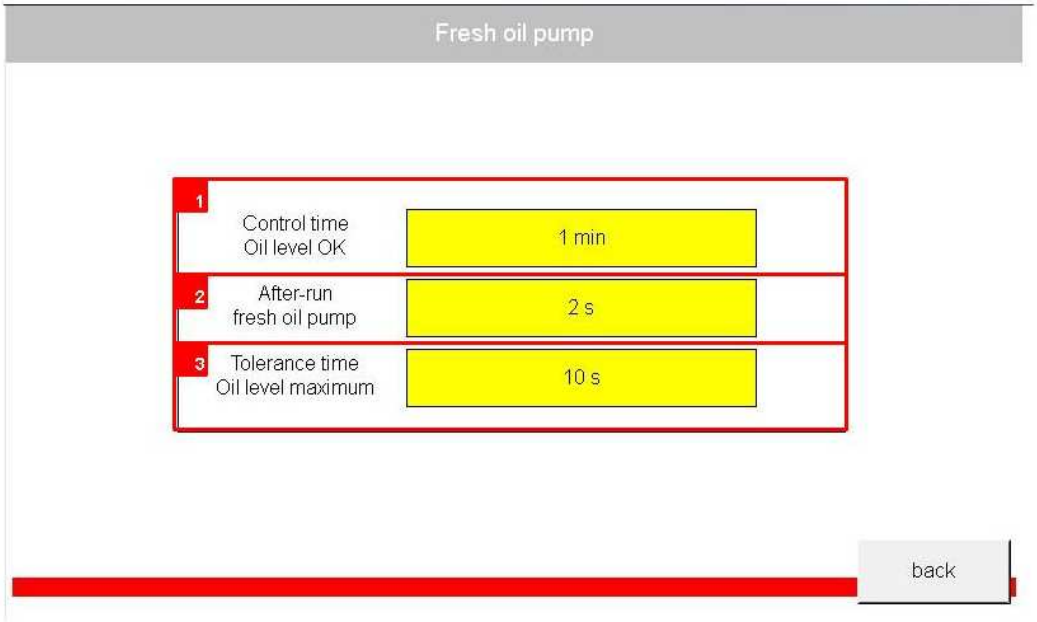


Figure 53: Menu – Fresh oil pump

1. The test cycle for the engine oil level can be set with this parameter.
2. If the oil level is too low, fresh oil is refilled for the specified period.
3. When the refilling process has been completed, the oil level is checked again after the specified tolerance time.
   - Oil level OK: The test cycle is started according to the specified time.
   - Oil level not OK: CHP plant stops and an error message (error: oil level check, error code: 27) is output.

6.7.5. System operator: (menu structure 2.6.13.)

This menu item is used to enter the plant owner. This setting is carried out at the factory and is only allowed to be changed by A-TRON or by qualified personnel approved and certified by A-TRON.

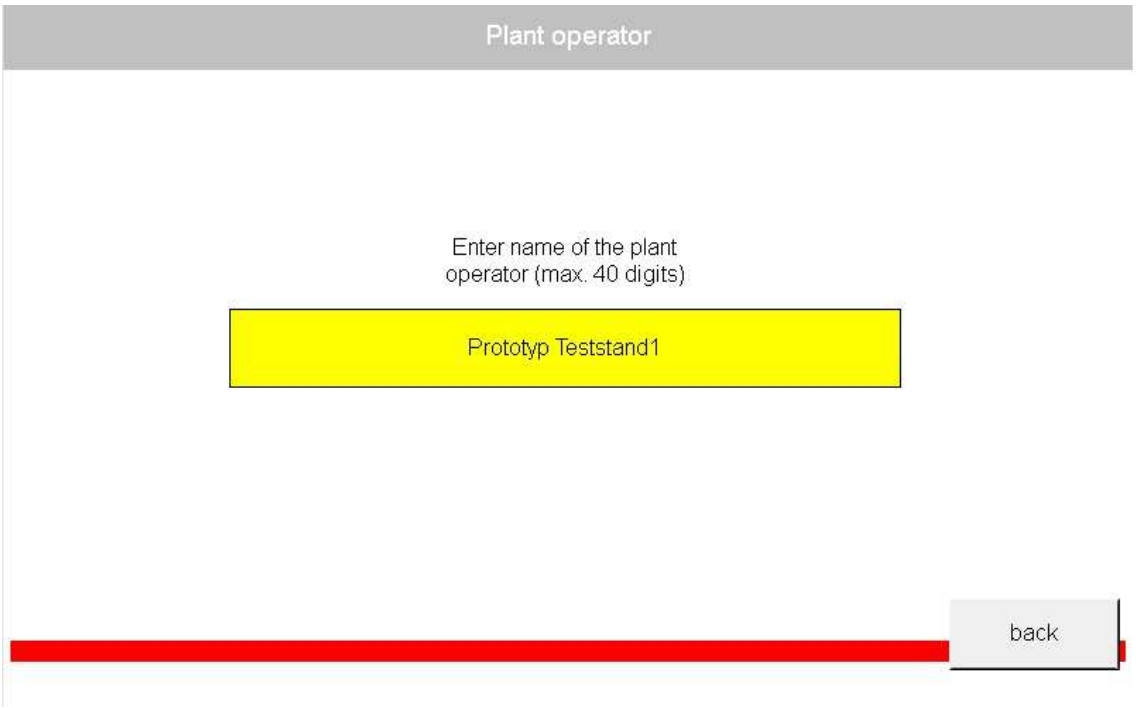


Figure 54: Menu - System operator

6.7.6. Serial number: (menu structure 2.6.14.)

This menu item is used to enter the serial number. This setting is made at the factory and is not allowed to be changed.

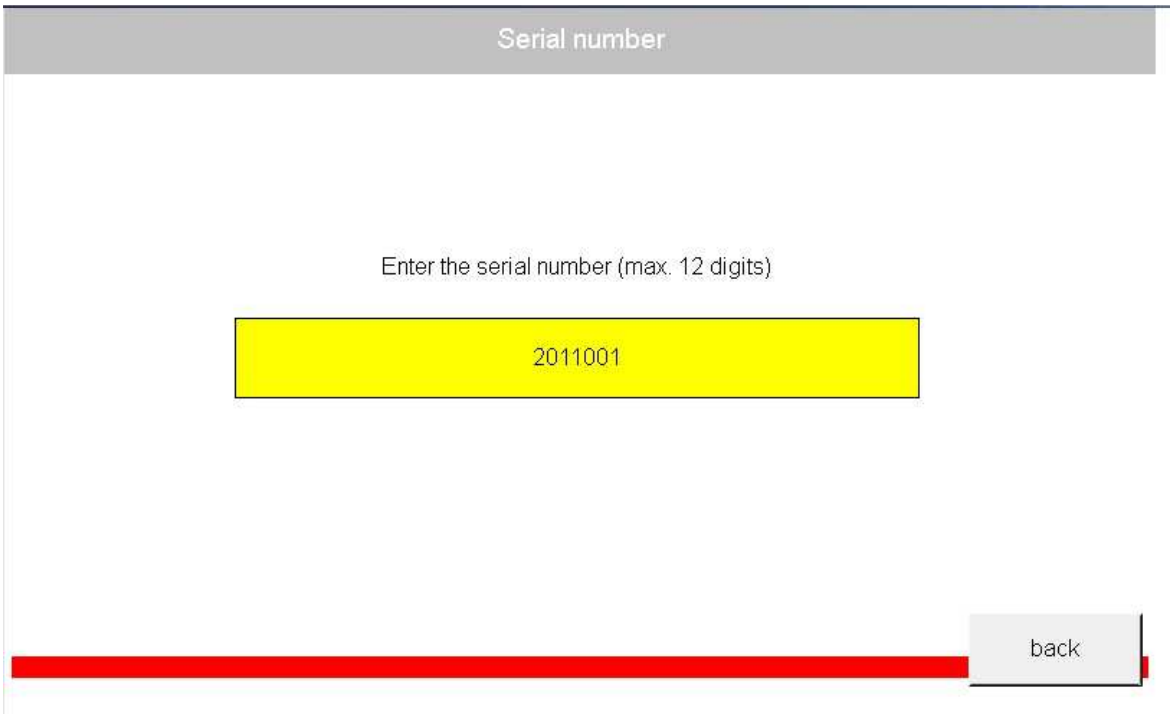


Figure 55: Menu - Serial number

6.7.7. Temperature configuration: (menu structure 2.6.15.)

Allows you to calibrate individual temperature probes and create warning and shutdown limits, as well as the response time.

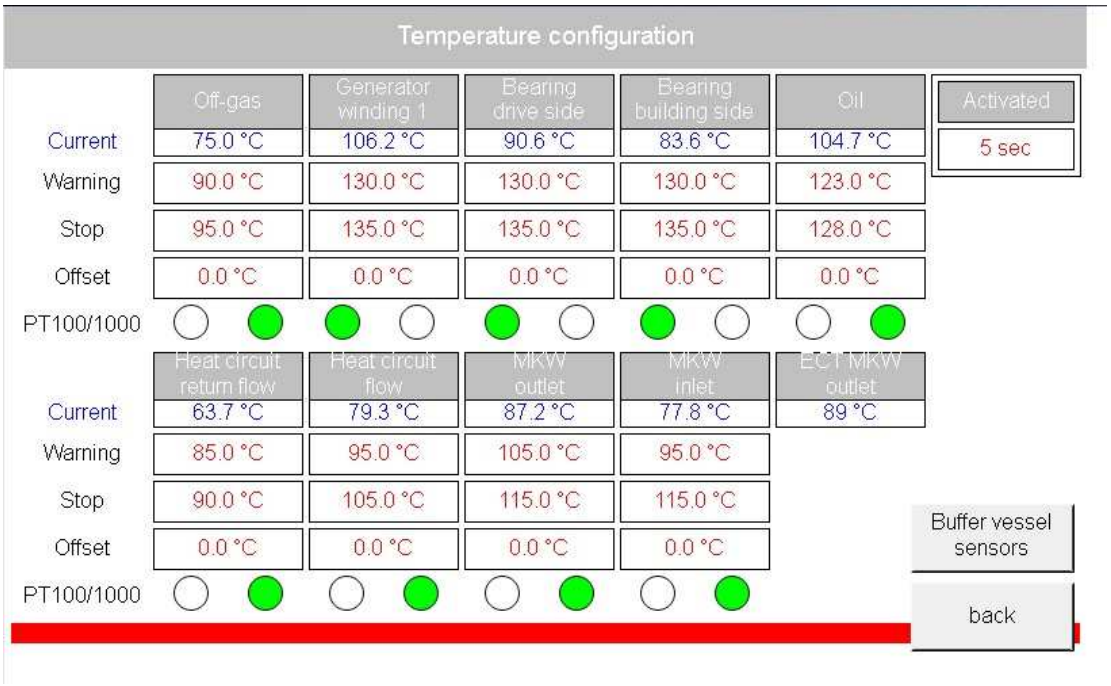


Figure 56: Menu - Temperature configuration

6.7.8. Manual control: (menu structure 2.6.16.)

Sets the CHP plant into manual control mode and thus enables testing of the individual components. This function is only allowed to be used by A-TRON or by qualified personnel approved and certified by A-TRON!

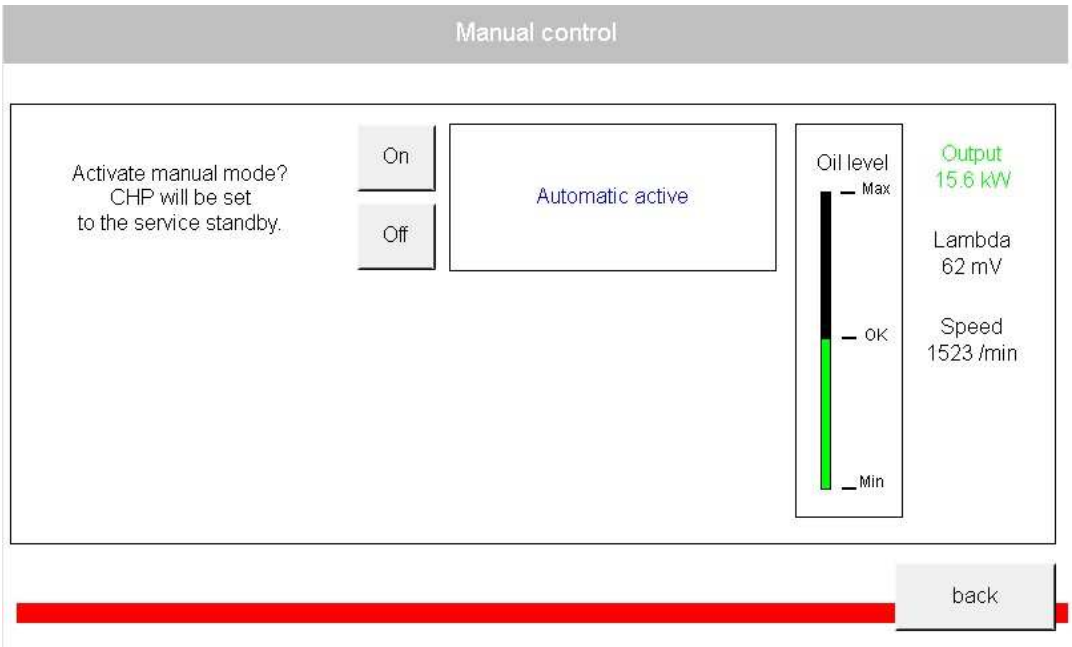


Figure 57: Menu – Manual control 1

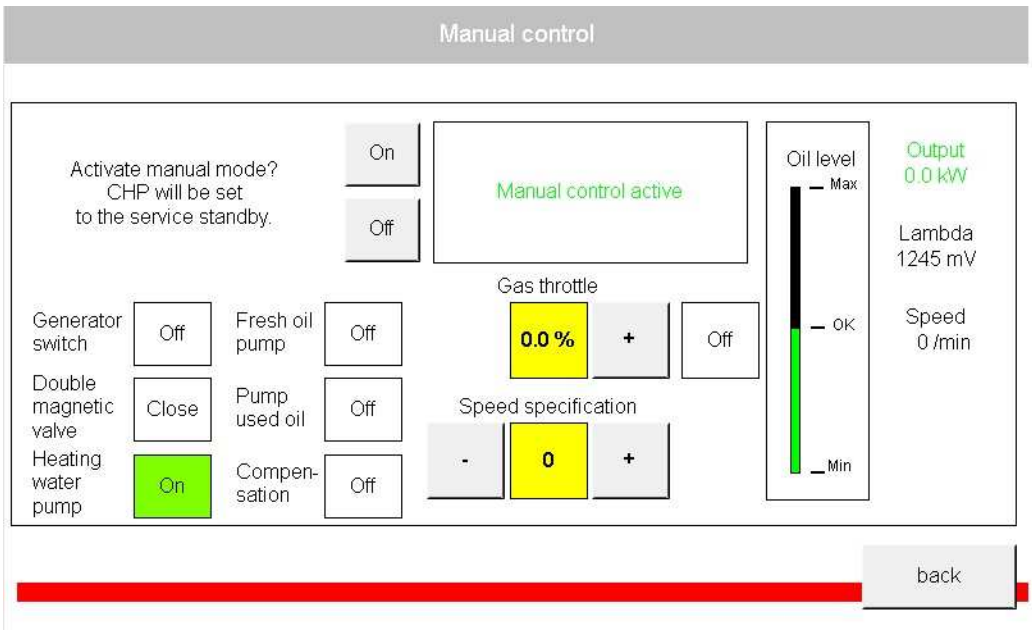


Figure 58: Menu – Manual control 2

6.7.9. Other parameters: (menu structure 2.6.17.)

This menu item can be used to make changes to various setting parameters for automatic and control mode as well as for the basic settings. These functions are only allowed to be used by A-TRON or by qualified personnel approved and certified by A-TRON!

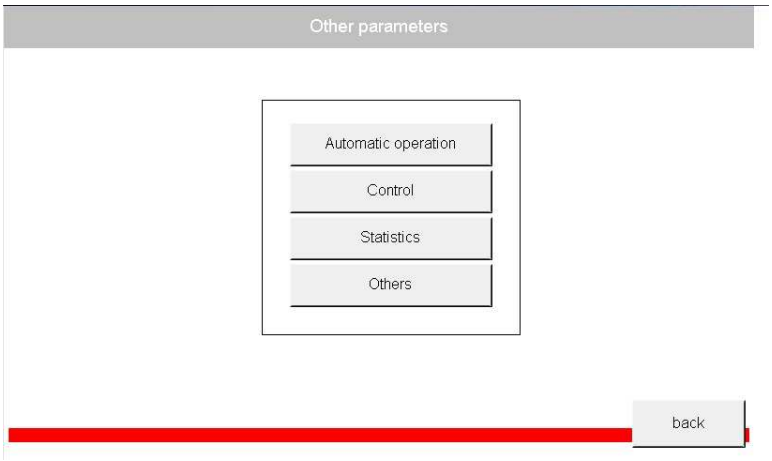


Figure 59: Menu - Other parameters

6.7.9.1. Automatic mode: (menu structure 2.6.17.1.)

Under this menu item, changes can be made to various nominal setting parameters. This is only allowed to be carried out by A-TRON or by qualified personnel approved and certified by A-TRON.

Points 1 - 4 are used for heating optimisation. All other parameters are factory-set and must not be changed.

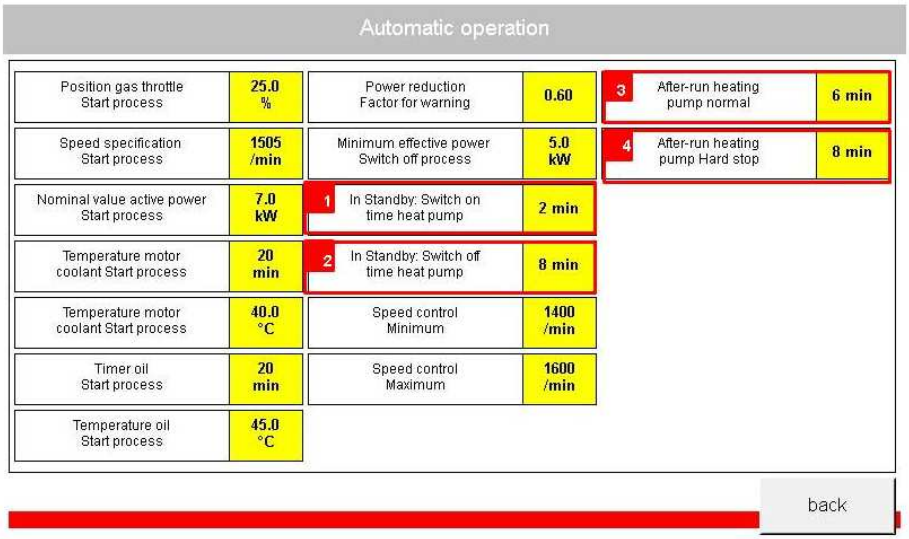


Figure 60: Menu – Automatic mode

1. Switch-on time of the heating pump
2. Switch-off time of the heating pump
3. After-run time of the heating pump when the switch-off temperature of the heating circuit is reached.
4. After-run time of the heating pump at hard stop

6.7.9.2. Control: (menu structure 2.6.17.2.)

The parameters for the control mode are set at the factory and are not allowed to be changed with the exception of "Lambda value minimum" and "Lambda value maximum" for optimisation of the exhaust gas values.

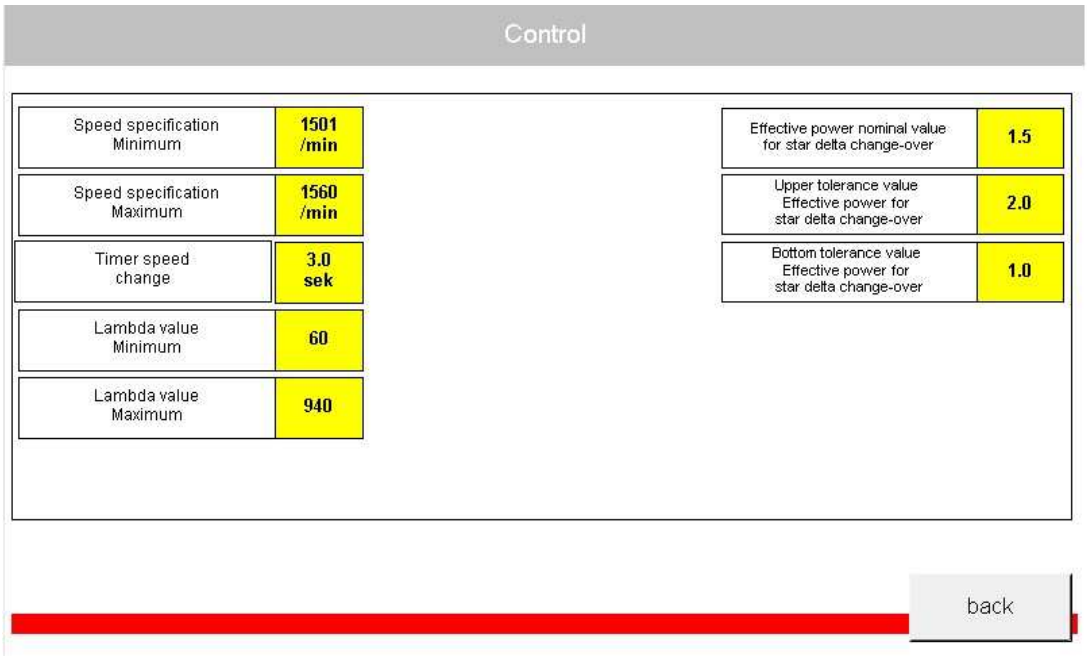


Figure 61: Menu - Control

6.7.9.3. Statistics: (menu structure 2.6.17.3.)

Display window of various data / statistics.

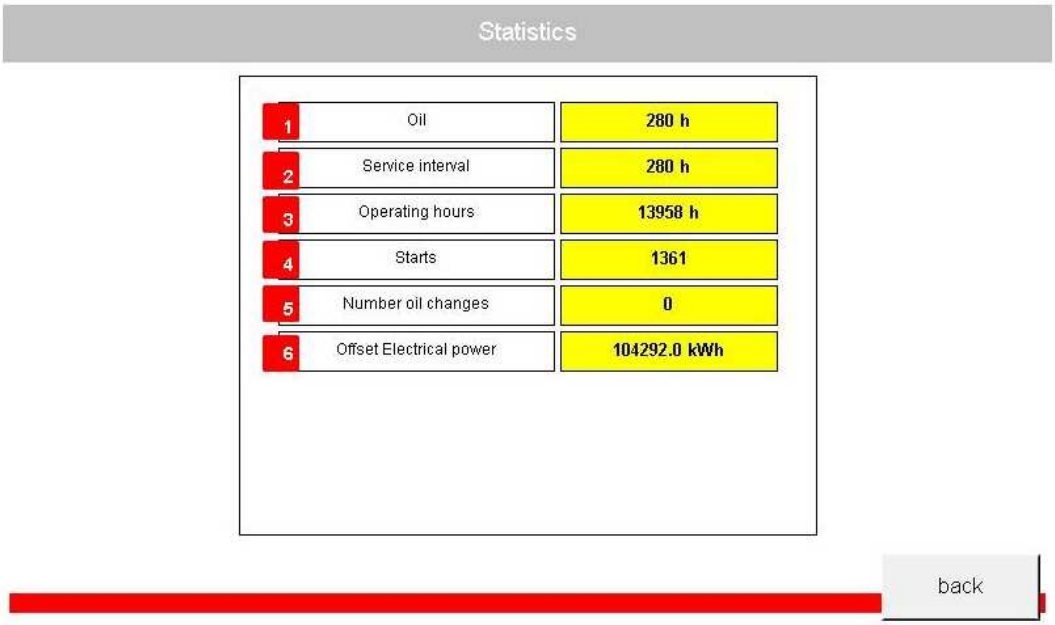


Figure 62: Menu – Statistics

1. Shows the remaining time in operating hours until the next oil change.
2. Shows the remaining time in operating hours until the next service interval.
3. Shows the number of operating hours.
4. Shows the number of starts.
5. Shows the number of oil changes that have already taken place.
6. This box can be used to record the meter reading of the old electricity meter in the event of an electricity meter change.

All boxes under the Statistics menu item can be changed if required. Changes are only allowed to be carried out by A-TRON or by qualified personnel approved and certified by A-TRON.

6.7.9.4. Miscellaneous: (menu structure 2.6.17.4.)

The Miscellaneous menu item contains setting parameters for the basic setting of the CHP plant.

Changes are only allowed to be carried out by A-TRON or by qualified personnel approved and certified by A-TRON.

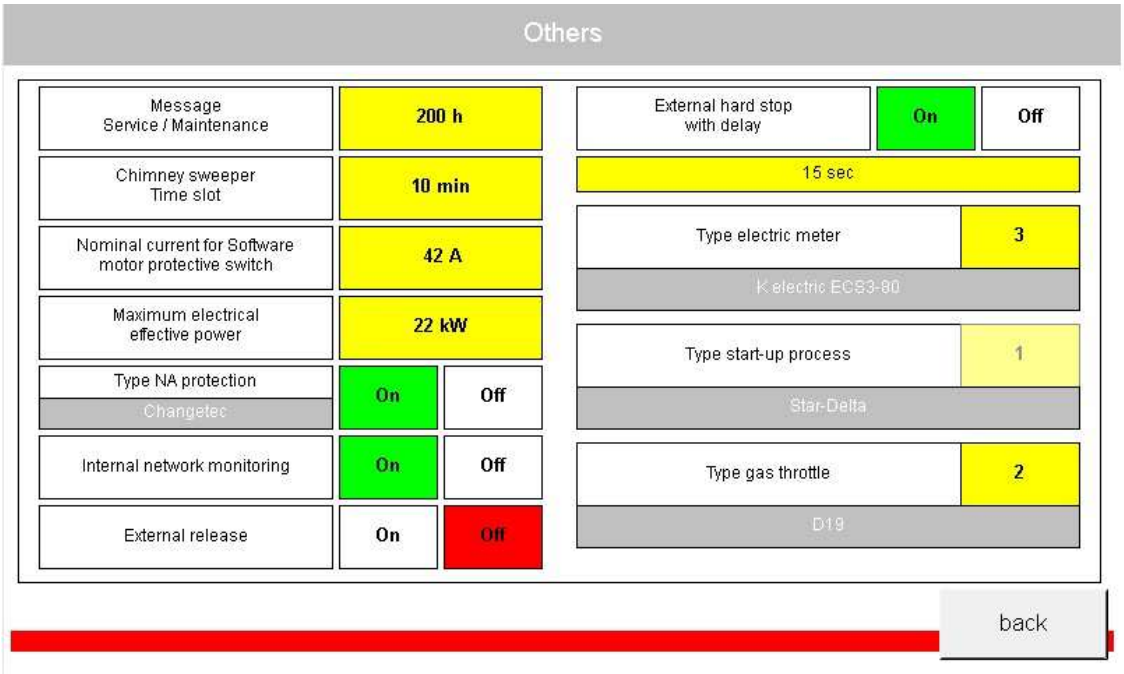


Figure 63: Menu – Miscellaneous

6.7.10. Save / load parameters: (menu structure 2.6.18.)

In this menu it is possible to save and load software versions. The CHP plant designation can also be changed here.

Updates are only allowed to be carried out by A-TRON or by qualified personnel approved and certified by A-TRON.

Figure 64: Menu – Save / load parameters

6.7.11. Stop mode / error: (menu structure 2.6.19.)

The CHP plant has many safety functions and is set to sensitive settings as standard. This guarantees a high level of protection for the components used. However, the sensitivity can be adjusted by the service technician / factory employee so that the CHP plant can be adapted to local conditions.

In the event of an error, the operation of the CHP plant is stopped in a rapid process in order to avoid damage. It can only be restarted if no current errors are present.

If one or more current errors exist, this is indicated on the main screen in the system status with the stop symbol.

6.7.12. Error window

If you click on the stop symbol in the main screen, a window appears with the existing errors (point 1). There are six current error pages which can be selected with the "forward >" or "< back" key (point 2).

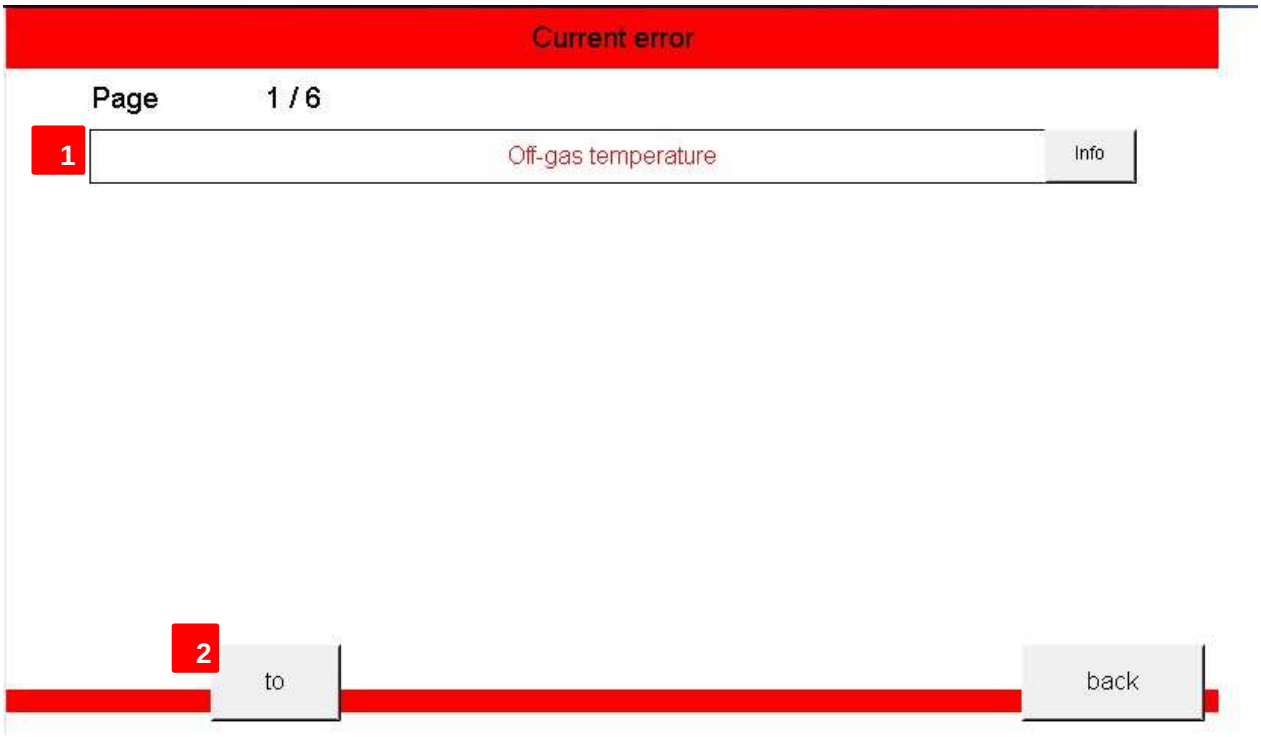


Figure 65: Menu – Error example

You can get more information about the errors by clicking the "Info" button. To return the CHP plant to the error-free status, the error can be reset with "Reset" if the current situation permits.

Notice:

All errors are recorded in the history.

Please notify the service technician / A-TRON in the event of an error and state the error and the associated error code.

Follow the instructions on the screen to correct the error.

In this example "Network check" (point 3), an error has occurred in the connected supply grid. If the grid does not show any more faults, the error can be reset (point 4).

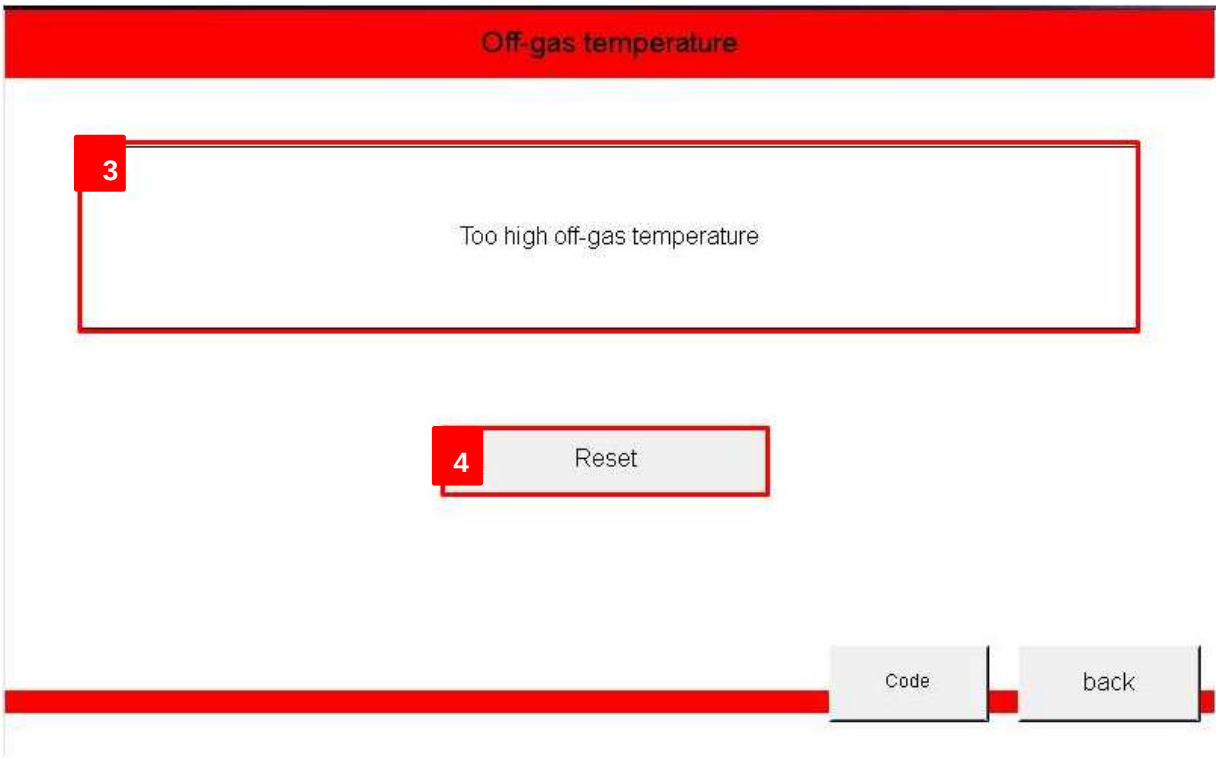


Figure 66: Menu – Error example

6.7.13. Error list: (menu structure 2.6.20.)

List of all possible error messages via the PLC. Please indicate the error code (no.) on request by the service technician.

No.	Error message short text	Error message long text	Possible cause of error
1	EMPTY (formerly mains check)		
2	ECU general	The engine control unit (ECU) signals an error.	Oil pressure switch, camshaft sensor
3	Oil change interval	Oil change interval error	Low oil level, oil level switch
4	No fresh oil pump control time	The monitoring time for the fresh oil replenishment was not entered	Menu item control time no entry
5	No after-run fresh oil pump	The after-run time for the fresh oil replenishment was not entered	Menu item control time no entry
6	No tolerance time maximum oil level	No tolerance time was entered for maximum oil level.	Menu item control time no entry
7	Maximum oil level too long	Error maximum oil level	Low oil level, oil level switch
8	Start procedure: Speed of rotation not reached	Start phase: The speed of rotation was not reached within the specified time.	No gas, spark plugs, engine control unit
9	Start procedure: Gas pressure not reached	The gas pressure was not reached within the specified time.	Throttle valve, gas / air mixer, no gas
10	Start procedure: Generator supply not reached	Start phase: The generator does not supply any electrical power into the power system within the specified time.	Electricity meter, star / delta contactor, soft-starter
11	Start procedure: Generator supply 2 kW not reached	Start phase: The generator does not supply at least 2 kW of electrical power into the power system within the specified time.	Electricity meter, star / delta contactor, soft-starter
12	Start procedure: Engine coolant inlet temperature not reached	Start phase: The temperature of the engine coolant inlet was not reached within the specified time	Electricity meter, star / delta contactor, soft-starter
13	Start procedure: Oil temperature not reached	Start phase: The temperature of the oil was not reached within the specified time	Electricity meter, star / delta contactor, soft-starter
14	Control mode: No generator supply	Control mode: No generator supply present.	Defective ignition system
15	Engine oil pressure	The engine oil pressure switch has tripped.	Engine oil level too low, oil pressure switch defective
16	EMPTY (formerly coolant pressure)		
17	Engine coolant inlet temperature	Engine coolant inlet temperature is high	Coolant pump defective, coolant level low, sensor defective

18	Engine coolant outlet temperature	Engine coolant outlet temperature is high	Coolant pump defective, coolant level low, sensor defective
19	Oil temperature	Engine oil temperature is high	Temperature sensor defective, oil pump
20	Exhaust gas temperature	Exhaust gas temperature is high	Exhaust gas sensor, catalytic converter clogged
21	Generator winding 1 temperature	Generator winding 1 temperature is high	Winding, coolant level low, bearing damage
22	Input end bearing temperature	Input end bearing temperature is high	Winding, bearing damage, lubricant level low, sensor
23	Building-side bearing temperature	Building-side bearing temperature is high	Winding, bearing damage, lubricant level low, sensor
24	Heating circuit return temperature	Heating circuit return temperature is high	Heating pump, sensor
25	Heating circuit flow temperature	Heating circuit flow temperature is high	Heating pump, air in system, sensor
26	Power system connection protective device (NA, BISI)	Waiting for power system enable by power system / plant protection device	Power system / plant protection defective, waiting time after power system error
27	Oil level check	Oil level check error	Oil level switch, oil replenishment pump, no oil in the reservoir tank
28	Parameter initialisation error	No parameter list could be loaded.	No parameters on USB stick
29	Speed of rotation below minimum	The speed of rotation has dropped below the minimum value.	Speed of rotation sensor defective
30	Speed of rotation above maximum	The speed of rotation is above the maximum value.	Speed of rotation sensor defective
31	Star-delta start process changeover	Star-delta start changeover error.	Contactor 1K2 defective
32	Current imbalance	There is a high degree of asymmetry in the currents.	Windings, contactors, contact error
33	Lambda value deviation	The oxygen sensor lambda values are outside the specified parameters.	Catalytic converter defective, lambda probe defective
34	Soft-starter message	No bypass from soft-starter. You can reset the error.	Soft-starter defective
35	Oil level cable	Discontinuity in the cable to the oil level sensor.	Discontinuity in the oil level switch
36	Request cascade master	Error: No start enable from cascade master. Check the connection to the master.	Check network cables
37	Motor circuit breaker software	Stop: Software motor circuit breaker tripped. Check the generator.	Check the generator, generator connection cable
38	Power failure L1	Error: No current phase L1. Presumed phase failure of L1.	Check power system voltage, check fuses

39	Power failure L2	Error: No current phase L2. Presumed phase failure of L2.	Check power system voltage, check fuses
40	Power failure L3	Error: No current phase L3. Presumed phase failure of L3.	Check power system voltage, check fuses
41	Error power system voltage L1-N	Error: Voltage L1-N. Check the electrical connection to your CHP plant.	Check power system voltage, check fuses
42	Error power system voltage L2-N	Error: Voltage L2-N. Check the electrical connection to your CHP plant.	Check power system voltage, check fuses
43	Error power system voltage L3-N	Error: Voltage L3-N. Check the electrical connection to your CHP plant.	Check power system voltage, check fuses
44	Frequency error	Error: Frequency. Check the electrical connection to your CHP plant.	Check power system voltage, check fuses
45	EMERGENCY STOP was pressed	The external emergency stop switch was pressed.	Check external emergency stop switch
46	External hard stop was pressed	The external hard stop was pressed.	Check external hard stop
47	CO alarm active	CO alarm was detected.	Leak in exhaust line
48	Temperature calorifier sensor 1	Excessive temperature on calorifier sensor 1	Sensor defective, contact interrupted
49	Temperature calorifier sensor 2	Excessive temperature on calorifier sensor 2	Sensor defective, contact interrupted
50	Temperature calorifier sensor 3	Excessive temperature on calorifier sensor 3	Sensor defective, contact interrupted
51	Temperature calorifier sensor 4	Excessive temperature on calorifier sensor 4	Sensor defective, contact interrupted

Table 2: Error message

6.7.14. Warning: (menu structure 2.6.21.)

The CHP plant issues warning messages as soon as plant-relevant values approach a critical status.

If one or more warnings exist, this is displayed on the main screen in the system status with a yellow warning triangle.

Warning window

If you click the warning triangle symbol in the main screen, a window appears with the existing errors (point 1). There are two current warning pages which can be selected with the "forward >" or "< back" key (point 2).

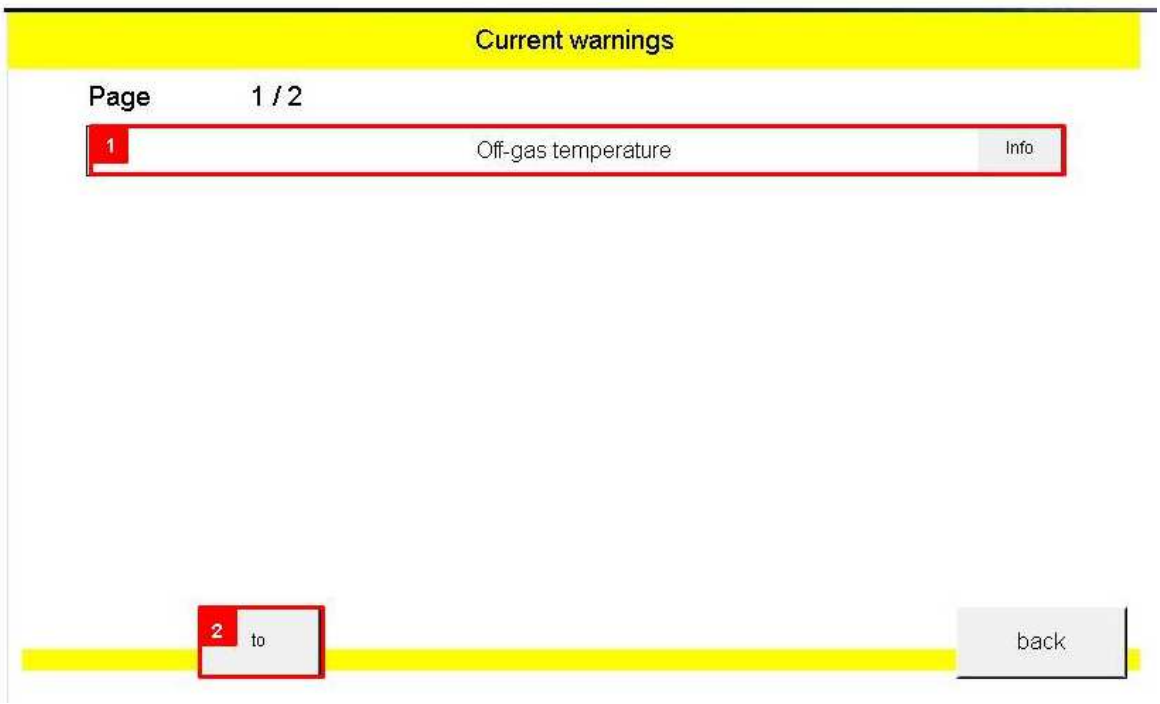


Figure 67: Menu – Warning example

Notice:

All warnings are recorded in the history.

In the event of temperature warnings, the CHP plant is automatically reduced in output until the temperatures have returned to normal values.

You can get more information about the warnings by clicking the "Info" button.

In the case of increased temperatures, such as here in the example the exhaust gas temperature (point 3), the CHP plant output is reduced until the normal condition has been restored. The warning message then goes out automatically.

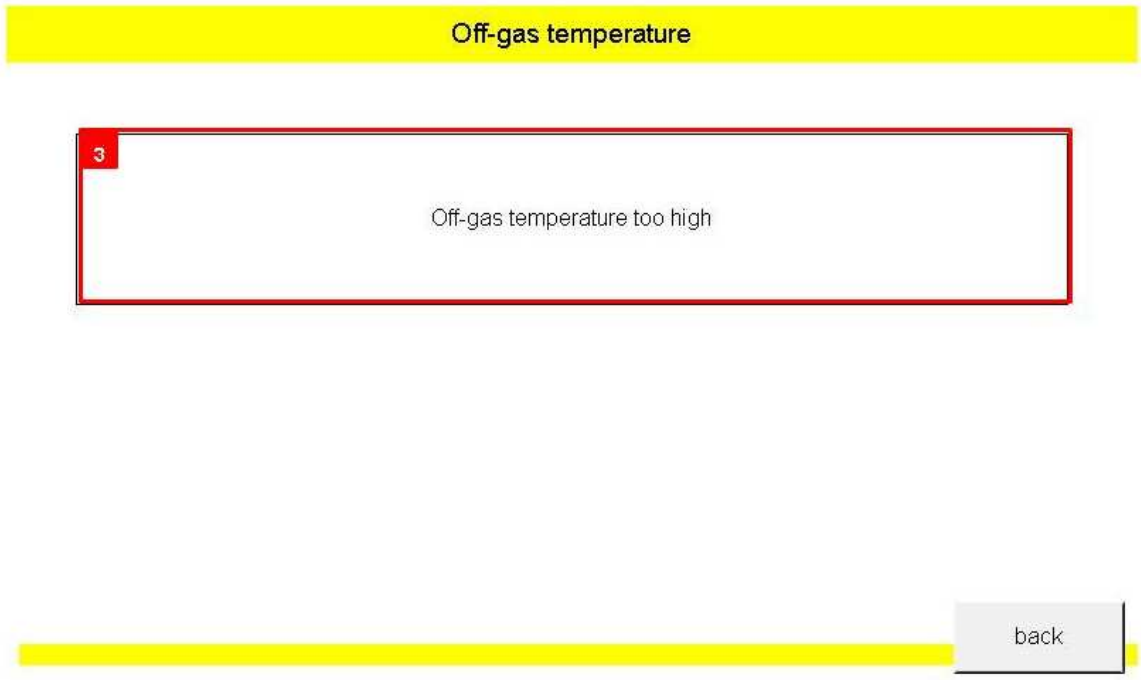


Figure 68: Menu – Warning example 2

6.8. Standards

The control unit complies with the following standards:

DIN EN ISO 12100 / DIN EN 954-1 Safety of machinery

DIN EN 60204 Electrical equipment of industrial machinery

EN 50081-2 / EN 50082-2 Electromagnetic compatibility (EMC)

7. Service and maintenance

7.1. Safety

Maintenance and servicing work must be carried out exclusively by specialist personnel. The environmental regulations must be observed in this context. Improper handling can lead to serious injuries and material damage.

Be aware of the following specific dangers when servicing the CHP plant.

- Installing incorrect spare parts or wear parts can cause severe damage to the system.
- Switching the energy sources on unintentionally can cause severe bodily injuries and damage to the system.
- There is a risk of injury on system parts / tools, etc., with sharp edges.
- Contact with leaking liquids (transmission oil, grease, etc.) can cause burns.
- Lines that are laid incorrectly (e.g. with insufficient bending radius) can cause smouldering or cable fires.
- Leaking lubricants, solvents, preservatives, cleansing agents, etc., can cause burns if they come into direct contact with the skin.
- Electronic components can be damaged by electrostatic processes.
- Connections that have been wired incorrectly can destroy the electrical / electronic components.
- Incorrect tightening torques for the screws can cause severe injuries and damage to the system.

Comply with the legal obligations for waste prevention and proper recycling / disposal for all work on and with the CHP plant.

Particularly when it comes to installation, repair and maintenance work, water-polluting substances such as greases and oils, as well as cleansing liquids / sprays containing solvents must not infiltrate the ground or end up in the sewage system!

WARNING

Warning of risk to the environment.

Hazardous substances must be stored, transported, collected and disposed of in suitable containers!

7.2. Cleaning and lubrication

7.2.1. Cleaning

The end user may only carry out superficial cleaning work. All other activities are only allowed to be carried out by specialist personnel.

CAUTION

Risk of electric shock!

Only qualified and authorised electricians may carry out work on the electrical equipment!

Switch off the main switch for the power supply and secure it with a padlock! The person who carries out the maintenance and repair work must hold onto the key for this lock!

When replacing heavy system parts, only use suitable and faultless equipment and slings.

7.2.2. Lubrication

The system is lubricated fully automatically, meaning that no lubrication is required by the operator between the main maintenance intervals. If the operator detects leaks then specialist personnel must be called in.

Cleaning and lubrication work are only allowed to be carried out by authorised specialist personnel. The maintenance instructions and accident prevention regulations must be complied with in this case.

7.3. Maintenance intervals and servicing work

7.3.1. Maintenance intervals

Maintenance work is required on the CHP plant every 6,000 operating hours. Due to the high level of automation, the work involved is particularly minor. Having qualified personnel carry out this maintenance regularly and on schedule is a precondition for warranty or guarantee claims to be accepted.

Regular maintenance is essential because disruptions in operation attributable to inadequate or incorrect maintenance can cause very high costs.

If leaks or abraded points become apparent on the CHP plant outside the maintenance intervals, please take photographs of these to document them and provide a brief accompanying description. Send this information to the specified service address, stating the serial number and plant location.

7.3.2. Repair work

The following points must be observed before carrying out commissioning:

- Use the main switch to switch off the central power supply and attach a warning sign to prevent reactivation, or secure the switch with a lock
- Make sure that adequate lifting gear and load handling equipment are available for replacing larger plant components
- Cordon off access to the working area of the CHP plant and make sure that no unauthorised persons are in the working area of the plant
- Immediately replace all plant components that are not functioning correctly
- Make sure that suitable collecting containers are available for all substances that could pollute ground water (oils, coolants, etc.)

 Please use the drain valve for draining the CHP heating circuit which is mounted on the CHP generator.

7.4. Connection work

The following points must be observed before starting the CHP plant:

- Once again, check all screw connections that have been unfastened previously to ensure that they are firmly tightened
- Check whether all previously removed protective devices, covers, etc., have been reinstalled correctly
- Make sure that all tools, materials and other equipment used are removed from the working area afterwards
- Clean the working area and remove any liquids and similar substances that may have leaked out according to the product datasheet
- Make sure that all safety equipment of the plant once again functions correctly.

7.5. Electrical installation

All electrical installation and checking work on the CHP plant must be carried out by locally authorised specialist personnel (electricians). The regulations from the local authorities must be observed here. The electrical connections must be installed in accordance with the diagrams and wiring plans.

Work on the controller is only allowed to be carried out by authorised specialist personnel who are familiar with all information and regulations in these operating instructions as well as the functional description and the electrical diagrams. A detailed description of the controller is included in the separate documentation.

7.6. Connecting to the electrical grid

The following must be observed when connecting to the electrical grid:

- The power supply lines must be secured in accordance with the local regulations.
- Check whether the operating voltage and frequency correspond to the information on the name plate and in the control cabinet.
- Establish the electrical connections after the mechanical installation.
- In every case, install a lockable manual switch, which can be used to disconnect the electrical components from the grid, close to the system. With this switch, it must be possible to block the electrical system in the event of possible repairs and maintenance work.

DANGER

DANGER OF ELECTRIC SHOCKS!

The regulations from the local authorities must be observed.

Furthermore, electrical equipment must only be laid or installed in line with VDE 0100, whereby particular attention must be paid to Part 410 "Protection against electric shock". To prevent discharges of electrostatic charges, all conductive parts on the CHP plant must have a conducting connection with one another and be earthed. The discharge resistance to earth is not allowed to be greater than 106 ohm (BGR 132 formerly ZH 1/200).
The system is earthed by means of equipotential bonding.

8. A-TRON Service GmbH

Our claim is highest quality, perfect function and longevity. To guarantee this, a regularly maintenance of your CHP is incessantly.

For this service, the A-TRON Service GmbH was founded.
With an own service fleet, a network of qualified and certificated service partners throughout Germany and our multilingual remote-maintenance-system, we guarantee a smoothly maintenance of your CHP. With over 400 installed CHPs in Germany, England, Switzerland, the Czech Republic, Italy and Spain, we are your partner for a reliable operation of the highly efficient A-TRON CHPs.

Our services:

- online fleet-management
- free telephone support *
- remote maintenance with a 48 hours reaction time
- local maintenance and service
- fast original-spare parts supply
- full maintenance contract (SW100)
- partial maintenance contract (SW50)
- remote control and telephone support (SW20)

*only in connection with a maintenance contract

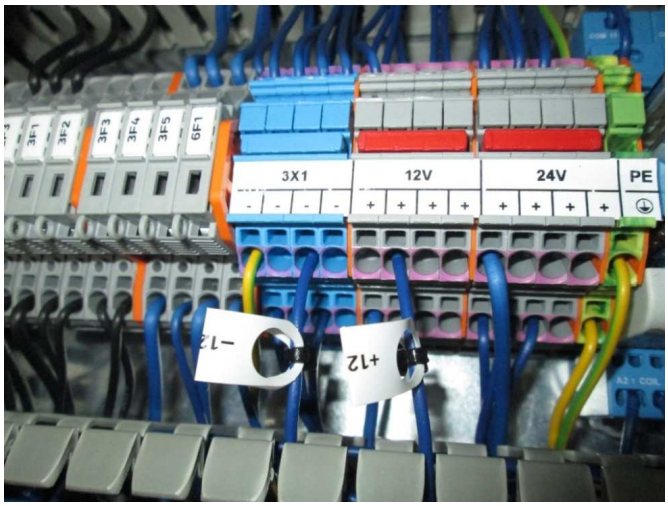
9. Remote maintenance and installation

9.1. Installing the remote maintenance module:

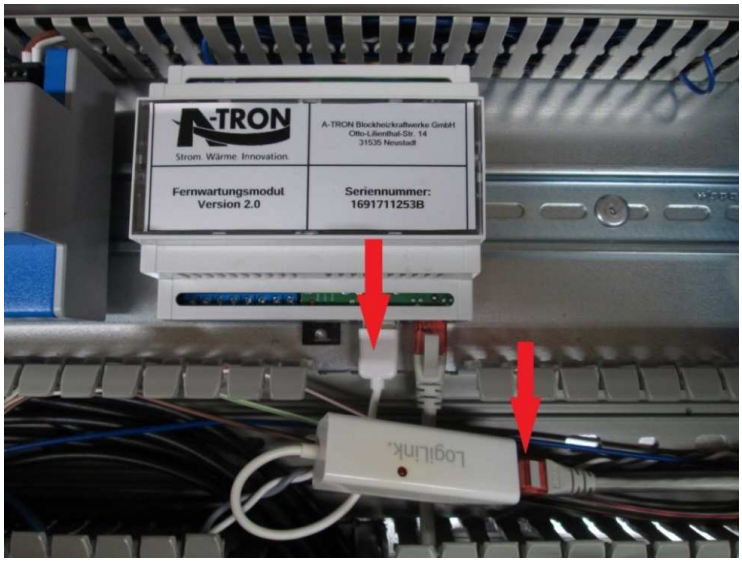
Before commencing installation, please remember to disconnect the CHP plant from the mains voltage at the main switch

1. Remove the cover from the top of the control panel and mount the remote maintenance module on the top hat rail inside the control panel as shown in the photograph. You will need to break through the corresponding cable duct tabs to make the connections for the remote maintenance module:

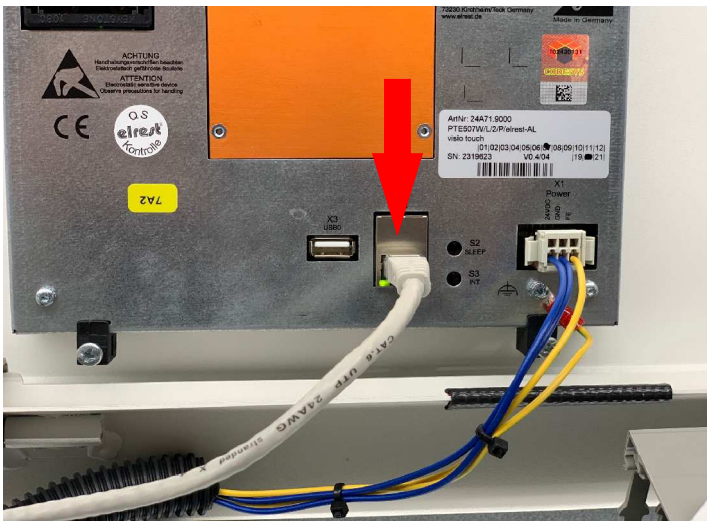
2. Lay the power connection cable (2 dark blue wires) in the cable duct running towards the 12 V +/- terminal strip and connect as shown in the photograph:



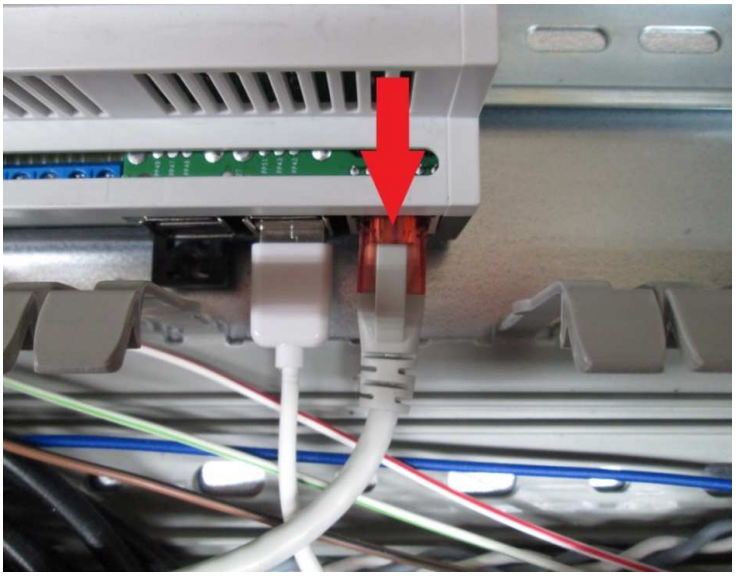
3. Plug the USB connector on the LogiLink USB 2.0 network adapter supplied with the remote maintenance module into one of the USB ports on the module. Plug a network cable into the other side of the adapter and connect this to your home network (Internet connection):



4. Plug the network cable supplied with the remote maintenance module into the RJ45 port on the controller:



5. Plug the other end of the network cable into the RJ45 port on the remote maintenance module:



Once all of the connections have been made, the CHP plant can be switched back on at the main switch.

9.2. CHP plant software configuration

The LAN setting for the CHP controller now needs to be checked or made.

To do this, press the "Code" button on the controller's touch display once. Then enter the code "2010" and press the "OK" button to confirm. Next, press the "LAN" button. The following character string should appear in the yellow "IP address" box at the top: "10.0.20.1". If this character string is not displayed, touch the yellow box once. Use the keypad that opens on the screen to enter the character string "10.0.20.1". Press the "OK" button to confirm your entry.

Change the "Subnet mask" box to "255.255.255.0".

Change the "Gateway" box to 10.0.20.20.

Touch the "Change IP" button on the next screen.

A "Reset" box is displayed; touch it once. The CHP plant must be in standby mode at this point. The controller will then restart the CHP plant and save the settings.

After the restart, check that the settings have changed:

IP address:	10.0.20.1
Subnet mask:	255.255.255.0
Gateway:	10.0.20.20

The remote maintenance module is factory-set for operation on a DHCP router and will establish a connection automatically.

If the network requires a static IP, this must be set by A-TRON prior to delivery of the remote maintenance module.

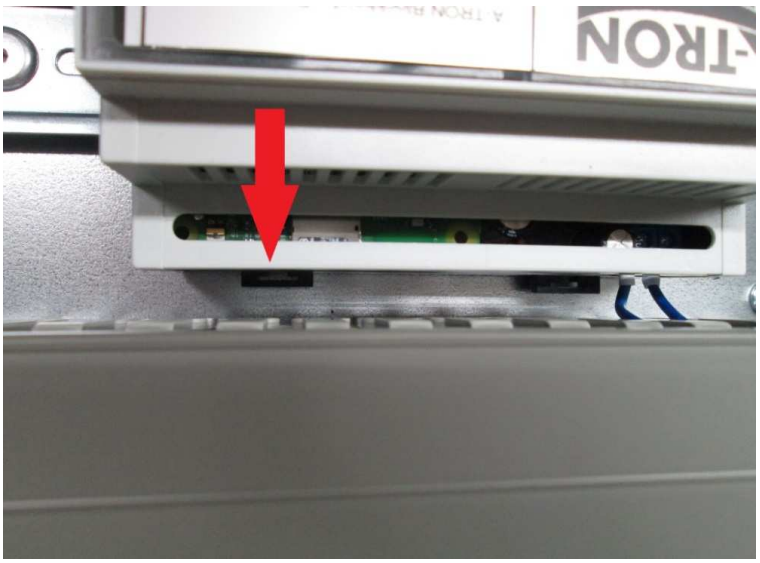
9.3. Cascade connection:

If multiple CHP plants are connected in a cascade, only the master CHP plant has a remote maintenance module. The CHP controller is then connected to the remote maintenance module via a switch.

The IP address of the **master** must be:	10.0.20.1
The IP address of the **first** slave is:	10.0.20.2
The IP address of the **second** slave is:	10.0.20.3
The IP address of the **third** slave is:	10.0.20.4

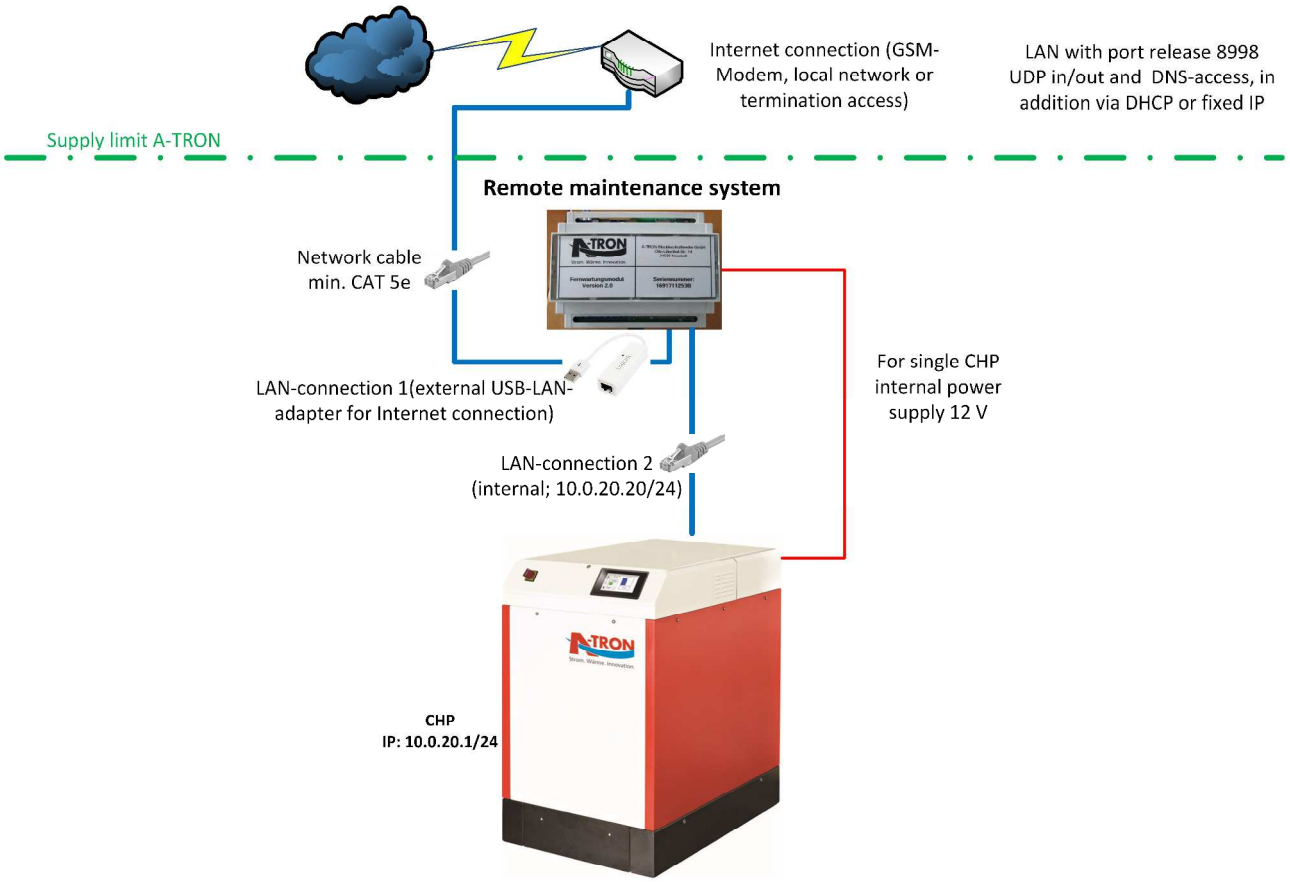
9.4. Changing the Micro SD card

If the Micro SD card needs to be changed, start by disconnecting the CHP unit from the supply voltage. Then carefully remove the remote maintenance module from the top hat rail. Next, carefully pull out the old Micro SD card and insert the new one. The side with the contacts points towards the board. Then reinstall the remote maintenance module as described above. The CHP plant can now be restarted.



9.5. Connection diagram for the remote maintenance module:

9.5.1. Connecting the individual CHP plant



9.5.2. Connecting the CHP plant cascade