Operating Manual

for the

microCHP

Valid for North American Series “C” Models:

Natural Gas: 336016

Propane Gas: 336017

AXIOM ENERGY GROUP

PH: (262) 642-6436 FAX: (262) 642-6437

WARNING: **The exhaust from the burning of fossil fuels in the engine in this product contains chemicals, such as soot, formaldyhyde, and carbon monoxide, known to the State of California, to cause cancer, birth defects or other reproductive harm.**

WARNING: **Components in this product and accessories contain chemicals, such as nickel (metallic), and ethylene glycol, known to the State of California to cause cancer, birth defects or other reproductive harm. Wash your hands after handling.**

EXPORT DECLARATION

THESE COMMODITIES, TECHNOLOGY OR SOFTWARE WERE EXPORTED FROM THE UNITED STATES IN ACCORDANCE WITH THE EXPORT ADMINISTRATION REGULATIONS. DIVERSION CONTRARY TO U.S. LAW IS PROHIBITED.

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Dear Customer,

Thank you for your purchase. By buying the microCHP you have obtained a top quality product from Axiom Energy Group.

You contribute not only to a conservative use of energy, but to less pollutant emissions and to lower ecological damage at the same time.

In order to obtain optimum value from this unit, please read this operating manual carefully before operating your microCHP. It contains the information you need to know about this unit and the corresponding accessories.

Intended Use

The microCHP is suitable for installation in homes and multifamily residences, as well as in small businesses, restaurants, and hotels. The microCHP engine speed can be modulated, i.e., the runs at variable speeds and performance levels. The microCHP is normally run with a complementary heating boiler. The boiler operates to meet peak capacity needs and as a backup. The microCHP is typically but not always operated with a buffer tank. Tank operation is recommended for maximum efficiency in basic configurations. The tank acts as a heat "battery," storing the energy for later use. Hot water preparation by the microCHP is also possible (in an external hot water tank). Small businesses and industry can efficiently meet heat loads and their electrical energy needs fully or partly by the microCHP and reduce usage during peak power times. The various operational modes and function of their control will be explained in detail.

Safety Guidelines

This manual provides Warnings and Cautions to alert readers of possible dangers or safety hazards associated with the installation, operation, or servicing of the micoCHP system.

The  **WARNING** symbol identifies special instructions or procedures, which if not correctly followed, could result in serious injury or loss of life.

The  **CAUTION** symbol identifies special instructions or procedures, which if not strictly observed, could result in damage to, or destruction of equipment, or may be a violation of a law, ordinance, standard, or code requirement.

Observe all safety instructions for safe and reliable operation.

NOTE: Installation, initial operation, maintenance, and repair of the microCHP must be performed by qualified personnel.

NOTE: The microCHP must be maintained and inspected in the scheduled intervals, otherwise any warranty claims become void.

 **WARNING:** The external cabinet panels can only be removed with keys and tools. Contact with components may lead to injuries (hot and/or live parts). Panels must be removed by qualified personnel.

 **CAUTION:** Do not destroy lead seals. If the seals are tampered with, the warranties are voided.

 **CAUTION:** In cold climates, protect the heating system from freezing pipes. This is possible only if the microCHP is always in use (energized and on, with the protection option activated).

NOTE: Do not switch off your unit. In standby mode, the microCHP consumes only approximately 5 W electricity.

NOTE: In the event of a start or restart of the engine, an approximate six minute delay may occur between the start command and the actual start of the engine. This is normal.

NOTE: Before modifying parameters of the microCHP, read the operating manual carefully.

WARNING: If the microCHP has not been operated for any length of time, ensure that the condensate drain trap is filled with water before operating. If the is operated with an empty condensation water drain trap, there is risk of intoxication by effusing exhaust gas. Exhaust gases contain CARBON MONOXIDE which is an odorless, colorless, and deadly gas.

WARNING: In case of fuel gas odor proceed as follows: Evacuate the area. Shut off the gas valve. Because of the danger of arcing, do not use lights. No other electrical switches must be switched. The all-pole cut-off point must not be switched off. Safely ventilate the area and notify the gas company and Fire Department. Do not use a telephone in the hazard area. No flame (e.g., lighter, match) is permitted in the area.

WARNING: In case of fire or water penetration proceed as follows: Shut the gas supply valve. Switch off the external circuit breaker cut-off point. Inform emergency personnel and the service provider, as needed.

CAUTION: Operation with liquefied petroleum gas (LPG): only LPG with an adequate minimum engine octane number (MOZ) may be used. Refer to the technical specifications. In case of non-observance, Axiom Energy Group does not warrant the resulting damage.

NOTE: After the microCHP is installed, the electronic equipment must be cleaned of dust and the air filter inspected by service personnel. During periodic maintenance, dust must also be removed (typically with compressed air). Dust layers on electronic components contribute to heat failure of boards.

NOTE: Please retain this operating manual for future use.

WARNING: Please note for your own safety that the assembly, setup, and maintenance of your unit must be performed by a qualified, licensed installer. This is also required for the inspection and overhaul of the unit as well as for the modification of the set gas volume.

WARNING: Do not make any modifications to the unit, on the gas supply line, combustion air supply, water and power, exhaust gas evacuation, drain pipe, and safety valve for the heating circuit water. The prohibition against modification also applies to structural components in the vicinity of the unit as far as they have any influence on the operational safety of the unit.

WARNING: For all installations, combustion air must be obtained from an external, outdoor air intake.

WARNING: To keep the electronic equipment cool, the vents under the control cabinet and the air outlet ports on the side panels must be unobstructed. Do not cover or block the housing or any vents with any items. When installing flooring, the ventilation slots underneath the electronics compartment must not be blocked or reduced in size.

CAUTION: Ensure an unobstructed supply of cooling air to the unit is circulating in the room. Do not enclose the unit or block the vents.

WARNING: Do not install any additional devices with exit air ducts (e.g. ventilators, tumble-driers or extractor hoods) in the environment of the unit without prior consultation of a qualified installer.

WARNING: You must ensure, after prior consultation with your qualified installer, that a sufficient supply of external, outdoor intake combustion air to the unit is provided and exhaust is properly vented outdoors.

WARNING: Do not use or store explosive or readily flammable materials (e.g., gasoline, paper, paints) in the room where the unit is located.

CAUTION: The microCHP must be serviced and inspected in the scheduled intervals, otherwise any warranty claims become void. Ask your qualified technician to perform the service. We recommend obtaining an inspection contract with your qualified installer.

WARNING: Any utilization exceeding the one described above is deemed an improper utilization and is prohibited. We cannot take any liability for damages caused by non-observance of this operating manual.

CAUTION: Corrosion Protection: Do not use any sprays, solvents, chloric detergents, paints, or adhesives near the unit. These agents can, under unfavorable circumstances, lead to corrosion – including in the exhaust gas system.

CAUTION: Use distilled water to fill and refill the heating unit. Decalcified water must be used to avoid clogging of the heat exchanger and piping.

NOTE: Check the water level of the unit at regular intervals described in this and the 4,000 Hour Maintenance Manual.

CAUTION: In case of leakage in the area of the hot water pipes between the unit and the tap connections, immediately shut down the unit. Shut the cold-water stop valve at the unit and have the leakage repaired by a qualified plumber.

WARNING: Always use the return temperature controller group (including the recirculation valve) provided by Axiom Energy Group for operation with the microCHP.

Forward

The microCHP has a unique engine as a prime mover,. The engine was designed and developed by the Gas Research Institute (GRI) and Briggs & Stratton Corporation for extended duration operation on gaseous fuels.

To meet the continuous duty requirements and long service intervals, the engine was designed with a number of high reliability features. These features are intended to reduce sliding friction and wear and tear of moving engine and valve train components, which helps to improve the engine efficiency and reduce lubricating oil contamination. These features allow the engine to operate up to 4,000 hours before service is required and provide a long life expectancy before engine overhaul or replacement is required.

This Operation Manual is provided to microCHP purchasers, to serve as an information guide for operation, as well as general technical specifications and information on the unit.

WARNING: Exhaust gases contain CARBON MONOXIDE which is an odorless, colorless, and deadly poison.

Install a carbon monoxide alarm according to the manufacturer's and UL/ NFPA guidelines.

WARNING: DO NOT place hands near moving or rotating parts (engine - flywheel coupling).

WARNING: To prevent accidental starting when servicing engine or equipment, always first turn off electrical power to unit at the external circuit breaker / disconnect and lock out/tag out. Wait 5 minutes for capacitors to discharge. No user serviceable parts.

INTRODUCTION

This manual is divided into sections as follows. The sections are intended to be independent as regards the activities described, although there may be references in sections to other sections in the manual or other manuals.

Section 1 **Applications**
Information on application operating modes and configurations.

Section 2 **Options**
Information on options.

Section 3 **Interface Description / Menu Overview**
Introduction to and overview of the microCHP interface and menu system.

Section 4 **microCHP Operation**
Instructions on the microCHP operations and operating menus.

Section 5 **Maintenance**
maintenance information.

Section 6 **Troubleshooting**
Descriptions and instructions for troubleshooting error and warning codes.

Section 7 **Factory/Field Settings**
Instructions for factory/field settings.

The instructions in this manual are based on good commercial practices and the requirements, recommendations, and guidelines of applicable U.S. National Codes, Standards, and Equipment Listings. These Codes, Standards, and Equipment Listings include the National Fire Protection Association (NFPA), which include the National Electrical Code (NEC), and Underwriters Laboratories Inc., (UL) Standards, as well as the Code of Federal Regulations (CFR). There may be other state and local codes, ordinances, restrictions, and safety requirements that may also apply to this type of equipment.

WARNING: Failure to follow the instructions and recommendations in this manual or the restrictions and requirements of the Codes, Standards, or Equipment Listing Standards referenced in this manual, or other Country, State, and local Codes, may result in Safety Hazards. These Safety Hazards could cause personal injury or death and could result in damage to the microCHP or components. Failure to follow the instructions or recommendations of this manual may also void the microCHP Warranty on workmanship and materials.

CAUTION: It is the responsibility of the Installation Contractor to ensure that the microCHP equipment is installed in compliance with all Federal, State, and Local Codes and Ordinances.

TERMS AND CONVENTIONS

The microCHP is contained in a single unit with physical connections for fuel supply to the engine, heat exchange water, and electrical power input/output.

The primary engineering units shown in this manual are the English system, with the primary units of pounds (lb) for unit mass or force, inches (in) for unit length, and seconds (s) for unit time. The metric equivalent unit is shown in parentheses following the English quantity. The metric units are based on the International Standard of Units, abbreviated as SI. The primary metric units are kilogram (kg), for mass, meter (m), for unit length, and second (s), for unit time.

ACRONYMS AND ABBREVIATIONS

A	Ampere
AC	Alternating Current
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
AWG	American Wire Gage
BTU	British Thermal Unit
°C	Degrees Celsius
CIR	Circular
CCA	Cold Cranking Amperes
CFR	Code of Federal Regulations
DB9	D Subminiature 9 pin Connector
DC	Direct Current
°F	Degrees Fahrenheit
cm	Centimeter
dB	Decibel
DC	Direct Current
H	Height
Hz	Hertz
in	Inch
K	Kelvin
kW	Kilowatt
LED	Light Emitting Diode
L	Liter
lb-in	Pound-Inch Torque
LPG	Liquid Petroleum Gas
MPa	MegaPascal
m	Meter
mm	Millimeter
mV	MilliVolt
NEC	National Electrical Code
–	Negative
NFPA	National Fire Protection Association
NIST	National Institute of Standards and Technology
N•m	Newton-Meter
NPT	National Pipe Tapered
O_2	Oxygen
OD	Outside Diameter
PC	Personal Computer
+	Positive

ACRONYMS AND ABBREVIATIONS (Continued)

psi	Pounds Force per Square Inch
rpm	Revolutions per Minute
SAE	Society of Automotive Engineers
s	Second
SI	International System of Units (Ie Systeme International d'Unites)
SCF	Standard cubic feet
STP	Standard Temperature and Pressure
TBD	To Be Determined
UL	Underwriters Laboratory
U.S.	United States
USA	United States of America
VGA	Video Graphics Adapter
V	Volt
W	Watt or Width

TRADEMARKS

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1 Applications

1.1 Operating Modes

The microCHP runs in two main operating modes:

- Heat driven: The engine speed and, consequently, the heat and electrical output are driven by the building heat load and, optionally, the domestic hot water demand. Heat driven is the most common operating mode.
- Electrical Power driven: The engine base speed is set to meet the expected or measured electrical power demand. However, controls optionally can take into account the building heat and hot water demand.

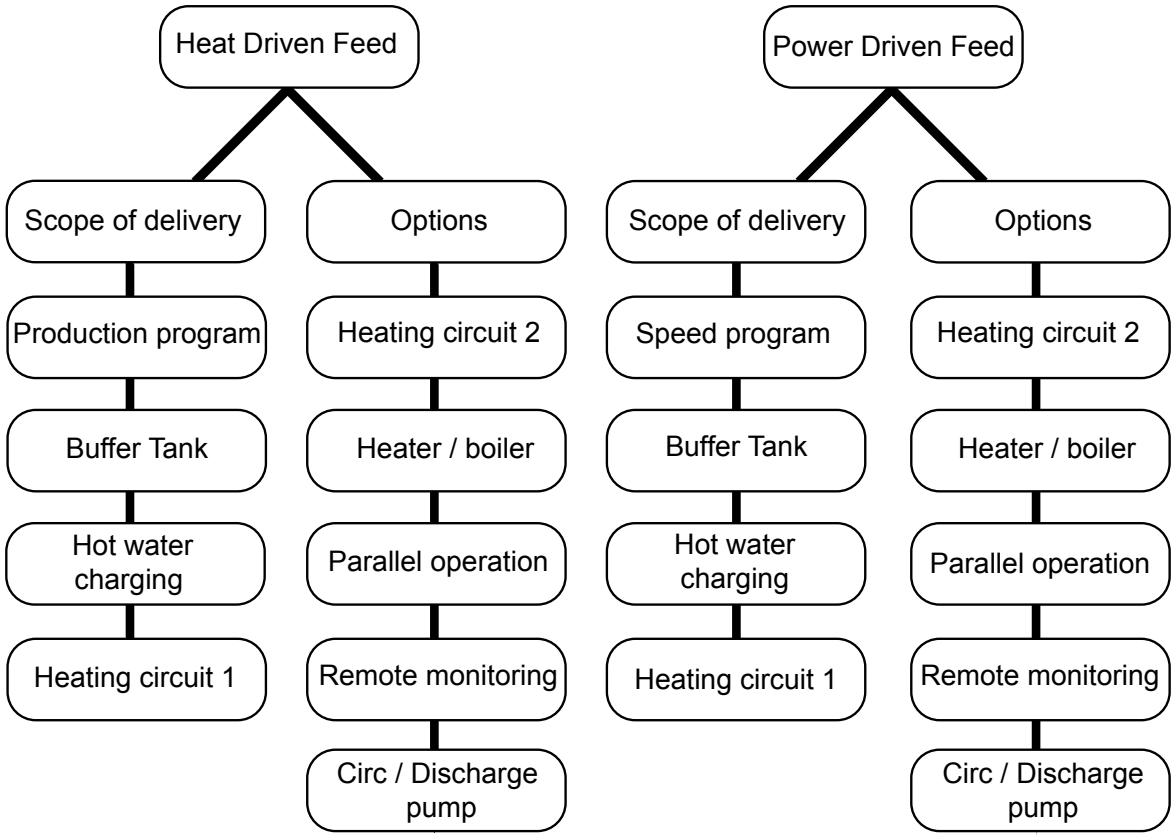


Figure 1.1 microCHP Software Operating Modes

The microCHP is equipped with a modulating engine/alternator that varies speed and thermal and electrical output based on the program control, as described in this Operating Manual. The unit responds to the conditions in the building, monitoring sensors, and making adjustments as needed.

1.1.1 Heat Driven

For the Heat Driven Production Program, the operating performance is primarily adjusted to the building heat and, if set up, the domestic hot water demand. Electrical power output is also generated which reduces or eliminates the electricity costs. This mode is suitable for large homes, multifamily residences, and commercial establishments.

1.1.1.1 Heat Fed with Buffer Tank

The engine speed is calculated based on the required heat demand from the building. Ideally, the engine starts only once a day (with long life, high coverage of home heat and electrical requirements). Heat is stored in a buffer tank, for later drawing off during peak demand times of the day. The buffer tank helps smooth out demand cycles.

In seasonal transition periods (spring and fall), and in summer months, more starts typically occur. Through the production program, the operator presets the time periods for increased heat and electrical power generation. The operator plans this according to the expected energy needs. If possible, the engine is operated at an increased speed during the programmed times. The electricity produced primarily covers the consumption of electricity of the home or commercial building. Any surplus electricity produced is fed back to the grid. Depending on the policies of your utility company, the electricity can be sold back to your local power company or credited against your utility bill.

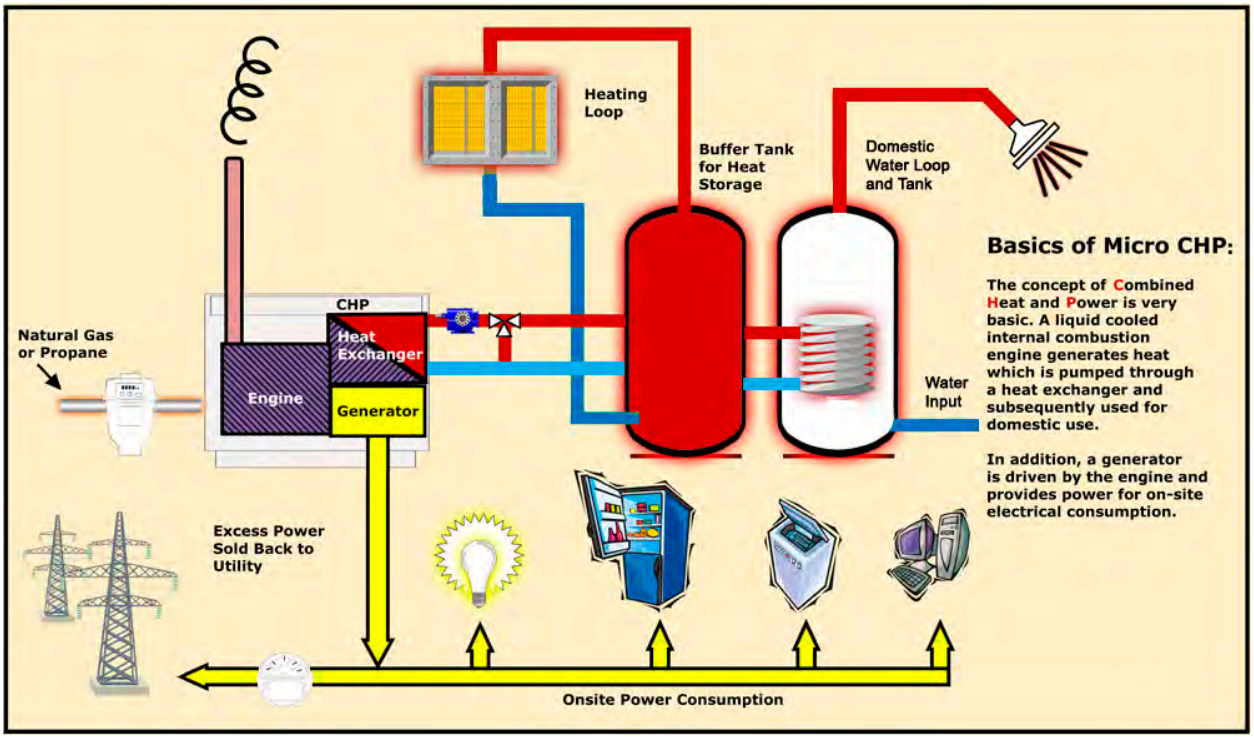


Figure 1.2 microCHP Basics - Heat and Electrical Output.

1.1.2 Power Driven

In the Power Driven operating mode, the engine speed is adjusted according to the expected electrical power requirements of the building. This mode has advantages if the electric base load will be met by the microCHP and/or power peaks mitigated (Power Driven/Impulse Mode). This mode is suited for small businesses, hotels, and restaurants, where a consistently high electrical demand is typical. Installation is typically with a buffer tank. The buffer tank is needed for heat storage, a place to store heat energy, for later application in building or hot water heating.

If the Power Driven mode is desired, additionally supplying building or process heat, or hot water demand is highly recommended because of the significant cost savings. The Power Driven speed program allows three configurable rpm speed settings (and engine off). Based on known power consumption patterns, the engine speed can be programmed to adjust throughout the week.

Heat load requirements can be met at any time in Power Driven mode. The increased heat demand can be given priority over the electricity generation. This is useful if, for instance, in a commercial environment the electricity consumption is met, but the heat demand must be met as well. In these situations, the is run at an engine speed to meet the electrical demand and then at a higher speed or longer time to meet additional heat demand.

1.2 Buffer Tank Management

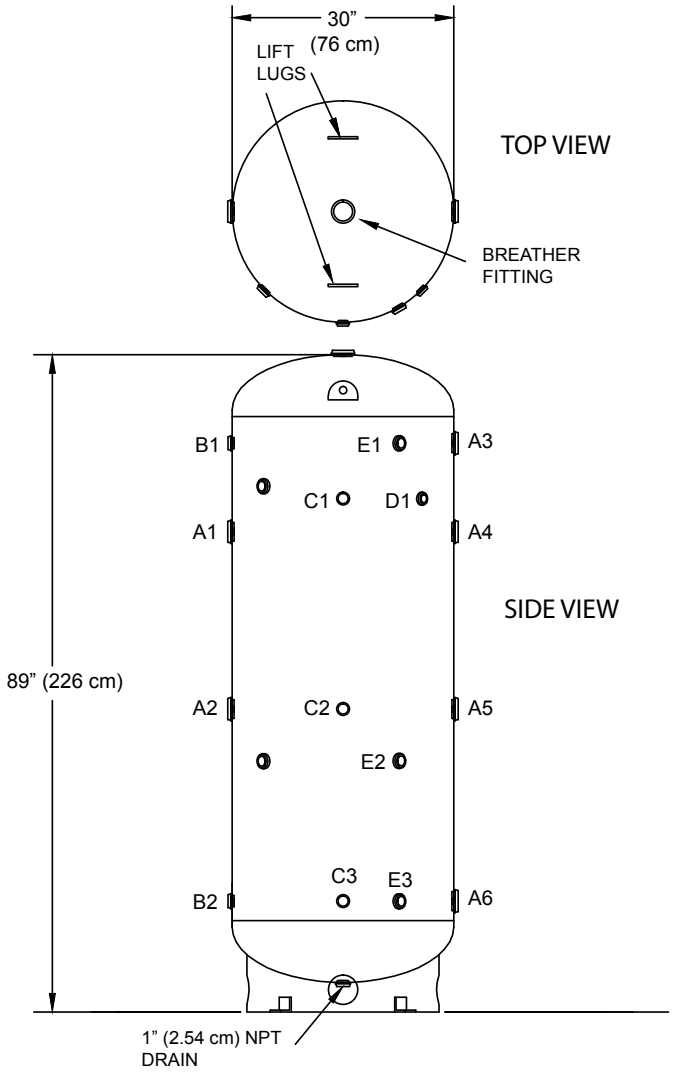
The buffer tank serves as an energy storage location or heat dump between the microCHP and the heat loads. It can also be used to directly or indirectly prepare domestic hot water (typically when used with a second, hot water tank). In times of elevated electrical power requirements, the engine speed is increased with the resultant heat absorbed by the buffer tank. The surplus heat produced by the engine is efficiently transferred to the buffer tank. Conversely, the stored heat can be gradually drawn off from the buffer tank by heat demand from the building or domestic hot water. The engine speed can be kept low or the engine turned off, when the target amount of heat energy is stored.

A higher coverage of the heat/electric requirements is possible with a buffer tank installed. A tank sized to match the requirements must be specified. If the tank is under-sized, increased start-stop switching of the engine may occur which may result in shorter engine life and less electrical output. Electricity is only generated when the engine is running. In some installations, a fan/radiator is added to disperse excess (unused) heat. Efficient tank management significantly contributes to the economical operation of the microCHP.

1.2.1 Application

Temperature sensors (T) are attached to the buffer tank and an optional domestic hot water tank. The sensors measure the temperature in the upper (or domestic hot water tank) (SP1), middle (SP2), and lower (SP3) areas of the buffer tank. The tanks are always charged with hot water from top to bottom. The supplied temperature sensors must be properly installed (immersion sensors with thermal conductance paste).

In most applications, the domestic hot water tank is separate with the hot water sensor (SP1 _WW) located in the hot water tank. The hot water tank is indirectly heated with water from the buffer tank. An aquastat or other device is installed to control operation of



Location	Description	Flange size
A1	Boiler Supply	2 inch (5.08 cm)
A2	Boiler Return	2 inch (5.08 cm)
A3	Heating System Supply	2 inch (5.08 cm)
A4	Water Heater Supply	2 inch (5.08 cm)
A5	Water Heater Return	2 inch (5.08 cm)
A6	Heating System Return (Drain Tee typically attached)	2 inch (5.08 cm)
B1	Supply	1 inch (2.54 cm)
B2	Return	1 inch (2.54 cm)
C1	Sensor SP1_ww (top)	3/4 inch (1.905 cm)
C2	Sensor SP2 (middle)	3/4 inch (1.905 cm)
C3	Sensor SP3 (bottom)	3/4 inch (1.905 cm)
D1	Relief Valve	3/4 inch (1.905 cm)
E1	Spare	1 inch (2.54 cm)
E2	Spare	1 inch (2.54 cm)
E3	Spare	1 inch (2.54 cm)

Figure 1.3 Example Buffer Tank 240 gallons (908 L)

a pump delivering heat exchange water to a coil in the separate tank. If the system does not include a separate hot water tank, SP1_WW typically is mounted as the top buffer tank sensor (SP1).

The temperature sensor VL_total (VL_gesamt) monitors the supply temperatures of the heated water for each heating circuit. If located in the buffer tank, it is installed below the supply connection and above the return. Alternatively, the sensor may be located in a low loss header. Note: This sensor typically is not used in the CHP buffer tank set of sensors.

The middle temperature sensor SP2 (SP2_mitte) measures heat values that are used for production management at medium production (MP) and high production (HP) of the microCHP.

The bottom temperature sensor SP3 (SP3_unten) is used for measuring the engine starting and stopping temperatures and for production management at medium (MP) and high production (HP) of the microCHP.

During the summer, when heat output is not needed as much (unless, for instance, swimming pool heat is required), only enough heat to prepare domestic hot water is generated. In this scenario, the heat transfer from the tank is reduced and the engine is used less often. The switch from winter to summer operation is set up and maintained through the control system software, based on selected average outside temperature.

An additional heater / boiler can be connected to the buffer tank up to a maximum of 200,000 BTU. The additional boiler startup is typically controlled by the boiler controls. These controls must be coordinated with the startup.

If the measured hot water temperature (SP1_WW) falls below the set hot water target temperature, the engine speed is increased, more heat is produced and the temperature rises again. If more water is tapped and if the microCHP does not reach the hot water target temperature, an additional boiler is switched on (if this option is installed and activated).

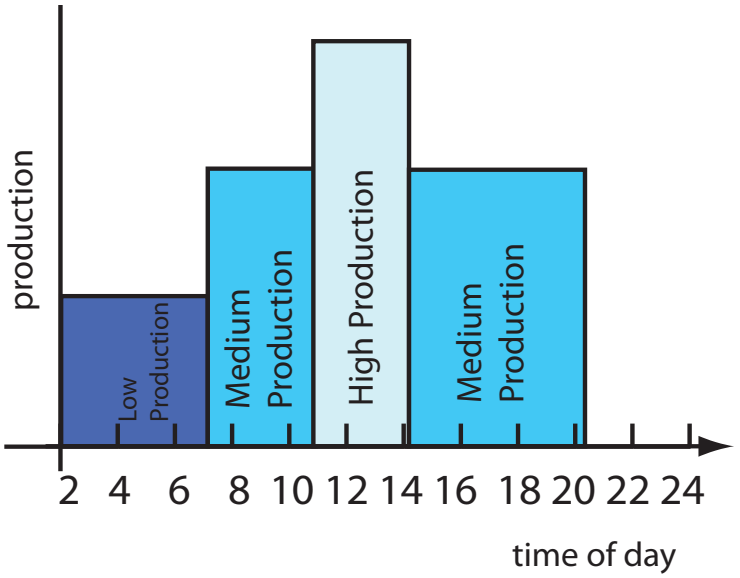


Figure 1.4 Example production levels at different times of the day

The buffer tank is charged until the lower tank temperature (SP3) reaches the set stop temperature (or a “no production” time frame is activated). If summer production is activated, the middle tank temperature (SP2) is monitored and controls instead of the lower tank temperature (SP3).

The temperature readings for the middle (SP2) and lower (SP3) temperature sensors are averaged during production management to control engine speed.

1.2.2 Production Program Settings

The following production program levels (KP, NP, MP and HP) can be programmed into schedules for various times and days of the week, to meet individual home and building requirements. See Section 4.3.4.1 for a discussion of production strategies.

1.2.2.1 KP – No Production:

In KP setting, the engine is off. No heat demand is met or it is being met by a hot water boiler. No electricity is generated at this setting.

1.2.2.2 NP – Low Production

In NP setting, the microCHP is operated in heating mode. The speed is calculated based on the current heat and hot water demand. The engine starts when heat is demanded and the lower tank temperature (SP3) falls 10 °C below the target setpoint value T_SP3_unten_max(NP). When heat is demanded the microCHP engine starts on the value T_SP3_unten_max(HP). In case there is a high heat demand the speed is run up to the preset engine maximum rpm. If the desired temperature is not reached at the shared supply sensor (if option installed), the complementary boiler/peak load tank is switched on. Boiler can be configured with aquastat for desired setpoint.

The engine speed is determined by the supply total temperature sensor (VL_gesamt), if installed. When the heat demand is satisfied the microCHP modulates down to the minimum speed (typically 1,200 rpm) and continues charging the tank.

If the set maximum temperature T_SP3_Unten_Max (MP/NP) – (winter); T_SP2_Mitte_Max(MP/NP) – (summer production) is exceeded, the microCHP is switched off automatically. If more heat is demanded (heat / hot water) the microCHP is switched off at T_SP3_unten_max(HP) after the demand is met.

1.2.2.3 MP – Medium Production

In the Medium Production setting, the microCHP starts when heat is demanded and the lower tank temperature (SP3) falls 10 °C below the target value T_SP3_unten_max(MP). If there is hot water demand, the engine starts on the value T_SP3_unten_max(HP). If the desired temperature is not reached at the shared supply sensor, the additional boiler is switched on (optional additional boiler / peak load tank). Boiler can be configured with aquastat for desired setpoint.

The speed is calculated based on the buffer tank averaged temperature of the SP2 and SP3 sensors and the heat demand and is then run up to the maximum value possible. If the set maximum temperature T_SP3_Unten_Max (MP/NP) – (winter); T_SP2_Mitte_Max(MP/NP) – (summer production) is exceeded, the engine is turned off automatically. If there is more heat demand (heating / hot water) the engine is turned off

at T_SP3_unten_max(HP) after the demand is met. Select this mode for continuously high heat consumption at low temperature level.

1.2.2.4 HP – High Production

In the High Production level, the microCHP starts when heat is demanded (for building heat or hot water) and when the lower tank temperature (SP3) falls 10 °C below the target value T_SP3_unten_max(HP). The speed is calculated based on the buffer tank temperature average of SP2 and SP3 sensors and the heat demand and is then run up to the maximum value possible. If the desired temperature is not reached at the shared supply sensor (if option installed), the additional heater is switched on (optional additional heater / peak load tank). Boiler can be configured with aquastat for desired setpoint.

The engine speed is adjusted to meet the heat demand. The microCHP modulates to the maximum speed possible and charges the tank with heat. If the set maximum (target) temperature T_SP3_Unten_Max (HP) – (winter); T_SP2_Mitte_Max(HP) – (summer production) is exceeded, the microCHP is switched off automatically. Select this mode also for continuously high heat consumption at low temperature level.

1.2.3 Water Temperature Management Chart

Below is a chart showing a possible temperature management scenario.

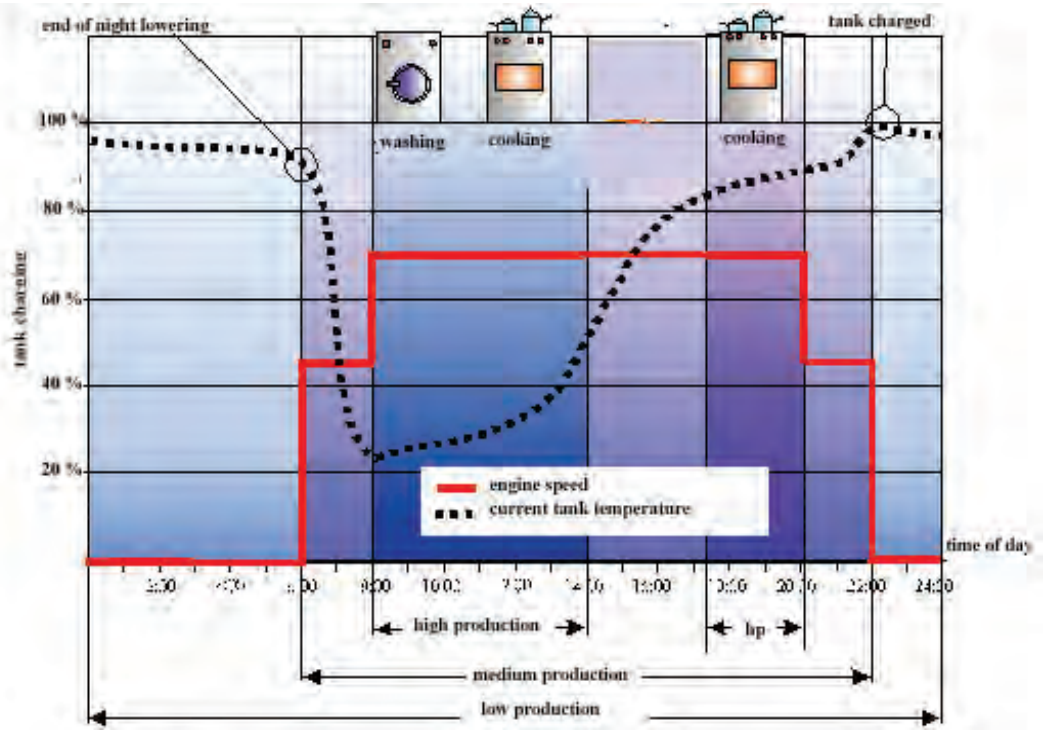


Figure 1.5 Chart showing example buffer tank water temperature management.

1.2.4 Speed Program Settings

The following speed program levels (Off, Low, Medium, and High) can be programmed into schedules for various combinations of times and days of the week, to meet individual home and building requirements. See Section 4.3.4.2 for a discussion of speed program strategies.

NOTE: The Production Program is the more typically used program in most installations. Some owners may prefer to use the speed program.

Consult with your servicer and local utility provider for net metering considerations and technical details.

1.2.4.1 Speeds

The engine speed can be set to LOW, MEDIUM, and HIGH.

The actual value for each of these settings is determined in the Desired Speed submenu. They range from 1,200 to 3,400 RPM, in increments of 100 RPM.

2 Options

Options may be added to the microCHP system, depending on the site specific requirements.

2.1 Peak Load Boiler

If the heat production of the microCHP is not sufficient, a peak load / backup boiler can be installed and activated by the boiler controls or microCHP. With this installation, the boiler is switched ON/OFF without modulation from the microCHP. Typically, this option is installed to maximize running time (and electrical output) and is a recommended option.

NOTE: If the is undersized for an installation, the peak load boiler activates during the peak load in extreme weather conditions when additional heat or electricity is needed. Strategically undersizing the increases the running time and electrical output of the microCHP. The peak load boiler also acts as a backup during maintenance intervals.

2.2 Heating Circuit 2

The heat control can activate a second (optional), self-contained heating circuit (such as multi level floor heating). It is possible to assign priority to one heating circuit (the other heating circuit is switched off if the heat output is not sufficient).

2.3 Remote Monitoring

The microCHP can be remote-monitored via an internet connection between computers. This enables a service technician to monitor the micoCHP. Before maintenance is needed or in case ofa malfunction, the microCHP can be configured (option) to notify the service provider andsend an alert message.

Remote monitoring is available when a desktop, notebook, or tablet computer with the ecoServ software installed is permanently attached to the back of the unit. The service technician can remotely log on via the internet to the local computer. An internet connection must be secured at the site.

2.4 Parallel Operation

In case of larger electrical power and/or heat demand, two or more units can be installed and connected in parallel. They communicate via a serial interface (RS-485). One unit is designated as the server (master) and controls the others (clients). In this type of configuration, the master evenly distributes the load so that all units can be in service at the same time. Up to four units can be configured in parallel. The units can be remotely monitored, individually and as a group.

2.5 Additional Heater Activation

If the heat production of the microCHP is not sufficient, an additional heater can be activated (modulation activation on/off via C1-C2). Often the installation includes a boiler that independently starts, but the set points must be coordinated. See paragraph 2.1 above.

Consult with the factory or your service provider.

2.6 Circulation Pump or Unload (Discharge) Pump

A circulating pump can be configured to support hot water tank circulation throughout the building. Alternatively, the pump option can be used to activate an unload (heat discharge) pump (e.g., discharge of hot water from buffer tank to remove excess heat). When chosen as an unload pump, the pump is switched off, based on the middle tank sensor temperature reading (T_SP2_mitte) as well as on the programmed time profile set up. The discharge ON/OFF temperature is set within a range of 4 – 90 °C (39 – 194 °F). For circulation pump, only the programmed time profile controls the pump ON/OFF.

2.7 Hot Water Charging Pump

A hot water charging pump can be used in-line to a connected separate hot water tank. The hot water preparation is controlled by three hot water set temperatures (standard activation). Priority for hot water can be controlled, as well as the running of the pump for heat dissipation.

3 Interface Description / Menu Overview

In this section, the microCHP LCD interface is described and a menu system overview presented.

3.1 System Boot Display

Upon power up, the microCHP will run through internal diagnostics and, if successful, display the successful system boot (Figure 3.1) message.

The screen displays the

- boot version
- equipment
- Program status

NOTE: The boot version is not the operating software version. See Section 4.3.2.3 for information regarding the software version.

Figure 3.1 microCHP Boot System Display

Figure 3.2 microCHP Operating Dial/Button.

3.2 Standard Display

The microCHP interface consists of a back-lit LCD display and a rotating combination dial/button (see Figure 3.2) located on the top front sloped area of the cabinet.

Usually the display is switched off (darkened) by a timer. By pressing the dial once, the standard display (see Figures 3.3 and 3.4) appears in light lettering with a blue background.

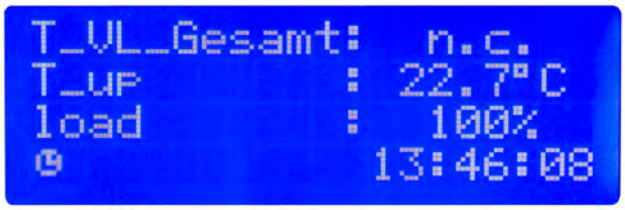


Figure 3.3 microCHP Example Standard (Initial) Display - Heat Driven Mode

Figure 3.4 microCHP Example Standard (Initial) Display - Power Driven Mode

The standard display screen includes one of the following information displays on four lines as follows:

Line 1:

In Heat Driven mode (see Figure 3.3):

Depending on the selected heating parameters for Heating Circuit 1, one of the following is displayed:

- room temperature
- outdoor temperature
- aggregate temperature of the water supply from the (as shown in the example in Figure 3.3) (often not used, indicated by n.c.)

In Power driven mode (see Figure 3.4):

- engine speed

Line 2:

Heat Driven Mode:

- Tank Upper temperature: T_Up (this is typically either the SP1 upper sensor in the buffer tank, or the hot water sensor in a domestic hot water tank.)

Power Driven Mode:

- The electric power output in watts.

Line 3:

Heat Driven Mode:

- Percentage of output (e.g., “100%”).

Power Driven Mode:

- Coolant temperature at return flow to engine.

Line 4:

- Operational mode indicator (automatic or manual)
- child protection indicator (if activated)
- errors (if any)
- warnings (if any)
- holiday (absence) program (if any)
- current time

NOTE: If a temperature “n.c.” is displayed, no temperature sensor is connected. If “k.s.” (short circuit) is displayed, a trouble (short circuit) at the temperature sensor or wiring is occurring.

By turning and pressing the operating dial/button (Figure 3.2) you can access all menus, starting at the Main Menu level.

3.3 Menu Structure

All menus derive from the Main Menu. Figure 3.5 depicts the menu structure and the navigation path through the menu structure. Depending on the specifics of your installation (number of heating circuits, etc.), some of the screens may not appear.

The microCHP has three versions of the menu structure:

- Complete: All user screens are displayed and settings can be modified.
- Restricted: Child protection is activated and non-modifiable screens (read-only) are displayed.
- Extended: Used by the service technician during initial operation and maintenance / diagnostics to change infrequently accessed settings.

See Section 4 for detailed instructions on the menu system selections and instructions for entering and changing settings.

3.4 Using the Rotating Dial / Button

Use the rotating dial / button located on the cabinet to access menu selections and make changes in the software parameters. In the following section 3.4.1 is an illustrated example procedure to show how the dial / button is used.

You will find detailed instructions on all menu items in Section 4.

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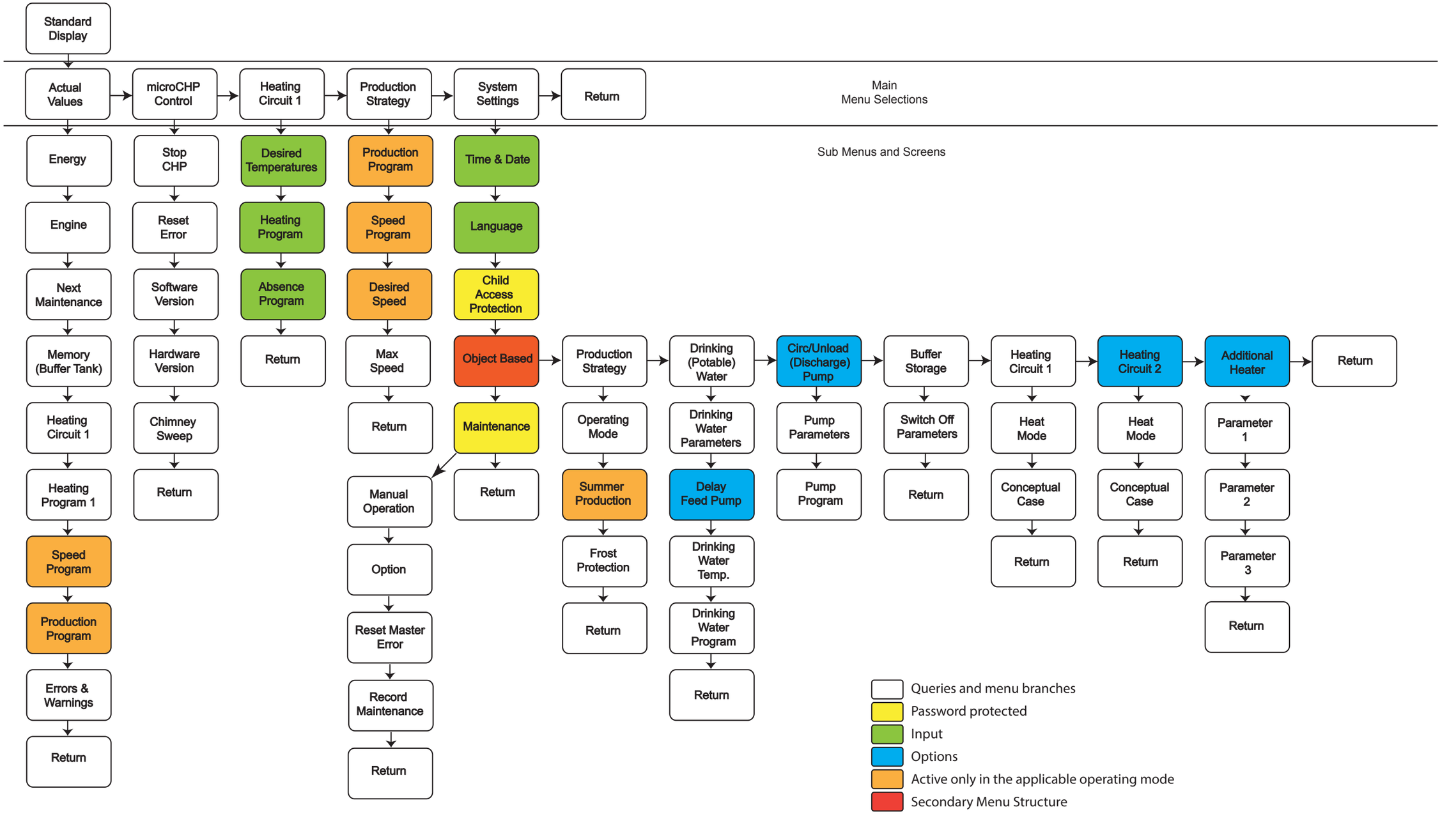

Figure 3.5 microCHP Menu Structure

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3.4.1 Illustrated Example Procedure (Setting the Target Temperatures)

1. Press the rotating dial / button . The standard display (such as in example Figure 3.6) appears.

Figure 3.6 Example Standard Display

2. Press the operating button and turn it , until the Main Menu / Production Strategy submenu screen appears (Figure 3.7).

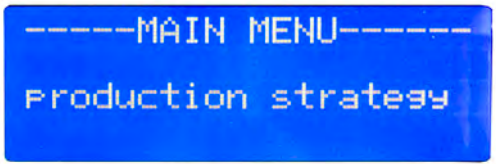

Figure 3.7 Production Strategy / operat. mode Screen

3. Press the operating button , the Production Strategy / production program submenu item appears (Figure 3.8):

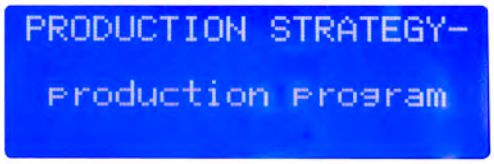

Figure 3.8 Production Strategy - Production Program Screen

4. Press the button . The Production Program day selection menu item appears (Figure 3.9) with Monday highlighted (flashing).

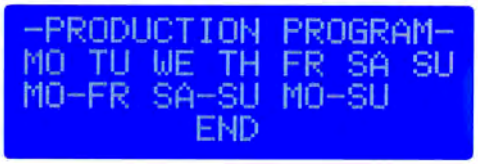

Figure 3.9 Production Program Day Selection Screen

5. Rotate the dial to the select a day or days and press the button  . The production strategy for the selected day or days is displayed (Figure 3-10), starting with the first 8 hours of the day in half hour increments. Rotate the dial to display the remaining time of day.

Figure 3.10 Prod. MO Production Level Selection Screen

6. Select a time segment by pressing the button  . The segment blinks rapidly. Rotate the dial  to modify the production level for that time segment (the bar graph will raise or lower). Press the button  when you have set the production to the desired level.

7. To finish setting the target production levels, turn the dial  to move the selection cursor to “OK.” The letters “OK” flash slowly when selected.

8. Press the button  to save the new settings.

   The Production Program day selection screen (Figure 3.9) appears again. You can navigate to another selection or return to the Main Menu.

4 microCHP Operation

4.1 Menu System

The microCHP status information and operations can be accessed via the LCD menu system and rotating dial/button.

The microCHP has three menu versions:

- Complete: All user screens and parameters can be displayed and modified.
- Restricted: Child / unauthorized user access protection is activated and non-modifiable screens are displayed.
- Extended: Used by the service technician during initial operation and for maintenance.

Before proceeding with this section, read Section 3 and see Figure 3.5 for an overview of the menu structure and a description of the standard display (initial screen).

4.2 Main Menu

The Main Menu selections are:

- Actual Values
- microCHP Control
- Heating Circuit 1 (optionally Heating Circuit 2)
- Production Strategy
- System Settings

You display the different submenu selections by turning the rotating dial  on the cabinet. You press the dial button  (the dial also acts as a button) to select a submenu item. The title of the displayed menu is shown in the top line of the display. Because of space considerations, each submenu selection is displayed individually. Rotate the dial to change the selection. The last selection is RETURN. The RETURN selection returns the display to the next level up in the menu hierarchy.

4.3 User Menu Instructions

The user Menu selections are available from the Main Menu. The submenus are described in the following sections.

4.3.1 Actual Values

4.3.2 microCHP Control

4.3.3 Heating Circuit 1 (optional Heating Circuit 2)

4.3.4 Production Strategy

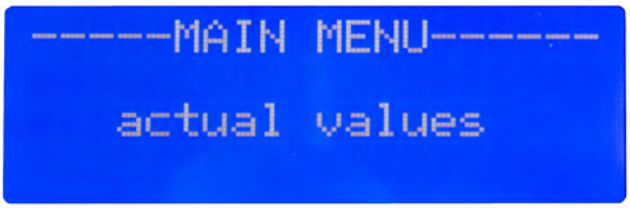

Figure 4.1 Actual Values Selection from Main Menu

4.3.5 System Settings

The following System Settings (typically expert or maintenance level menu items) are documented as follows:

4.4 Object Based (Setup Strategy) Settings

4.5 Maintenance

4.3.1 Actual Values

The “Actual Values” submenu (see Figure 4.1) displays current values in the system:

- Energy
- Engine
- Next Maintenance
- Memory (Buffer Tank)
- Heating Circuit 1 (and optionally Heating Circuit 2)
- Heating Program 1 (and optionally Heating Program 2)
- Production Program
- Speed (RPM) Program
- Errors and Warnings

NOTE: Either a Production Program or Speed Program will display, depending on whether the is configured for heat driven or power driven mode operation.

NOTE After viewing the values/settings for a menu selection, press the rotating dial/ button to return to the Actual Values submenu.

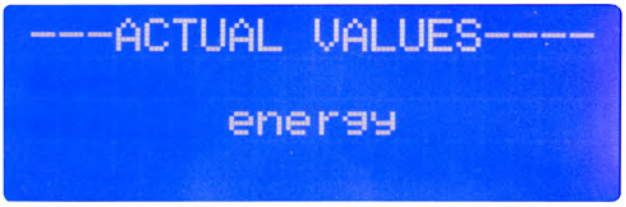

Figure 4.2 Actual Values Energy

4.3.1.1 Actual Values Energy

The Actual Values Energy submenu (Figure 4.2) displays the following (see Figure 4.3 for example display):

- Electrical power being generated in watts
- Total electrical energy generated over time in kWh
- Thermal power being generated in watts
- Total thermal energy generated over time in kWh

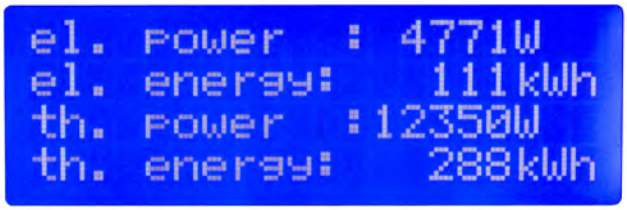

Figure 4.3 Example Energy Information Display

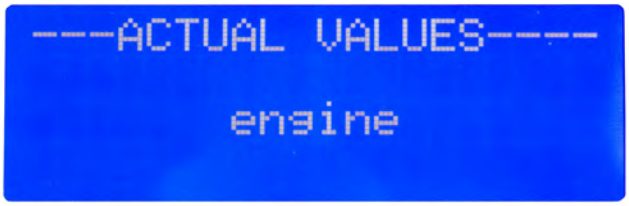

Figure 4.4 Actual Values Engine

4.3.1.2 Actual Values Engine

The Actual Values Engine submenu (Figure 4.4) displays the following (see Figure 4.5 for an example display):

- Engine speed (rpm)
- Engine (coolant) temperature (at engine cylinder block)
- Oxygen sensor voltage (for O_2 measurement and lambda control)
- Total operating hours

Figure 4.5 Example Engine Information Display

Figure 4.6 Actual Values Next Maintenance

4.3.1.3 Actual Values Next Maintenance

The Actual Values Next Maintenance submenu (Figure 4.6) allows you to display the next scheduled maintenance date/time (see Figure 4.7). The date is shown in day/month/year format and the number of hours refers to engine operating hours before maintenance is due, should it reach those hours before the scheduled date.

Depending on which counter is reached first, maintenance will be flagged on the display.

Figure 4.7 Example Next Maintenance Information Display

Figure 4.8 Actual Values Memory (Tank Temperatures)

4.3.1.4 Actual Values Memory (Tank Temperatures)

The Actual Values Memory submenu (Figure 4.8) allows you to display tank temperature values (see Figure 4.9 for an example display):

- Upper tank (or domestic hot water if a potable water tank is configured) temperature sensor reading (SP1_WW)
- Middle buffer tank temperature sensor (SP2) reading
- Lower buffer tank temperature sensor (SP3) reading

Figure 4.9 Example Memory (Tank Temperatures) Display

Figure 4.10 Actual Values Heating Circuit 1

4.3.1.5 Actual Values Heating Circuit 1

The Actual Values Heating Circuit 1 submenu (Figure 4.10) allows you to display temperature readings in an external heating circuit. The detail screen (Figure 4.11) displays:

- Flow supply temperature sensor reading
- Return temperature sensor reading
- Room temperature sensor reading
- Outside sensor temperature reading

NOTE: If an optional second heating circuit is installed, the submenu selection for Heating Circuit 2 can also be displayed with values shown for the second heating circuit.

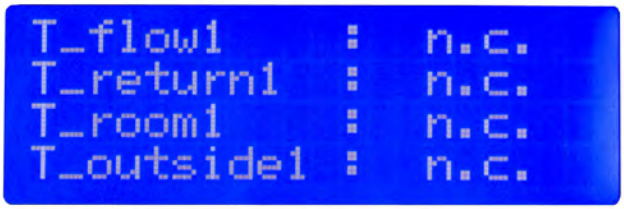

Figure 4.11 Example Heating Circuit 1 Temperature Reading Display (n.c. = not connected)

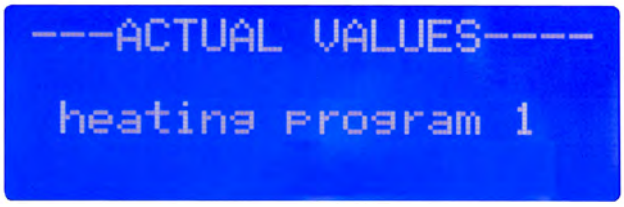

Figure 4.12 Actual Values Heating Program 1

NOTE: If a heating circuit is not used, n.c. will be displayed instead.

4.3.1.6 Actual Values Heating Program 1

The Actual Values Heating Program 1 submenu (Figure 4.12) allows you to display the Heating Program 1 settings (for Heating Circuit 1) (see example in Figure 4.13) for the current day.

NOTE: If you want to view Heating Program settings for days of the week other than the current day, you must access them from the Object Based submenu (see Section 4.5).

By turning the dial, you can browse through the hours of the day for the current day. For instance, Figure 4.13 shows the program settings for hours 0 through 8 on a Friday. Each vertical line indicates a half hour segment. By rotating the dial clockwise, the remaining hours (up to 24) of the day or group of days are displayed. You can scroll forwards and backwards.

NOTE: If the has an optional Heating Circuit 2 installed, the submenu for Heating Program 2 can also be displayed with values shown for the second program.

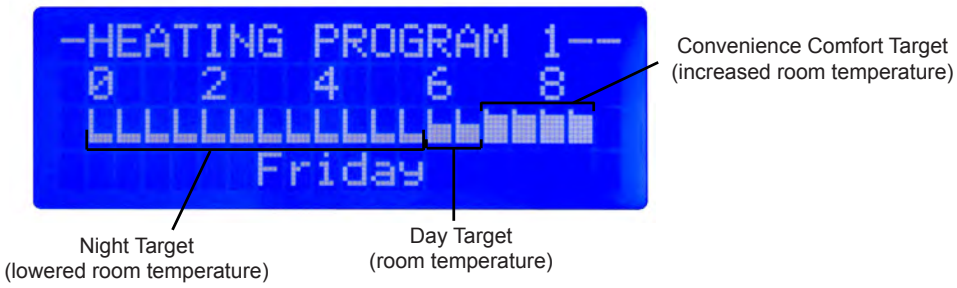

Figure 4.13 Example Heating Program 1 Display Hours 0 – 8

Figure 4.14 Example Heating Program 1 Display Hours 8 – 16

Figure 4.15 Example Heating Program 1 Display Hours 16 – 24

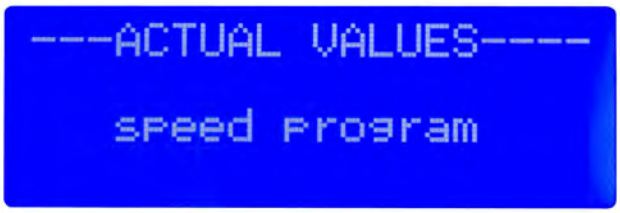

Figure 4.16 Actual Values Speed Program

4.3.1.7 Actual Values Speed Program

NOTE: The Speed Program is activated and displayed if the is operating in power driven mode. If the is operating in heat driven mode, the Production Program is instead activated and displayed (see Section 4.3.1.8).

The Actual Values Speed Program submenu (Figure 4.16) allows you to display the speed program settings (Figure 4.17). By turning the dial, you scroll through the hours of the day for the current day. For instance, Figure 4.17 shows the program settings for hours 0 through 8 on a Friday. Each vertical line indicates a half hour segment. By rotating the dial, the remaining hours of the day are displayed. Press the button to return to the Actual Values submenu.

Figure 4.17 Example Speed Program Screen

Figure 4.18 Actual Values Production Program

4.3.1.8 Actual Values Production Program

NOTE: The Production Program (Figure 4.18) is activated and displayed if the is operating in heat driven mode. If the is operating in power driven mode, the Speed Program is instead activated and displayed (see Section 4.3.1.7).

The Actual Values Production Program submenu (Figure 4.18) selection displays the Production Program settings (see example in Figure 4.19). By turning the dial, you can scroll through the hours of the day for the current day. For instance, Figure 4.19 shows the program settings for hours 0 through 8 on a Thursday. Each vertical line indicates a half hour segment. By rotating the dial, the remaining hours of the day can be displayed. Press the button to return to the Actual Values submenu.

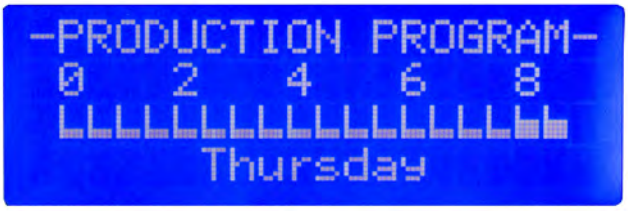

Figure 4.19 Example Production Program Screen

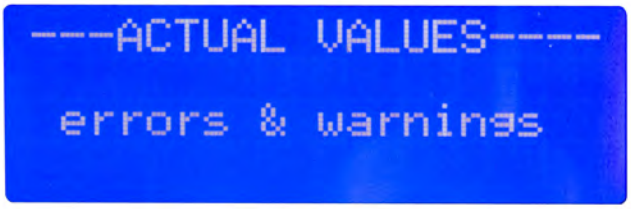

Figure 4.20 Actual Values Errors and Warnings

4.3.1.9 Actual Values Errors and Warnings

The Actual Values Errors and Warnings submenu (Figure 4.20) selection displays the error and warning list (Figure 4.21). Up to 50 indexed lines of errors and warnings can be scrolled through, starting with the most recent. See Section 6 for a listing and description of errors and warnings.

Figure 4.21 Example Errors and Warnings Display

Figure 4.22 Main Menu microCHP Control Selection

4.3.2 microCHP Control

You can shut down the from the microCHP Control submenu (Figure 4.22). You can also delete safety errors (password protected) and query for the hardware and software versions.

4.3.2.1 Manual Shut Down of the microCHP

Navigate to Stop microCHP (Figure 4.23). Press the button to select Stop microCHP.

Figure 4.23 Stop microCHP

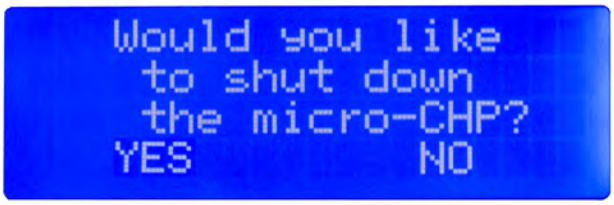

Figure 4.24 Stop microCHP Confirmation Screen

A confirmation screen appears (Figure 4.24). Select YES to shut down the microCHP. Select NO to cancel the shutdown.

If you select YES, you are queried as to whether you want to keep freeze protection activated (Figure 4.25), if the option is on. Select YES to keep freeze protection activated while the is shut down. If the outside temperature goes below the defined temperature, the will start up to protect the piping from freezing (see section 4.4.1.3).

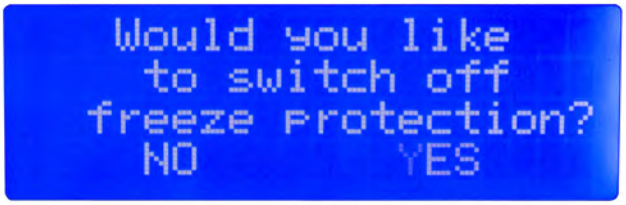

Figure 4.25 Freeze Protection Query

Once you make your selection, the displays the “shutting down” message (Figure 4.26).

Figure 4.26 microCHP Shutting Down Message

When the system is shut down, a confirmation screen appears (Figure 4.27).

Figure 4.27 Example microCHP Shut Down Message (with Freeze Protection Activated)

From this point the microCHP can be restarted. Press the button while highlighting the NEW START message to restart the .

4.3.2.2 Reset Errors

The Reset Error submenu (Figure 4.28) allows you to clear safety errors (categorized as S Control-1 errors). After you select this option, a cautionary confirmation screen (Figure

4.29) is displayed. Press YES to confirm the reset. Press NO to cancel. See Section 6 for a further description and explanation of safety errors.

NOTE: If you have previously deleted three safety errors in a day, a message “Safety error cannot be reset anymore” (Figure 4.33) is displayed. Press OK. Contact your service provider. The error must be reset through the Maintenance submenu. Otherwise, all but the last error will reset at time date change (roll over to next day).

NOTE: If no safety errors exist, the screen indicates no errors are active (Figure 4.34).

Figure 4.28 microCHP Control Reset Error

You are advised to inform your service provider (Figure 4.30), in case maintenance is needed.

WARNING: Observe all safety warnings and cautions in this manual. Report safety errors to your service provider. Do not attempt to service the . Diagnostic, repair, and maintenance activities shall only be performed by qualified, factory trained service personnel.

A password challenge screen (Figure 4.31) appears. Enter the default password 1995 (or another appropriate password you have been supplied or have created).

A message indicates how many more safety errors may be reset (Figure 4.32) before the errors must be cleared in the Maintenance submenu. Select OK.

Figure 4.29 microCHP Control Reset Error Confirmation Screen

Figure 4.30 Safety Error Reset Acknowledgement

Figure 4.31 Safety Error Reset Password Entry

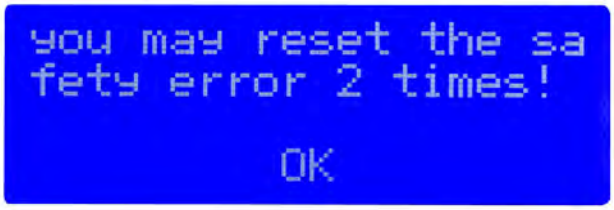

Figure 4.32 Number of Safety Error Resets Available Message

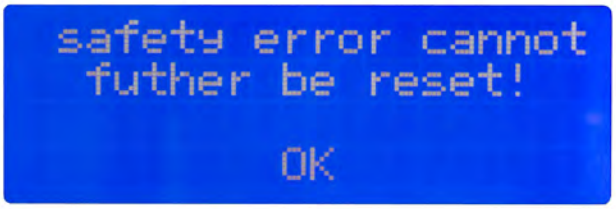

Figure 4.33 Safety Error Cannot Be Reset Anymore Message

Figure 4.34 No Safety Error Active Message

4.3.2.3 Software Version Query

You can query the to determine the installed system software version (Figure 4.35). Select Software Version.

Figure 4.35 microCHP Control Software Version

In addition to the system software version, the build date and a checksum (Figure 4.36) are displayed.

After displaying the software version, press the button to return to the microCHP Control submenu.

Figure 4.36 Software Version Display

4.3.2.4 Hardware Version Query

You can query the to determine the system controller hardware version (Figure 4.37). Select the Hardware Version submenu.

Figure 4.37 microCHP Control Hardware Version

Figure 4.38 Hardware Version Display

After displaying the hardware version, press the button to return to the microCHP Control submenu.

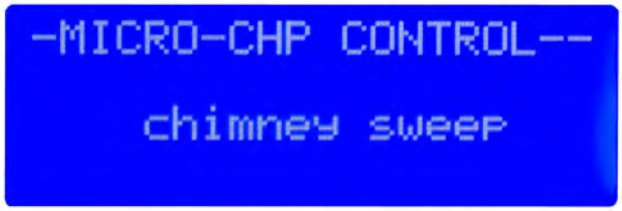

Figure 4.39 Chimney Sweep Submenu

4.3.2.5 Chimney Sweep

The Chimney Sweep submenu (Figure 4.39) allows you to activate an additional boiler for a period of 1 – 15 minutes. The additional boiler is not modulated in this mode. If the buffer tank reaches 85 °C (185 °F) during this mode, the additional boiler is shut off prior to scheduled shutoff. After selecting Chimney Sweep, you are prompted to activate Chimney Sweep (Figure 4.40). If you want to end Chimney Sweep early, select Chimney Sweep submenu and you are prompted to deactivate Chimney Sweep (Figure 4.41). This mode is typically used for diagnostics. While it is running, the can continue to provide heat and hot water supply.

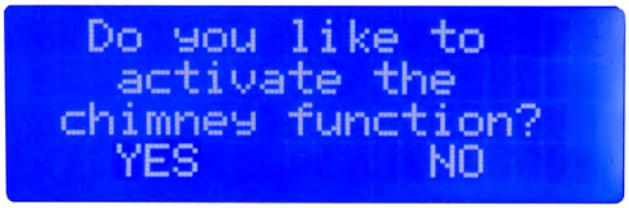

Figure 4.40 Chimney Sweep Activation Confirmation Screen

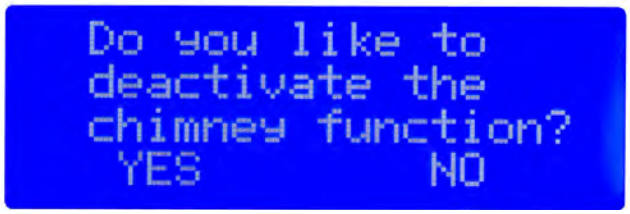

Figure 4.41 Chimney Sweep Deactivation Confirmation Screen

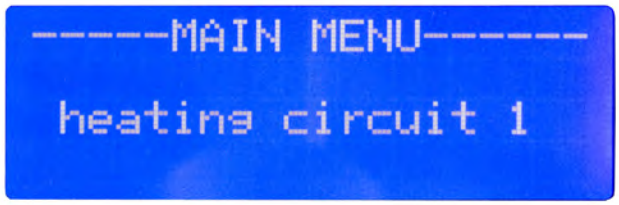

Figure 4.42 Main Menu Heating Circuit 1

4.3.3 Heating Circuit 1

From the Heating Circuit 1 submenu (Figure 4.42), the following selections can be accessed:

- Desired Temperatures

- Heating Program
- Absence Program

NOTE: If your system is equipped with two heating circuits, Heating Circuit 2 will also appear on the display. Heating Circuit 2 submenu has the same options available as Heating Circuit 1 and the circuits can be tailored individually.

4.3.3.1 Desired Flow Temperatures

Select Desired Temperatures (Figure 4.43) to display and modify the target flow temperatures for Convenience (high bar), Day (mid level bar), and Night (low bar) program parameters. (Figure 4.44).

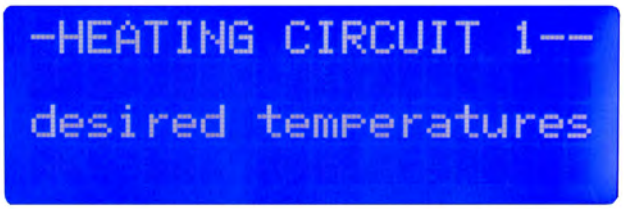

Figure 4.43 Heating Circuit 1 Desired Temperatures

Figure 4.44 Example Heating Circuit Desired Flow Temperatures Change Screen

Select a heat exchange flow temperature to change by pressing the button and then rotating the dial (allowable range 4 – 90 °C (39 – 194 °F). This flow temperature value is the temperature for the heat exchange hydronic fluid. Press the button again to accept the value, make any other changes and then select OK to save the changes.

4.3.3.2 Heating Program

The Heating Program submenu is the gateway to setting the heat levels for the heating circuits. Heat levels are set for

- Convenience (comfort level) (high bar)
- Day (mid level bar)
- Night (low bar)

Select Heating Program (Figure 4.45) and then choose from the Heating Program day options (Figure 4.46). The heating program can be configured via multiple strategies:

- Each day individually (MO TU WE TH FR SA SU)
- Monday – Friday (MO – FR)
- Saturday and Sunday (SA – SU)
- Weekly, Monday – Sunday (MO – SU)

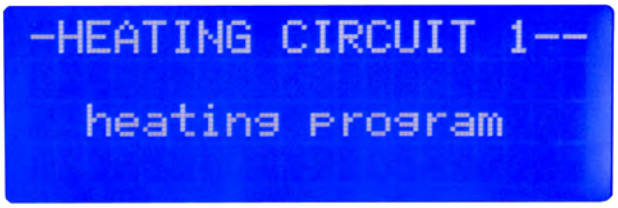

Figure 4.45 Heating Circuit 1 Heating Program

Figure 4.46 Heating Program Strategy Selections

Figure 4.47 Example Heating Program Screen for Individual Day (Monday)

Figure 4.48 Example Heating Program Screen for Monday – Friday

Figure 4.49 Example Heating Program Screen for Saturday – Sunday

Figure 4.50 Example Heating Program Screen for Monday – Sunday

4.3.3.3 Absence (Away from Home) Program

The Absence Program (Figure 4.51) allows you to set heat output levels for times when you will be away (for instance, on vacation or business trip).

Select the Absence Program and select the line with "new absence prg." (Figure 4.52).

NOTE: If several Absence Programs have already been created, you will need to use the up and down arrows to scroll through the programs.

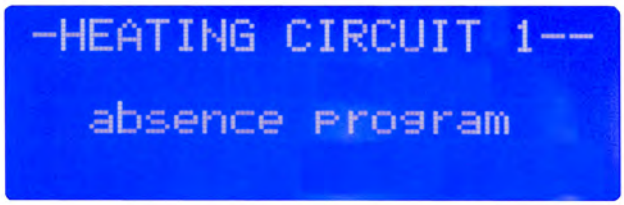

Figure 4.51 Heating Circuit 1 Absence (Away from Home/Building) Program

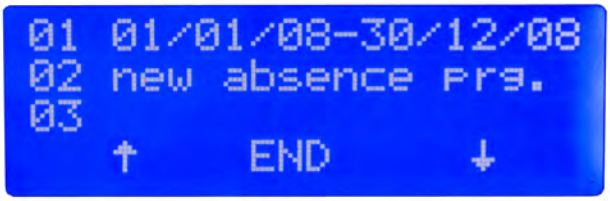

Figure 4.52 Add New Absence (Away from Home/Building) Program

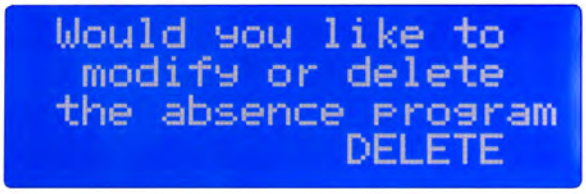

Figure 4.53 Delete or Modify Absence Program Dialog

Figure 4.54 Absence Program Setup Screen

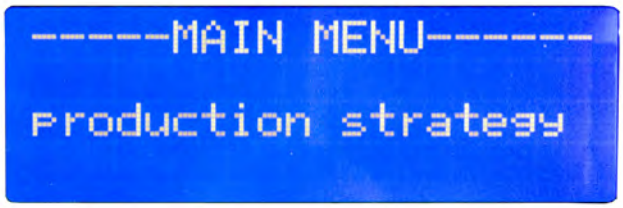

Figure 4.55 Main Menu Production Strategy

4.3.4 Production Strategy

The Production Strategy submenu (Figure 4.55), depending on the operating mode (heat driven or power driven), displays the appropriate strategy selections.

- For heat driven operation: Production Program
- For power driven operation: Speed Program

4.3.4.1 Production Program

The Production Program submenu (Figure 4.56) is the gateway to setting the production levels for the . These production levels are typically measured in the buffer tank. Production levels are set for

- High
- Medium
- Low
- None

Select the Production Program and then choose from the Production Program strategy options (Figure 4.57). The production program can be configured via multiple strategies:

- Each day individually (MO TU WE TH FR SA SU)
- Monday – Friday (MO – FR)
- Saturday and Sunday (SA – SU)
- Weekly, Monday – Sunday (MO – SU)

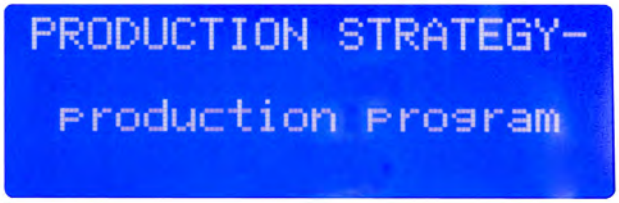

Figure 4.56 Production Strategy Production Program

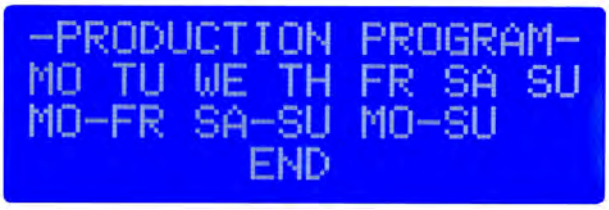

Figure 4.57 Production Program Options

By turning the dial, you can scroll through the hours of the day for the current day. For instance, Figure 4.58 shows the program settings for hours 0 through 8 on a Monday. Each vertical line indicates a half hour segment. By rotating the dial, the remaining hours of the day are displayed (Figures 4.59 and 4.60).

Select a time segment by pressing the rotating dial/button. The segment blinks rapidly. Rotate the dial to modify the production level for that time segment. Press the button when

you have set the production to the desired level. Rotate the dial to select and modify other time segments as needed.

NOTE: As a shortcut, you can copy settings to a range of time segments by pressing the button and turning the dial while continuing to press the button until the range is selected.

To save the changes and exit the screen, rotate the dial (forward or backward) to OK and press the button. Alternatively, to cancel the changes before they are saved, select CANCEL and press the button.

Figure 4.58 Example Production Program 0 through 8 Hours Screen

Figure 4.59 Example Production Program 8 through 16 Hours Screen

Figure 4.60 Example Production Program 16 through 24 Hours Screen

4.3.4.2 Speed Program

The Speed Program submenu (Figure 4.61) is the gateway to setting the engine speed levels (in RPM) for the . Speed levels are set for

- High speed
- Medium speed
- Low speed

The settings can be thought of as analogous to setting a Production Program. Select the Speed Program and then choose from the Speed Program options (Figure 4.62). The speed program can be configured via multiple strategies:

- Each day individually (MO TU WE TH FR SA SU)
- Monday – Friday (MO – FR)

- Saturday and Sunday (SA – SU)
- Weekly, Monday – Sunday (MO – SU)

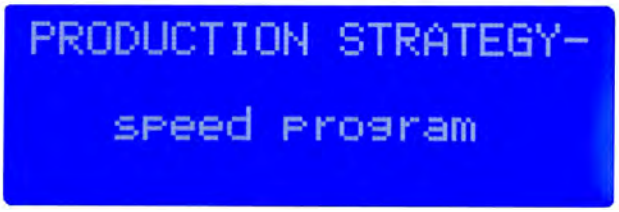

Figure 4.61 Production Strategy Speed Program

Figure 4.62 Speed Program Groupings

By turning the dial, you can scroll through the hours of the day for the current day. For instance, Figure 4.63 shows the program settings for hours 0 through 8 on a Monday. Each vertical line indicates a half hour segment. By rotating the dial, the remaining hours of the day are displayed (Figures 4.64 and 4.65).

Figure 4.63 Example Speed Program 0 through 8 Hours Screen

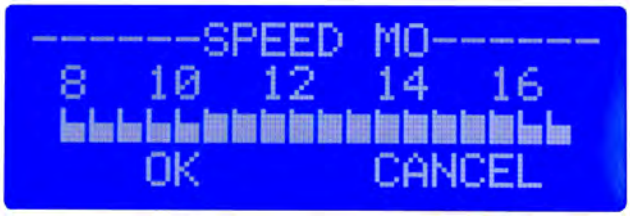

Figure 4.64 Example Speed Program 8 through 16 Hours Screen

Figure 4.65 Example Speed Program 16 through 24 Hours Screen

Select a time segment by pressing the button. The segment blinks rapidly. Rotate the dial to modify the speed level for that time segment. Press the button when you have set engine speed to the desired level. Rotate and press the dial to select and modify other time segments as needed.

The actual engine speeds set at the various levels are set by the “Target Speed” settings (see Section 4.3.4.3).

Set the engine speed to 0 RPM by rotating the dial to the lowest level.

To save the changes and exit the screen, rotate the dial (forward or backward) to OK and press the button. Alternatively, to cancel the changes before they are saved, select CANCEL and press the button.

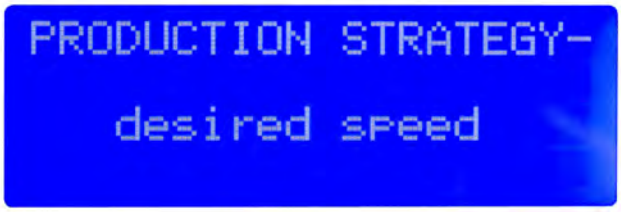

Figure 4.66 Desired Speed Submenu

4.3.4.3 Desired Speed

The Desired Speed submenu (Figure 4.66) allows you to view and modify the target engine speeds for the various engine speed program levels.

Figure 4.67 Example Desired Speed Settings Screen

Three desired speed levels can be set (see Figure 4.67):

- High speed setting
- Medium speed setting
- Low speed setting

Rotate the dial to select the engine speed setting you want to change. Press the button. The selected speed will blink rapidly. Rotate the dial to increase or decrease the target speed. The range you can control the speed typically spans from 1,200 to 3,400 RPM. The actual physical speed limit for the engine is 3,600 RPM, but it is limited to 3,400 RPM during installation / setup. Changes can be made in increments of 100 rpm.

4.3.4.4 Max Speed

The Max Speed submenu (Figure 4.68) allows you to bring the engine speed up to the preset maximum speed.

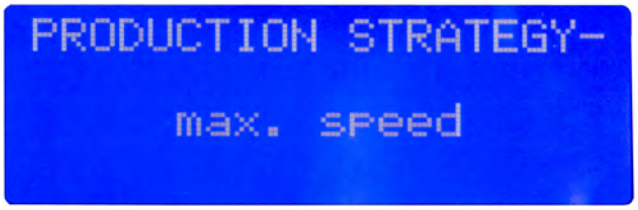

Figure 4.68 Maximum Speed Submenu

Once selected, you are prompted to confirm that you want the engine to run at the preset maximum speed (Figure 4.69). Select YES to confirm or select NO to cancel.

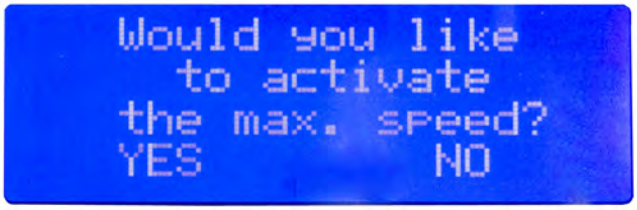

Figure 4.69 Maximum Speed Activation Confirmation Screen

If you select YES, the engine speed is gradually run up to the preset maximum, 3,400 RPM (200 RPM less than the physical maximum).

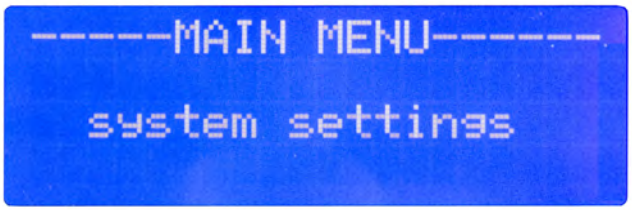

Figure 4.70 Main Menu System Settings

4.3.5 System Settings

The System Settings submenu (Figure 4.70) allows you to view and change the following settings:

- Time and date
- Interface language
- Child Access Protection mode

In addition, System Settings is the gateway to Object Based and Maintenance settings.

4.3.5.1 Time and Date

The Time and Date submenu (Figure 4.71) allows you to set the system time and date as well as activate daylight saving time automatic clock changeover.

NOTE: The system time and date is independent of the time/date settings of a connected computer.

Select Time & Date. You are prompted for the time and date (Figure 4.72). Enter the time in 24 hour format. Enter the date in day/month/year format. Select Yes or No for daylight saving time activation. Select OK to save the settings.

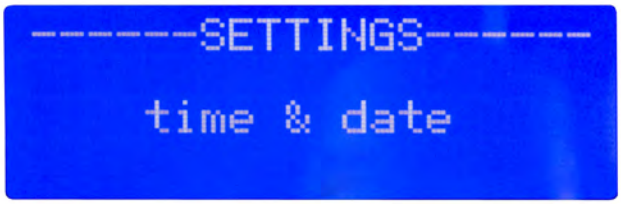

Figure 4.71 Settings Time & Date

Figure 4.72 Time and Date Setup Screen

4.3.5.2 Language

You can change the interface language of the . Select Language (Figure 4.73) and choose the interface language from available choices (see Figure 4.74 for an example screen).

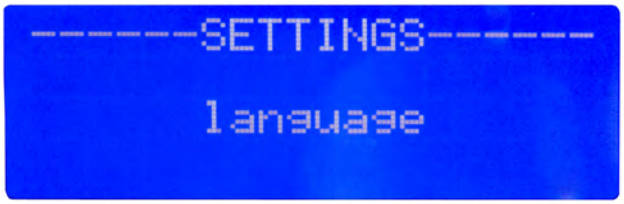

Figure 4.73 Settings Language

Figure 4.74 Example Language Choice Screen

4.3.5.3 Child Access Protection

When child access protection is activated, the graphic appears in the bottom row of the initial standard display (see Figure 4.75). A restricted non-modifiable menu structure is displayed. When Child Access Protection is activated, the only submenus that display on the are Actual Values and the password prompt.

Figure 4.75 Initial Standard Display with Child Access Protection Activated

The measured values of the microCHP can be read but settings cannot be changed.

Select the Child Access Protection submenu (Figure 4.76). You are prompted to select the setting (Figure 4.77). Select YES and OK. You are prompted to change the password (Figure 4.78) The default value is “1995.” Enter the password and confirm the password by typing it a second time. You can continue to use the existing password, the password does not need to be changed.

Figure 4.76 Child Access Protection Submenu

Figure 4.77 Child Access Protection Setup Screen

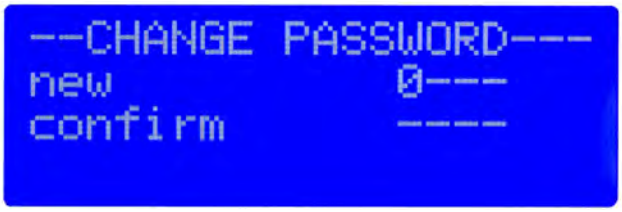

Figure 4.78 Child Access Protection Confirmation Screen

To deactivate Child Access Protection and allow changes to the system, select Password from the Main Menu (Figure 4.79).

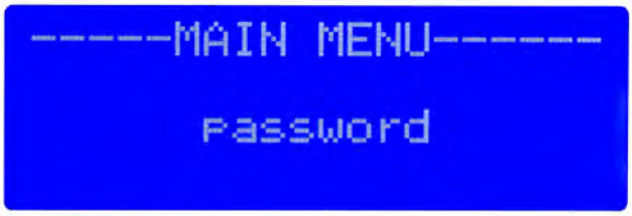

Figure 4.79 Password Prompt Main Menu (Child Access Protection Activated)

You are prompted to enter the Child Access Protection password (Figure 4.80).

Figure 4.80 Password Prompt Main Menu (Child Access Protection Activated)

Enter the password and navigate to the Child Access Protection submenu.

You are prompted to select the setting (Figure 4.77). Select NO and OK.

NOTE: You can also temporarily access all settings by entering the password at the Main Menu. You can then navigate through all the submenus as you normally would. Once you leave the submenus, the system will be password protected again.

4.4 Object Based

The Object Based submenu (Figure 4.81) selection provides access to advanced settings that are typically performed during initial installation and maintenance by service personnel.

Settings that are changed from this submenu include:

- Production Strategy
  - Operating Mode
  - Summer Production
  - Frost Protection
- Drinking Water
  - Drinking water parameters
  - Drinking water temperature
  - Delay Pump
- Circulation Pump
  - Pump Parameters
  - Pump Program
- Buffer Storage
- Heating Circuit 1 (optional Heating Circuit 2)
  - Heating Mode
  - Conceptual Case
- Heating Tank

After you select Object Based, a confirmation screen (Figure 4.82) is displayed.

Figure 4.81 Settings Object Based

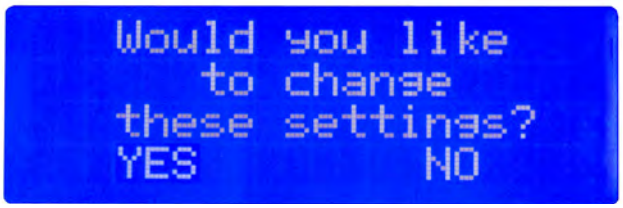

Figure 4.82 Object Based Confirmation Screen

Select YES and press the button to continue on to the Object Based submenus. Select NO to cancel. If you select NO the display will return to the initial standard display screen.

NOTE: If you select YES and make no changes in the Object Based submenus, no changes are made.

4.4.1 Production Strategy

The Production Strategy submenu (Figure 4.83) allows you to view and set:

- Operating Mode
- Summer Production (in applicable operating mode)
- Freeze Protection

Figure 4.83 Object Based Production Strategy

4.4.1.1 Operating Mode

The Operating Mode (Figure 4.84) submenu allows you to select the operating mode, either Heat Driven (see Figure 4.85) or Power Driven (see Figure 4.86).

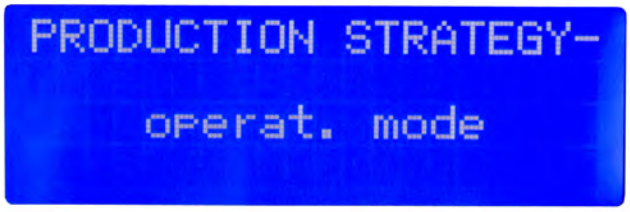

Figure 4.84 Production Strategy Operating Mode

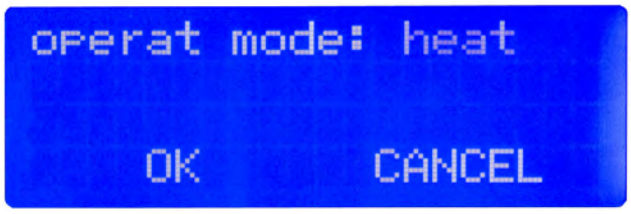

Figure 4.85 Production Strategy Operating Mode Selection – Heat

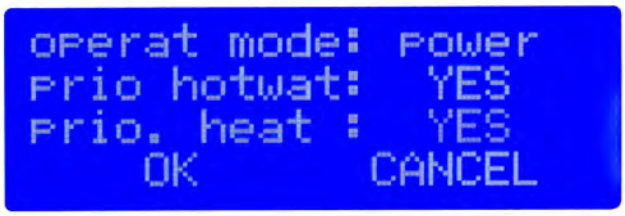

Figure 4.86 Production Strategy Operating Mode Selection – Power with Hot Water and Heat Priority

For the Power Driven mode, additional options Priority Hot Water (YES/NO) and Priority Heat (YES/NO) can be selected. Typically these are selected for hot water tank and heating circuit support in addition to electrical needs.

NOTE: In most applications, Heat Driven mode is the typical selection.

4.4.1.2 Summer Production

The Summer Production submenu (Figure 4.87) allows you to set operation to compensate for warmer weather. The buffer tank temperature values are measured at the middle tank sensor (SP2), instead of the normally used lower tank sensor (SP3) to set operating levels. See paragraph 4.4.4.1 for changeover temperature settings.

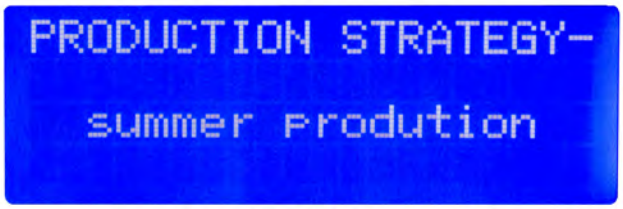

Figure 4.87 Summer Production Submenu

On the detail screen (Figure 4.88) press the button and rotate the dial to select YES or NO. Press OK to confirm.

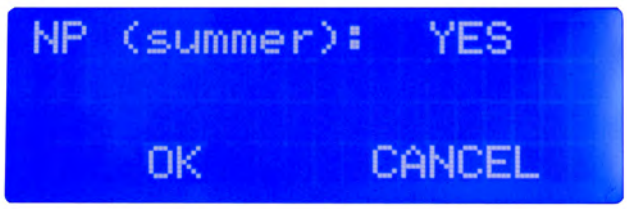

Figure 4.88 Production Strategy Summer Production

4.4.1.3 Freeze Protection

CHP Freeze protection can be activated from the Production Strategy submenu (Figure 4.89). Select Frostschutz.

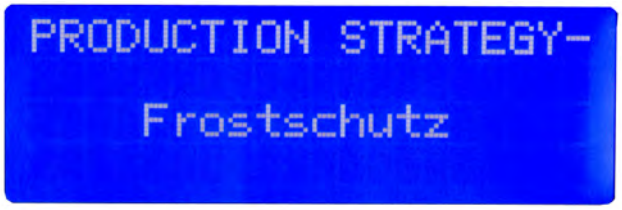

Figure 4.89 Production Strategy Freeze Protection

Figure 4.90 Freeze Protection Set Screen

On the detail screen (Figure 4.90) press the button and rotate the dial to select YES. Select OK. Freeze protection is activated when one of the tank temperature sensors (T_SP1_WW, T_SP2_mitte or T_SP3_unten) indicates a temperature less than 10 °C (50 °F). The protection shuts off when a temperature of 15 °C (59 °F) is reached.

4.4.2 Drinking (Potable) Water

The Drinking Water submenu (Figure 4.91) allows you to view and modify:

- Drinking Water (SP1_WW) Parameters
- Pump Delay (overrun)
- Drinking Water (SP1) Temperature
- Drinking Water Program

Figure 4.91 Object Based Drinking Water

4.4.2.1 Drinking Water Parameters

The Drinking Water Parameters submenu (Figure 4.92) allows you to configure

- Drinking Water
- Priority Operation
- Disinfection Operation (High Temperature mode to kill bacteria)

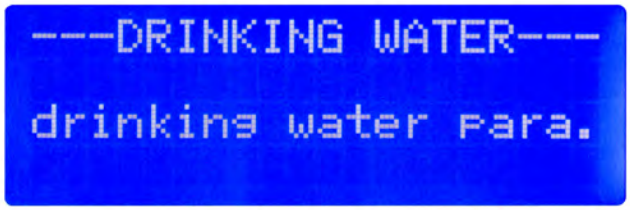

Figure 4.92 Drinking Water Parameters

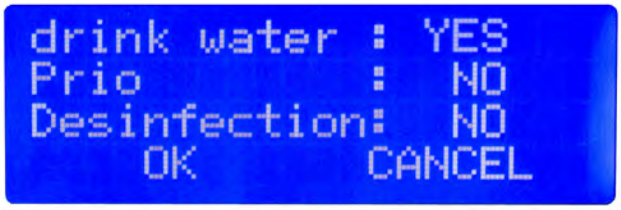

Figure 4.93 Drinking (Potable) Water Parameters Detail

4.4.2.2 Delay Pump

The Delay Pump submenu (Figure 4.94) allows you to view and modify the Delay Pump parameter. This parameter allows the charging pump to continue running a selected number of minutes after the desired hot water temperature has been reached in the hot water tank. Press the button, rotate the dial to enter the value (1 – 10 minutes) and OK.

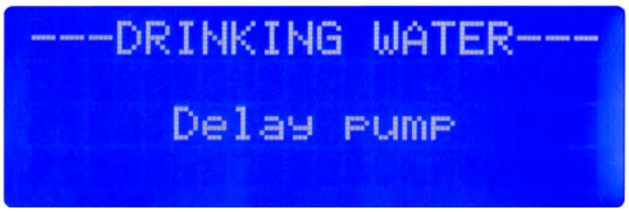

Figure 4.94 Drinking (Potable) Water Delay Pump

Figure 4.95 Drinking (Potable) Water Delay Pump Setup

4.4.2.3 Potable (Drinking) Water Temperature

The Drinking (Potable) Water Temperature submenu (Figure 4.96) allows you to view and set the target water temperature (5 – 70 °C (41 – 158 °F)) for the three Drinking (Potable) Water temperature levels. These values are used by the Drinking (Potable) Water Program.

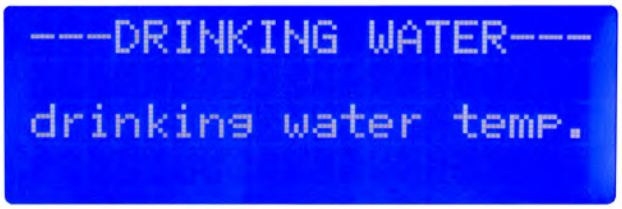

Figure 4.96 Drinking (Potable) Water Temperature

Figure 4.97 Drinking (Potable) Water Temperature Settings

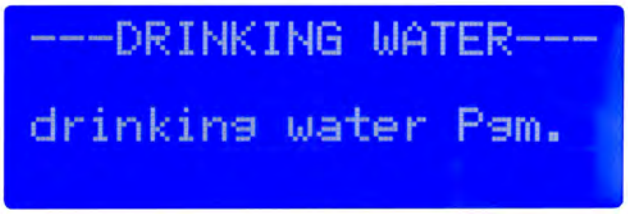

Figure 4.98 Drinking (Potable) Water Program

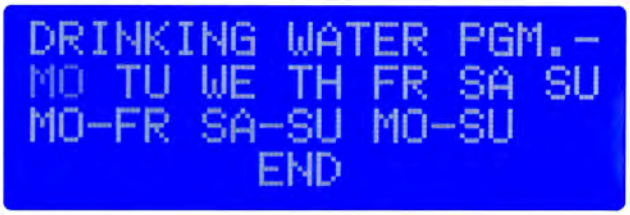

Figure 4.99 Drinking (Potable) Water Program Groupings

4.4.2.4 Drinking (Potable) Water Program

The Drinking (Potable) Water Program submenu (Figure 4.98) is the gateway to setting the potable water temperature levels. Drinking Water temperatures can be set for three different levels. The actual target temperatures are set in the Drinking Water Temperature submenu (See Section 4.4.2.3 above.)

Select Drinking (Potable) Water Program and choose from the Drinking Water Program strategy options (Figure 4.99). The Drinking Water Program can be configured via multiple strategies:

- Each day individually (MO TU WE TH FR SA SU)
- Monday – Friday (MO – FR)
- Saturday and Sunday (SA – SU)
- Weekly, Monday – Sunday (MO – SU)

By turning the dial, you can scroll through the hours of the day for the selected week day or group of week days. For instance, Figure 4.100 shows the program settings for hours 0 through 8 on a Monday. Each vertical line indicates a half hour segment. By rotating the dial, the remaining hours of the day can be displayed.

Select a time segment by pressing the button. The segment blinks rapidly. Rotate the dial to modify the drinking water temperature level for that time segment. Press the button when you have set the water temperature to the desired level. Rotate the dial to select and modify other time segments as needed.

To save the changes and exit the screen, rotate the dial (forward or backward) to OK and press the button. Alternatively, to cancel the changes before they are saved, select CANCEL and press the button.

Figure 4.100 Example Drinking (Potable) Water Program Display

Figure 4.101 Circulation Pump Submenu TBS

4.4.3 Circulation Pump TBS

The Circulation Pump submenu (Figure 4.101) allows you to view and set the following:

- Pump Parameters
- Pump Program

Figure 4.102 Pump Parameters Submenu TBS

4.4.3.1 Pump Parameters TBS

The Pump Parameters submenu (Figure 4.102)

Figure 4.103 Pump Parameters Detail TBS

Figure 4.104 Pump Program Submenu TBS

4.4.3.2 Pump Program TBS

The Pump Program submenu (Figure 4.105) allows you to

Figure 4.105 Pump Program TBS

Figure 4.106 Object Based Buffer Storage

4.4.4 Buffer Storage

The Buffer Storage submenu (Figure 4.106) allows you to set the maximum temperature values of the lower tank sensor. The summer/winter temperature can be set.

Select the Switch off parameter (Figure 4.107) submenu.

Figure 4.107 Buffer Storage Switch Off Parameter

Figure 4.108 Example Switch Off Parameter Detail

4.4.4.1 Switch Off Parameters

The Switch Off Parameters submenu allows you to view and change the temperatures at which the engine is switched off. The parameters set (Figure 4.108) include:

- T_Sp3_unten HP – The lower tank temperature set point at which the engine is switched off during High Production, Power Driven Mode or Maximum Speed. Valid values range 40 – 75 °C (104 – 167 °F) in 1 °C degree increments.
- T_Sp3_unten NP – The lower tank temperature set point at which the engine is switched off during Medium or Low Production. Valid values range 40 – 75 °C (104 – 167 °F) in 1 °C increments.
- Summer/Winter – Activating “summer operation” allows changeover from Winter to Summer operation for the buffer tank based on the average outdoor temperature for 24 hours. (Note: An outdoor sensor must be installed.) During summer operation, the buffer tank is only charged down to the middle sensor (SP3). During summer operation, limit values for the lower tank temperature (SP3) are applied to the middle tank temperature. The setting range of changeover temperature is 5 – 40 °C (41 – 104 °F) in .1 (1/10) °C increments.

Figure 4.109 Hot Water Submenu TBS

4.4.4.2 Hot Water TBS

The Hot Water Submenu

Figure 4.110 Object Based Heating Circuit 1

4.4.5 Heating Circuit 1

The Heating Circuit 1 submenu (Figure 4.110) provides access to

- Heat Mode
- Conceptual Case

4.4.5.1 Heating Mode

The Heat Mode submenu (Figure 4.111) allows the setting of the heat mode parameters:

- o_norm (Outside temp normal with no night switch off)
- flow (constant flow temp) No outdoor temperature sensor is needed. The constant supply flow temperature. It is controlled by the shared supply temperature.
- o_night (outside temp economical with night switch off)
- room (outside and room temperature economical with night switch off)
- Off The heating circuit is off (pump and mixer off)

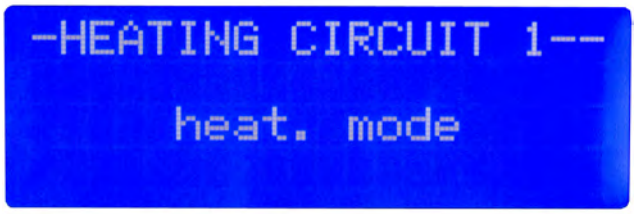

Figure 4.111 Heating Circuit 1 Heat Mode

Figure 4.112 Example Heating Mode Detail

4.4.5.2 Conceptual Case (Design Objective)

The Conceptual Case submenu (Figure 4.113) provides access to the settings that control the response to environmental conditions.

Select Conceptual Case from the Heating Circuit 1 submenu. The Conceptual Case detail screen appears (Figure 4.114).

Two parameters can be set:

- slope: This parameter sets the response rate to changes in setpoint temperature. It is also called the heating curve. Some typical slopes:
  - 1.2 The supply set temperature is adjusted by 1.2 °C up or down per 1 degree adjustment of the ambient room setpoint value.
  - 2.0 The supply set temperature is adjusted by Δ 2.6 °C up or down per 1 degree adjustment of the ambient room setpoint value.
  - 0.6 The supply set temperature is adjusted by Δ 1.6 °C up or down per 1 degree adjustment of the ambient room setpoint value.
- TempVLMax: This value sets a limit for the supply setpoint temperature.

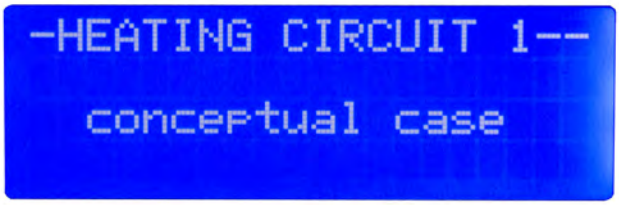

Figure 4.113 Heating Circuit Conceptual Case

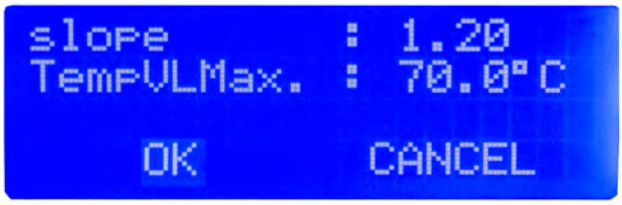

Figure 4.114 Heating Circuit Conceptual Case Detail

Select Slope and rotate the dial to increment or decrement the slope. The slope can be adjusted in .05 increments.

The conceptual case is effective only for the following heating modes:

- o_norm (Outside temp normal with no night switch off)
- o_night (outside temp economical with night switch off)
- room (outside and room temperature economical with night switch off)

4.4.6 Heating Circuit 2

The optional Heating Circuit 2 selection is available if a second heating circuit is installed. The screens are similar to those for Heating Circuit 1. See Figures 4.110, 4.111, 4.112, 4.113, and 4.114.

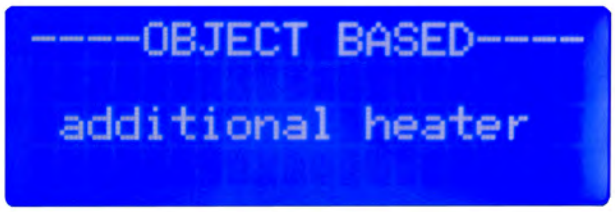

Figure 4.115 Additional Heater

4.4.7 Additional (Peak Load / Backup) Heater

The Additional Heater submenu (Figure 4.115) appears if an additional boiler is connected via the ProE System connectors on the rear of the cabinet. Note: Typically, additional boilers are configured with independent aquastats.

Figure 4.116 Additional Heater Parameter 1

4.4.7.1 Additional Heating Unit Parameter 1

The first parameter screen (Figure 4.116) allows you to set temperature values for hysteresis:

T_Hyst_on: Switch-on hysteresis for the heating unit / peak load tank. Default value is 8 K (shared supply temperature under-run from setpoint).

T_Hyst_off: Switch-off hysteresis for the heating unit / peak load tank. Default value is 2 K (shared supply temperature exceeded setpoint).

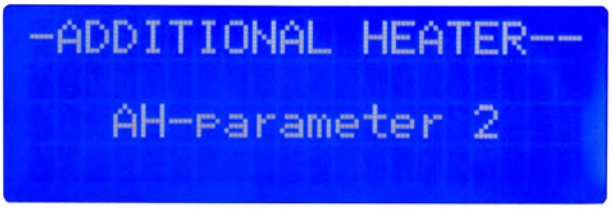

Figure 4.117 Additional Heater Parameter 2

4.4.7.2 Additional Heating Unit Parameter 2

The second parameter screen (Figure 4.117) allows you to set the Off Period and Turn On time.

Off-period: The minimal off period for the tank. During delivery status the tank remains off for at least 3 minutes in any case.

Turn on time: The minimal turn on time of the tank. During delivery status the tank remains on for at least 3 minutes in any case.

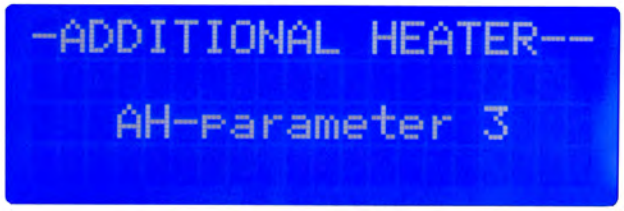

Figure 4.118 Additional Heating Unit Parameter 3

4.4.7.3 Additional Heating Unit Parameter 3

The third parameter screen (Figure 4.118) allows you to set Delay Heating.

4.5 Maintenance

The Maintenance submenu (Figure 4.119) provides password protected access to maintenance related submenus. It is typically used by service personnel during maintenance visits.

Once selected, the user is prompted (see Figure 4.120) for a four-digit passcode. Turn the dial and press the button to select and enter each digit of the password.

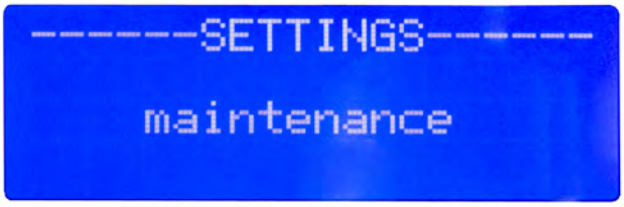

Figure 4.119 Maintenance Submenu

Figure 4.120 Maintenance Password Prompt

4.5.1 Manual Operation

The Manual Operation submenu (Figure 4.121) allows you to view and set the following settings:

- RS-232
- BOOT
- RPAR
- P_SP
- P_ZE
- DOWN
- AUTO

- MANU

Figure 4.121 Maintenance Manual Operation

Figure 4.122 Maintenance Manual Operation Detail

The Manual Operation Detail screen (Figure 4.122) provides diagnostic information from the electronics as follow:

S – (first line) Safety Control

S – System Control Board

Snn – State code

Li – Oxygen sensor measured voltage (control) Note: If error condition, error code is displayed instead. Errors with + indicates safety error, - indicates error.

R – Target engine speed (RPM)

F – Gas relay state (control)

Z – (second line) Inverter Status

Z – Inverter

Snn - State code

Lm – Oxygen sensor measurement (engine electronics) Note: If error condition, inverter shows the error code instead.

R – indicates engine speed (RPM) (inverter)

00 – Dropout state when the last gas relay error occurred

M – (third line) Engine Control Status

M – Engine electronics

Snn – State code

Ls – Oxygen sensor probe voltage target value. Note: If error condition, engine electronics shows the error code instead.

R – indicated engine speed (RPM) (engine electronics)

F – Gas relay state of engine electronics

MANU – (fourth line) Operating Modes selection

AUTO – Automatic operation

MANU – Manual operation

R232 – Direct serial port (diagnostic interface) connection (via RS-232 or USB / RS-232 – RS-232)

BOOT – System reboot

RPAR – switching on the engine control and the inverter

P-SP – Programming Control

P-ZE – Programming inverter electronics

DOWN – Shut down the microCHP

E1 – Stated error code (if any)

T = 75 °C (167 °F) – Coolant temperature

END – Return to the Maintenance Menu

See Section 6 for an description of error codes.

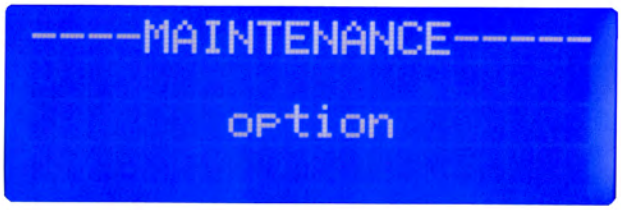

Figure 4.123 Maintenance Option

4.5.2 Option

The Option submenu (Figure 4.123) selection allows you to view and change codes for new software options. When you have software modules added to your configuration, the software option code must be changed.

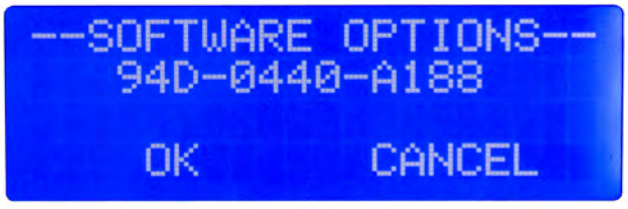

Figure 4.124 Example Software Options Code

The Software Options display (see example in Figure 4.124) shows the software configuration code for the . The first character in the code blinks slowly. By pressing the button, you can select and change the character by rotating the dial. Press the button after making the appropriate change, as included in documentation from the manufacturer. Rotate the dial to select other character positions in the software code. After making all changes, select OK to confirm the changes. Select CANCEL to cancel the changes.

The software options that can be activated through entry of option codes are:

- 2nd heating circuit
- Additional boiler
- Heater 7-8-9 / C1 C2
- Hot water charging pump
- Circulation pump / unloading pump
- Remote monitoring
- Parallel operation

After changes are made in the option code and saved, the microCHP is automatically shut down and restarted before the changes take effect. This may take several minutes.

4.5.3 Reset Master Error

The Reset Master Error submenu selection (Figure 4.125) is used by service personnel to reset the counter that controls the Reset Error option in the microCHP Control submenu. If three safety errors have been reset in the Reset Error option in a 24 hour period, the Reset Master Error function must be used.

Figure 4.125 Maintenance Reset Master Error

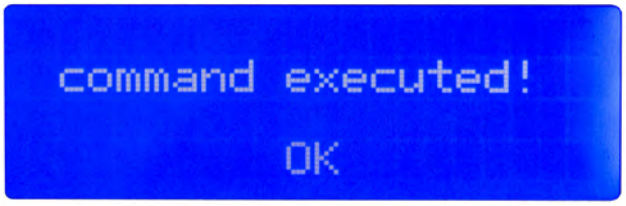

Figure 4.126 Reset Master Error Confirmation Screen

A “command executed” message is displayed (Figure 4.126). Select OK to acknowledge.

4.5.4 Record Maintenance (Reset Timer)

The Record Maintenance submenu (Figure 4.127) allows you to reset the timer/counter for the next scheduled routine maintenance.

Typically this option is used by the service provider when scheduled maintenance has been performed on your system.

NOTE: This option does not reset the total operating hours counter.

A reset prompt (Figure 4.128) is displayed after Record Maintenance is selected.

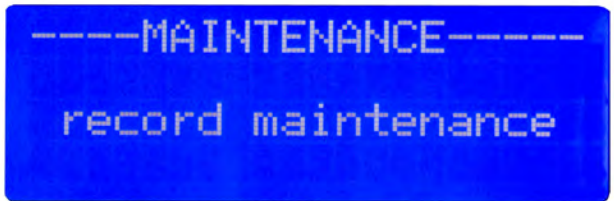

Figure 4.127 Record Maintenance Submenu

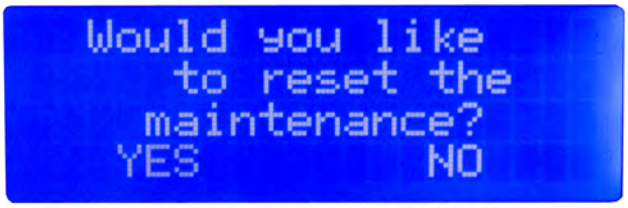

Figure 4.128 Reset Maintenance Counter/Timer Prompt

Select YES to reset the maintenance. Select NO to cancel the reset. If you select YES, the confirmation (Figure 4.129) screen is displayed.

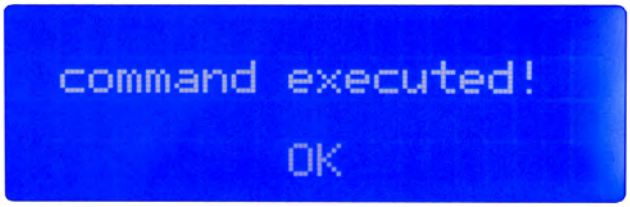

Figure 4.129 Reset Maintenance Command Executed Confirmation

5 Maintenance

Keep the microCHP physical environment dust-free and dry. Dust build up on the electronics and in cooling fans will cause heat build up on the electronics and shorten the operating life span.

The microCHP cabinet must be clear and accessible on all sides to the service technician. Do not use the microCHP cabinet as a storage area.

No modifications can be made to the condensate drain. Because more than $^1/_2$ gallon (2 L) of condensate per hour can accumulate, make sure the drain path is not blocked. If the microCHP is connected to a neutralization system, follow the instructions concerning the operation and periodic cleansing of the system.

WARNING: If the microCHP has not been operated for any length of time, ensure that the condensate drain trap is filled with water before operating. If the microCHP is operated with an empty condensation water drain trap, there is risk of intoxication by effusing exhaust gas. Exhaust gases contain CARBON MONOXIDE which is an odorless, colorless, and deadly gas.

The microCHP can be completely disconnected from the electrical network with the all-poles cut-off point (electrical disconnect / circuit breaker located between the microCHP and the building power panel).

In order to avoid damage to the engine caused by excessive off-time, the engine is automatically switched on for 30 minutes at least once every 60 days. In order to avoid damage to the pumps caused by excessive off-time they are switched on for two minutes per day.

A desktop, notebook, or tablet computer with corresponding software (ecoServ) can be connected to the microCHP diagnostic interface (RS-232). Typically a USB to RS-232 converter is used to interface with the microCHP. A second computer can remotely access this connected computer via the internet. If the modem option is installed, the local computer can dial in to a server with diagnostic information.

WARNING: Mortal danger is present due to electric shock hazard at live electrical parts! Dangerous voltage exists at the power supply connections of the microCHP even if the main cabinet switch is in the off position. Before working on the microCHP, disconnect the electrical power at the external circuit breaker/ disconnect and secure (lock out/tag out) the microCHP against switching on again. Wait five minutes for the capacitors to discharge. No user serviceable parts, Refer to qualified service personnel for service.

Ensure that no liquids come in contact with the electrical components.

The engine switch turns the engine electronics and inverter off. However the microCHP remains powered.

Routine maintenance is required every 4,000 operating hours. Contact your service provider. Refer to the 4,000 Hour Maintenance Manual.

WARNING: Shock hazard. The engine switch does not remove electrical power from the microCHP.

On the C series microCHP, the engine switch is mounted inside the left side panel.

5.1 Maintenance

WARNING: Observe all safety warnings and cautions in this manual. Report safety errors to your service provider. Do not attempt to service the microCHP. Diagnostic, repair, and maintenance activities shall only be performed by qualified, factory trained service personnel.

The technician must enter a password to navigate to the Maintenance submenu.

Every 4,000 operating hours or once yearly, maintenance must be performed by a qualified service technician. One hundred hours before reaching the scheduled maintenance hour, or one week before the one year period expires, the microCHP LCD indicates that maintenance is needed. Schedule maintenance with your service provider.

If the maintenance interval is exceeded, the microCHP switches to 2,100 rpm operation at 4,100 operating hours. At 4,400 operating hours the microCHP switches off and further operation is blocked. Both operating modes are continuously shown on the LCD display.

6 Troubleshooting

Malfunctions and abnormal operating states are flagged on the microCHP LCD display by errors (E) and warnings (W) lists (See Figure 6.1 for example).

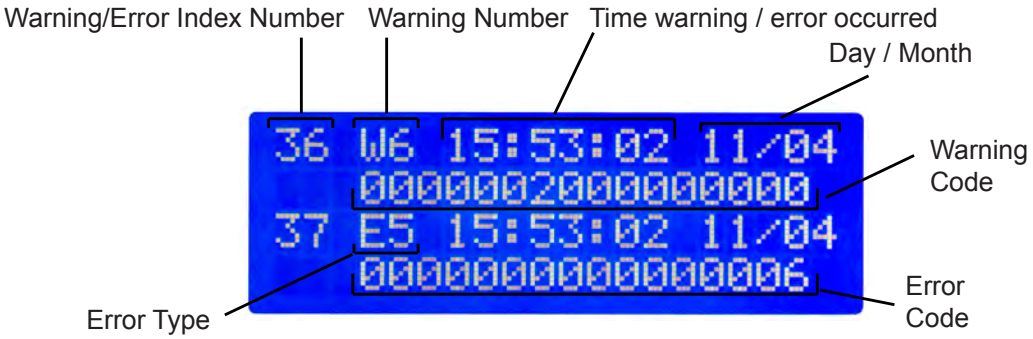

Figure 6.1 Example microCHP Error Listing

6.1 Errors

The microCHP error types are listed below in Table 6.1. To clear these, please observe the actions described. The Telephone symbol indicates you should make a call to your service provider. Before you call, write down the hexadecimal error code, error type, and time and date it occurred. This information is found under the Main Menu / Actual Values / Errors and Warnings submenu (see the example listing, Figure 6.1) in the microCHP . This information will help your service provider diagnose the cause of the problem.

Table 6.1 microCHP Error Types

microCHP Error Type	Error Type Description	Effect of error during microCHP operation	Subsequent effect	Action to take
E1	An engine stopping error has occurred. Engine will not run until the error is cleared.	Emergency auto switch-off	Will not start, microCHP remains disabled	and possibly reset error
E3	An error at the inverter (from the generator) has occurred	Emergency switch-off	New attempt to start, if energy is needed; if the error occurs repeatedly, this leads to error E1	
E5	An error at the engine has occurred	emergency switch-off	New attempt to start, if energy is needed; if the error occurs repeatedly, this leads to error E1	
E6	An error generated by the inverter (interfacing the grid) has occurred	microCHP is shut down	New attempt to start, if energy is needed; if the error occurs repeatedly, this leads to error E1	Check disconnect switch, and circuit breaker cutoff and fuses.
E7	An error at the system controller has occurred	microCHP is shut down	New attempt to start, if energy is needed; if the error occurs repeatedly, causes E1 error	

6.1.1 Error Listings

Table 6.2 below contains a detailed list of errors that may be displayed on the microCHP LCD display and in the ecoServ software, in a different format.

Errors and warnings are further categorized:

WARNING: Observe all safety warnings and cautions in this manual. Report safety errors to your service provider. Diagnostic, repair, and maintenance activities shall only be performed by qualified, factory trained service personnel.

S - Control 1 (Safety Errors)

T - Control 2 (Control Errors)

Z - Electro (Inverter Errors)

M - Engine (Engine Electronics Errors)

W - Warnings

Table 6-2 contains the listing and description of the errors. The table contains a cross-reference between the microCHP on-screen error display and the categorized errors in the first column (which are also viewable in the ecoServ software).

Up to 50 lines of error listings are sequentially displayed on the microCHP LCD, starting with the most recent errors. NOTE: Numerous errors can be displayed in each line, because each position in the 16 character listing can have multiple errors. Typically only one or a few are displayed on each line.

Service providers are equipped with the diagnostic software (ecoServ and other tools) that can remotely or locally connect to your microCHP.

If multiple errors occur on a single line, multiple numbers and / or a number will appear that represents a combination (sum) of the errors (see Figure 6.2). A number that represents a combination (sum) of the errors represents multiple errors at the one position. For instance, the letter C in the 13th position, index line 25, in Figure 6.2, represents errors M8000 (activation engine electronics) and M4000 (communication control). 8+4 =C (hex).

Hexadecimal numbers that could appear in an LCD error position include:

A = 8 + 2
B = 8 + 2 + 1
C = 8 + 4
D = 8 + 4 + 1
E = 8 + 4 + 2
F = 8 + 4 + 2 + 1

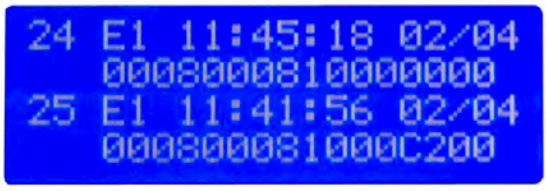

Figure 6.2 Example microCHP Error List with Multiple Errors on Each Line

Table 6.2 microCHP LCD Error Display (Sorted by LCD Error Type)

ecoServ Error Display	LCD Error Type	LCD Error Codes (16 -digit positions)																Description of error
		S				T				Z				M				
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
S0001	E1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	selftest
S0002	E1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	program sequence control
S0004	E1	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	speed difference
S0008	E1	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	too many start failures
S0010	E1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	too many emergency shut downs
S0020	E1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	monitoring oxygen sensor voltage engine electronics
S0040	E1	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	monitoring oxygen sensor voltage control
S0080	E1	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	measuring oxygen sensor voltage
S0100	E1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	program sequence inverter
S0200	E1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	program sequence engine electronics
S0400	E1	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	too many communication errors inverter
S0800	E1	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	too many communication errors engine electronics
S1000	E1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	safety chain
S2000	E1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	exhaust gas counterpressure
S4000	E1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	coolant temperature >110 °C (230 °F)
S8000	E1	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	exhaust gas > 116 °C (241 °F)
Z4000	E1	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	selftest
M0001	E1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	oil pressure
M0008	E1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	coolant temperature sensor
M0010	E1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	multiphase motor
M0020	E1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	safety chain
M0040	E1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	oxygen sensor
M0080	E1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	program sequence
M0100	E1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	oxygen sensor voltage
M1000	E1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	selftest
T0200	E3	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	timeout launch
T4000	E3	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	communication inverter
Z0001	E3	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	DC Link (intermediate circuit) voltage too low
Z0002	E3	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	DC Link (intermediate circuit) voltage too high
Z0080	E3	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	timeout launch
Z0400	E3	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	speed too low
Z0800	E3	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	speed too high

Table 6.2 microCHP microCHP Error Display (Sorted by LCD Error Type) (Continued)

ecoServ Error Display	LCD Error Type	LCD Error Codes (16 -digit positions)																Description of error
		S				T				Z				M				
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Z1000	E3	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	communication control
T0004	E5	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	fuel gas pressure too low during operation
T0008	E5	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	start failure, engine
T0080	E5	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	activation engine electronics
T0100	E5	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	switch-off engine
T8000	E5	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	communication engine electronics
M0004	E5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	coolant temperature > 103 °C (217 °F)
M0200	E5	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	start failure, engine
M0400	E5	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	speed too high
M0800	E5	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	speed too low
M2000	E5	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	supply voltage
M4000	E5	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	communication control
M8000	E5	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	activation engine electronics
Z0004	E6	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	grid frequency too high
Z0008	E6	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	grid frequency too low
Z0010	E6	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	grid voltage too high
Z0020	E6	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	grid voltage too low
Z0040	E6	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	PLL not synchronous
Z0100	E6	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	power factor
Z0200	E6	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	too many IGBT (inverter) errors
Z2000	E6	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	output too low
Z8000	E6	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	Electro, wiring phase sequence error
T0040	E7	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	temperature sensor Ni 1,000 (room sensor)
T0400	E7	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	engine compartment temp >100 °C (212 °F)
T0001	E7	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	Temperature Sensor Return micoCHP / Wrong Version
T0002		0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	reserved
T0010		0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	false start, power start
T0020		0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	communication modem
T0800		0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	reserved
T1000		0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	reserved
T2000		0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	reserved
M0002	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	coolant temperature > 95 °C (203 °F)

6.1.1.1 Self test Error E1

0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0

(S0001)

Problem: Hardware safety check failed.

Corrective action: Reset the error. If it reoccurs, contact your service provider.

6.1.1.2 Program Sequence Control Error E1

0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0

(S0002)

Problem: A software processing error occurred.
Corrective action: Reset the error. If it reoccurs, the software file may be corrupt. Contact your service provider.

6.1.1.3 Speed Difference Error E1

0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0

(S0004)

Problem: A discrepancy in the engine speed readings as measured by the engine electronics and the inverter/power electronics varies by more than 200 rpm. The two readings should correlate.
Corrective action: Reset the error. If it reoccurs, contact your service provider.

6.1.1.4 Too Many Starting Failures Error E1

0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0

(S0008)

Problem: More than 5 successive engine false starts occurred.
Corrective action: See error **M0200** Start Failure Engine.

6.1.1.5 Multiphase Motor Error E1

0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0

(S0010)

Problem: More than 5 emergency shutdowns within 24 hours.
Corrective action: Check for other error codes. In most cases, this error occurs as a result of other errors. Those errors should be evaluated to determine the source issue.

6.1.1.6 Monitoring Oxygen Sensor Error E1

0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0

(S0020)

Problem: An error occurred when measuring the oxygen sensor voltage by the engine electronics.

Corrective Action: Check the oxygen sensor. See engine electronics **M0040**.

6.1.1.7 Monitoring Oxygen Sensor Voltage Control Error E1

0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0

(S0040)

Problem: The measured oxygen sensor (lambda) voltage of the engine electronics deviated for at least 3 minutes by more than 40 mV from the specified target measurement on the control.

Corrective Action:

- Check the oxygen sensor connectors;
- Check the wiring of the oxygen sensor voltage between the engine electronics and the system controller (control connectors SG3/4 and engine electronics connectors MB11/12).
- Check O2 sensor heater for proper operation.
- See also the description for control-1 **S0020.**

6.1.1.8 Measuring Oxygen Sensor Voltage Error E1

0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0

(S0080)

Problem: The internal monitor of the oxygen sensor voltage reports an error.

Corrective Action:

- Shut down the microCHP and restart (maximum two restarts).
- If the error still re-occurs, consult the factory.

6.1.1.9 Program Sequence Inverter Error E1

0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0

(S0100)

Problem: The inverter software was not correctly processed and generated an error.

Possible Corrective Actions:

- Shut down the microCHP and restart (maximum two restarts).
- Software may be corrupted. If the error re-occurs, reload the software.
- If the error re-occurs, exchange the inverter.

6.1.1.10 Program Sequence Engine Electronics Error E1

0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0

(S0200)

Problem: The inverter software was not correctly processed and generated an error.

Possible Corrective Actions:

- Shut down the microCHP and restart (maximum two restarts).
- If the error continues to re-occur, exchange the engine electronics.

6.1.1.11 Too Many Communication Errors inverter Error E1

0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0

(S0400)

Problem: Too many communication errors between the system controller and the inverter.

Possible Corrective Actions:

- If error **S 0C00** occurs; check the engine switch, switch “ON,” restart.

- Check the flat ribbon comm cable between the system control and inverter/power electronics.
- Check the O2 sensor and connectors. Replace defective or damaged O2 sensor.
- Exchange the inverter.
- Exchange control

6.1.1.12 Too Many Communication Errors Engine Electronics Error E1

0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0

(S0800)

Problem: Communication errors between the system control board and the engine control electronics.

Possible Corrective Actions:

- If error **S 0C00** occurs: check to see if the engine switch is “ON,” and restart;
- Observe the “Power On” LED at top center of engine control board to see if it is lit (strobing @ 30 Hz).
- Check the connection between the control and engine electronics (ribbon cable). If necessary, replace the ribbon cable or connectors S MOMO on control and M SPOCK on engine electronics.
- If the error still re-occurs, exchange the engine electronics:
- Inspect for problems and exchange system controller, if necessary;

6.1.1.13 Safety Chain Error E1

1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

(S1000)

Problem: The safety chain has generated a safety error.

Possible Corrective Actions:

Based on the red LEDs (Light Emitting Diodes) mounted on the system control and the engine electronics it may be determined which monitoring function in the safety chain has tripped. In order to determine LED locations, see the diagram showing the LEDs on Spock and Momo. Remove the front panel of the control cabinet to view the diagram on the inside of the panel and compare to the boards.

6.1.1.14 Exhaust Gas Counterpressure Error E1

2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

(S2000)

Problem: Exhaust gas pressure monitoring has generated an error. Exhaust gas counter pressure too high (> 1.2 w.c.i.).

Possible Corrective Actions:

- Check exhaust gas pipe for obstruction or icing.
- If the exhaust gasses are discharged freely, check the exhaust gas pressure monitor and its connector cable; the exhaust gas pressure monitor is connected in

the microCHP rear electronics compartment (factory wired); it is a break contact (if the exhaust gas pressure is okay, the contact remains closed).

6.1.1.15 Coolant Temperature >110 °C Error E1

4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

(S4000)

Problem: Coolant temperature in the engine cooling loop is ≥ 110 °C (230 °F). The coolant temperature limiter located on the pipe between the expansion tank and plate heat exchanger has opened. This error can occur after an emergency cutout (e.g. power failure) because the engine did not have the opportunity to go through cool down before shutting off;

The switch will reset at 90 °C (194 °F).

This error occurs in combination with the errors **S1000** and **S2000**. See error description control-1 **S1000**;

Corrective Actions:

- Reset error
- If the error reoccurs, the originating problem must be located; which water circuit the error generated from. If the plate heat exchanger is cold, the problem is in the cooling loop of the engine. If the plate heat exchanger is hot, the heat in the heating loop is not being dissipated adequately to the buffer tank (or other heat exchange tank).
- If the problem is found in the cooling loop of the engine:
  - Check the coolant level in the expansion tank (coolant level should be at the maximum mark).
  - Bleed cooling loop (using the air bleed valve at the top of the recuperator).
  - Check for a leak in the cooling loop (tubes, etc.).
  - Check engine water pump operation.
  - Check the coolant temperature sensor at the engine (2.45 kOhm at 20 °C (68 °F) 500 ohm at 65 °C (149 °F)); test wiring connectors MB 5/6.
  - Check temperature limiter located on the pipe beneath the coolant expansion tank (break contact, contact is closed in normal cases).
  - Test wiring connection, coolant temperature limiter.
  - Check for a leak from the recuperator (no glycol contamination in the exhaust gas pipe behind the recuperator or tube between recuperator and muffler), otherwise exchange the recuperator.
  - Check if the spark plug is wet or the gas mixer is contaminated with dirt, debris, or pipe dope.
  - Check if the temperature jumps up at low speeds and if high speeds are unproblematic; or considerable trapped air is in the cooling loop (no coolant circulation, cold plate heat exchangers and cold expansion vessel). It is

likely that a cylinder head gasket or an exhaust gas heat exchanger is the fault; bleed, engine runs smoothly.

- If the same phenomenon occurs again during a new start with a cooled engine:
  - If coolant contaminant is found in the exhaust gas duct, exchange the recuperator.
  - If the spark plug is wet and the exhaust gas heat exchanger is definitely not the problem, replace the cylinder head gasket.

- If the problem may be in the heating loop:
  - Check to see that all shutoff valves are open.
  - Check filters for cleanliness.
  - Check for plugging.
  - Bleed the heating loop.
  - Check the CHP pump and mixer valve (use the test function in the ecoServ).
  - Check flow rate in the plate heat exchanger (normal > 159 gal. (600 L) per hour); in case of contamination (from 106 gal. (400 L) /hour flow rate) flush the plate heat exchanger. The contamination of the plate heat exchanger can be determined by the temperature differences between the feed and return. Refer to maintenance instructions.

The temperature limiter resets at 90 °C (194 °F).

6.1.1.16 Exhaust Gas >116 °C (241 °F) Error E1

8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

(S8000)

Problem:

- Exhaust gasses are insufficiently cooled.
- The exhaust gas temperature ranges up to a maximum of 96 °C (205 °F) in normal operation.
- This error occurs in combination with the errors **S2000** and **S4000**.

Corrective Actions:

- Reset error.
- Air lock in the coolant compartment of the exhaust gas heat exchanger (recuperator) may have occurred. Refer to the microCHP Repair Manual for instructions on bleeding the coolant in the recuperator.
- If the error re-occurs after a longer running time, the exhaust gasses are not sufficiently cooled down; it can also occur if the coolant temperature is ≥ 110 °C: (230 °F) exhaust gas heat exchanger is defective.

– If the error is displayed and if the temperature at the muffler is below 96 °C (205 °F), the temperature limiter (break contact, contact is closed in normal operation) and electrical connections must be checked;

– Note: the exhaust gas temperature limiter status can be checked via the LED on the system control board (Spock);

– Check the recuperator (exhaust gas heat exchanger): if there is any coolant in the tube between exhaust gas heat exchanger and muffler, the exhaust gas heat exchanger is leaking: replace the recuperator.

WARNING: Exhaust gases contain CARBON MONOXIDE which is an odorless, colorless, and deadly poison. The exhaust gas heat exchanger (recuperator) and exhaust gas pipe must be leak-proof as they are operated with high pressure.

6.1.1.17 Control-2, Temperature Sensor Return CHP/Wrong Version Error E7

0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0

(T0001)

Problem: the return flow temperature sensor between the buffer tank and the microCHP is not connected or defective. It is also possible that a control circuit board with the hardware release number < D.N has been installed;

Corrective Actions:

Check the hardware number of the control circuit board -> if < D.N -> control circuit board built in D.N.;

Inspect the installation of the sensors. For the location of the sensors refer to installation drawings.

Table 6.3 Sensor

function	description	order number	features
RL CHP	VR10	105 558	attached sensor with flattened side

Solid contact between the sensor and the tank immersion sleeve must be achieved Use thermal conductance paste.

Please observe the assembly instructions for the temperature sensor from the installation specifications.

In the following overview the reactions to the sensor errors in case of sensor short circuit (“s.c.”) or sensor interruption (“s.i.”) are described.

6.1.1.18 Control-2, Reserved

0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0

(T0002)

Problem: Control-2, reserved.

6.1.1.19 Control-2, Gas Pressure too Low During Operation Error E5

0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0

(T0004)

Problem:

This error leads to turning off of the power plant.

Corrective Actions:

- Liquid gas: Check if propane tank is empty; check fuel lines and valves.
- Natural gas: Contact gas supplier; check fuel lines and valves.

6.1.1.20 Control-2, False Start Engine Error E5

0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0

(T0008)

Problem:

False start engine or inverter cannot launch

Corrective Actions:

See the following error:

- Engine electronics **M0200**
- Inverter **Z0080**

6.1.1.21 Control-2, False start, power start

0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0

(T0010)

Problem: The engine did not reach the required speed.

Corrective Actions:

Check for proper gas pressure.

6.1.1.22 Control-2, Communication Modem Error

0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0

(T0020)

Problem:

Communication errors are occurring with the modem (during remote monitoring).

Corrective Actions (if frequent errors):

– Inspect the communication cable (flat ribbon) from control electronics board (Spock) connector S FB to the modem connector MOD SPOCK.

– Inspect the cable from control electronics board connector S G pin 5 to modem connector MOD A pin 1 (hardware version BN and CN).

NOTE: Errors are not uncommon and do not necessarily indicate a defective modem. Exchange the modem only after making sure the software settings are correct, cables are not defective or incorrectly installed, and no communication via the telephone network is possible.

6.1.1.23 Control-2, Temperature Sensor CHP Error E7

0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0

(T0040)

Problem: A required temperature sensor (buffer tank, supply and return, outside, room, according to operational mode) is not correctly connected or is defective.

Corrective Actions:

Please confirm the appropriate installation of the sensors.

For the exact placement of the installation sensors see the hydraulic integration examples and installation drawings.

Table 6.4 List of the possible sensors:

function	description	order number	features
Sp1 WW - hot water (Hot Water Tank, typ.)	VR10	105 558	attached sensor or immersion sensor with flattened side
Sp2 mitte - middle (Buffer Tank)	VR10	105 558	attached sensor or immersion sensor with flattened side
Sp3 unten - lower (Buffer Tank)	VR10	105 558	attached sensor or immersion sensor with flattened side
RL_CHP	VR10	105 558	attached sensor or immersion sensor with flattened side
VL1	VR10	105 558	attached sensor with flattened side
RL1	VR10	105 558	attached sensor with flattened side
VL2	VR10	105 558	attached sensor with flattened side
RL2	VR10	105 558	attached sensor with flattened side
VL total	VR10	105 558	attached sensor with flattened side
AF	VRC693	105 560	outside sensor with case (without cable)

RF	KF-Ni1000	105 561	room sensor with case (without cable)

Solid contact between the sensor (VR10) and the tank immersion sleeve must be made. Use thermal conductance paste. Please observe the installation instructions for the temperature sensor from the installation specifications.

In the following overview the responses to the sensor errors due to sensor short circuit (“s.c.”) or sensor interruption (“n.c.”) are described.

If a sensor error occurs, replace the defective sensor with a new one. Professional installation required. Refer to the site installation drawings for exact placement of the sensors.

outside temp sensor – AF

- An error message is displayed
- The outside sensor is set to -60 °C (-76 °F)(highest negative value)
- Afterward the regulation is as before, i.e. the tank is activated if necessary
- microCHP is blocked from operation.

heating circuit supply temp sensor – VL1/VL2

- Error message is generated
- HK-pump (HK1 Heating Circuit 1/HK2 Heating Circuit 2) is switched on
- HK-mixer (HK1 Heating Circuit 1/HK2 Heating Circuit 2) is permanently run
- Supply target value for HK1/HK2 is set on zero.
- Afterwards the regulation is as before, i.e. the tank is activated if necessary.
- microCHP is blocked from operation.

heating circuit return temp sensor – RL1/RL2

- If outside-night- switch-off is activated, an error message is generated.
- The actual value (HK1/HK2) of the return temperature is set at 20 °C (68 °F) and no night switch-off is performed.
- Afterwards the regulation is as before, i.e., the tank is activated if necessary.

total supply temp sensor– VL_gesamt

- Error message is generated.
- The mutual target value of the supply temperature is determined out of the highest supply target value of the heating circuits (+2 K) and I-share are left out; the mutual supply actual value is then set on 10 °C (50 °F) or 10 °C below the highest target value of the supply temperature in order to warrant operation.

– If this error occurs together with VL1/VL2-error, the mutual supply target is directly generated via the biggest heating curve.

room temp sensor – RF

– If the outside room temperature is activated, an error message is generated.

– The room target values (DAY / NIGHT / CONVENIENCE - TA / NA / KO) are set on 20 °C (68 °F) target=actual value.

– Afterwards the regulation is as before, i.e., the tank is activated if necessary.

hot water tank temperature (or upper tank temp sensor) – SP1_WW

– Error message is generated.

– The hot water charging pump is switched off.

– There is no hot water charging with the CHP and the tank.

– Afterwards the regulation is as before, i.e., the tank is activated if necessary.

middle tank temp sensor – SP2_mitte

– Error message is generated.

– The regulation continues without any alteration.

– Medium and high production are not possible.

lower tank temp sensor – SP3_unten

– Error message is generated.

– The microCHP is blocked as before; on parallel operation the sensor error is transmitted to the slave units as well.

– The tank is operated normally.

return water temp sensor RL_CHP

– Error message is generated.

– The microCHP is disabled.

– The tank is operated normally.

6.1.1.24 Control-2, Activation Engine Electronics Error E5

0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0

(T0080)

Problem:

The engine electronics must be activated by the system controller and the inverter; if this error is displayed, an activation is not possible, i.e. the activation signal is not transmitted to engine electronics.

Corrective Actions:

– If no other error is displayed and the microCHP nonetheless does not start, inspect the ribbon cable between the system control and engine electronics and the flat ribbon cable between the system controller and the inverter.

6.1.1.25 Control-2, Switch Off Engine Error E5

0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0

(T0100)

Problem:

Power factor outside the tolerance

The inverter cannot reach the power factor 0.8 – 1.0 of at least one phase of the three phases.

NOTE: Three phases are for internal diagnostic use only. The microCHP generates single phase output in the North American market.

Corrective Actions:

- Reset error; start plant; using the ecoServ main screen electro panel, observe the three power factors
- If the measured values are outside the tolerance (0.8 – 1.0) with all the three phases, there is an error with the generator:
- Check generator : unplug connector ZA at the inverter
- Resistance phase - starpoint = 0.7 ohm
- Resistance phase - phase = 1.4 ohm
- Resistance phase - earth = interrupt (very high resistance).
- If there are great differences, the generator must be replaced (see repair instructions Service folder)
- If not all the three phases are concerned, the error can be with the power choke or the inverter:
- Unplug power choke on power electronics (inverter connector ZB) and measure the resistors of the three coils with an ohmmeter; identical values must be measured between the cables L1B and L1A (etc.): approx. 0.2 ohm;
- The resistance between the three coils and earth must be high-resistance;
- If there are great differences, the power choke must be replaced;
- If no error can be found with the power choke, the inverter must be replaced.

6.1.1.26 Control-2, Timeout Launch Error E3

0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0

(T0200)

Problem:

Inverter has not been launched within the prescribed time

Corrective Actions:

- See error inverter **Z0080**

6.1.1.27 Control-2, Engine Compartment Temperature > 100 °C Error E7

0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0

(T0400)

Problem: The engine compartment temperature is ≥ 100 °C (212 °F).

Corrective Actions:

- If the mini CHP is cold, the engine compartment thermostat, its wiring or the control are defective. At the connectors control S B12 there must be a level of 12V (against GND S B2), if the engine compartment temperature is okay.
- Inspect the exhaust gas pipe in the engine compartment for cracks.
- Check the coolant temperature (normal 75 – 85 °C (167 – 185 °F)).
- Check the temperature level in the case (normal 90 – 94 °C (194 – 201 °F)).
- Check the position of thermostat (according to repair instructions)

6.1.1.28 Control-2, Reserved Error

0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0

(T0800)

Problem: Error **T0800** Control-2, Reserved

6.1.1.29 Control-2, Reserved Error

0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0

(T1000)

Problem: Error **T1000** Control-2, Reserved

6.1.1.30 Control-2, Reserved Error

0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0

(T2000)

Problem: Error **T2000** Control-2, Reserved

6.1.1.31 Control-2, Communication Errors Inverter, Error E3

0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0

(T4000)

Problem:

Communication errors inverter.

Corrective Actions:

See control-1 **S0400**

6.1.1.32 Control-2, Communication Errors Engine Electronics Error E5

0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0

(T8000)

Problem: Communication errors engine electronics.

Corrective Actions: see control-1 **S0800**

6.1.1.33 Electro, DC Link (Intermediate Circuit) Voltage too Low Error E3

0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0

(Z0001)

Problem: The output voltage of the step-up-converter is too low (nominal +/-380 V)

may be caused by power loss of the engine or the generator or by a failure of the inverter

Corrective Actions:

- Reset error; start plant; observe the intermediate circuit voltages using the ecoServ main screen electro panel.
- If both voltages remain at zero, observe if both the LED of the supply of the step-up-converters flash while the engine is running (see inverter)
- NO: exchange inverter (see corresponding chapter in the Service folder)
- YES: line circuit breaker generator (with older versions fuses generator).
- Check connections between generator and inverter.

6.1.1.34 Electro, DC Link (Intermediate Circuit) Voltage too High Error E3

0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0

(Z0002)

Problem:

The voltage behind the step-up-converter is too high (nominal +/-380 V)

The error may occur as a consequence of an emergency cutout or a power failure; a further reason could be a problem with the inverter

Corrective Actions:

- Reset error; start plant; observe the intermediate circuit voltages using the ecoServ main screen electro panel.
- If the error occurs immediately after starting the engine or after launching, the inverter is defective and must be replaced.

6.1.1.35 Electro, Power Frequency too High Error E6

0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0

(Z0004)

Problem:

The power frequency measured by the inverter is too high; this error may occur with a power failure

Corrective Actions:

- Reset error. Observe the power frequency using the ecoServ main screen electro panel.
- In case of frequent re-occurrence, replace the inverter

6.1.1.36 Error 0008 Electro, Power Frequency too Low Error E6

0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0

(Z0008)

Problem: The power frequency measured by the inverter is too low; this error may occur with a power failure

Corrective Actions:

- Reset error. Observe the power frequency using the ecoServ main screen electro panel.
- In case of frequent re-occurrence, replace the inverter

6.1.1.37 Electro, Power Supply Voltage too High E6

0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0

(Z0010)

Problem: The power supply voltage is too high.

Corrective Actions:

- Reset error; using the ecoServ main screen electro panel, check if the power supply voltage is within the tolerance (230 V +10/-15%). If these are outside with one or several phase(s), the voltage displayed must be examined by a voltage reading at the terminal blocks in the control cabinet. If these readings do not match values displayed in the ecoServ, there is an error in the inverter. The inverter must be replaced.
- If the power supply voltage is frequently outside the quoted tolerance, a parameter file with adapted tolerances can be used if the respective energy supply company permits it. The form for the operating license and the parameter file can be obtained from the supplier.

6.1.1.38 Electro, Power Supply Voltage too Low Error E6

0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0

(Z0020)

Problem: The power supply voltage is too low, or one phase is disconnected.

Corrective Actions:

- Reset the error; using the ecoServ software main screen (electro panel). Check if the power supply voltage is within the tolerance (230V +10/-15%). If these are outside with one or several phase(s), the voltage displayed must be examined by a voltage reading at the terminal blocks in the control cabinet. If these readings do not match values displayed in the ecoServ, there is an error in the inverter. The inverter must be replaced
- If one or several power supply voltages are nearly zero, check the fuses in the supply line.
- Check connections from the connection box to the terminals in the control cabinet.
- If the power supply voltage is frequently outside the specified tolerance, a parameter file with adapted tolerances can be used if the respective energy supply company permits it. The form for the operating license and the parameter file can be obtained from the supplier.

6.1.1.39 Electro, PLL not Synchronous Error E6

0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0

(Z0040)

Problem:

Internal caster synchronisation of the inverter (PLL) is not synchronous to the mains.

This error can occur when switching on the plant.

Corrective Actions:

Reset error; using the ecoServ main screen electro panel, observe electro power frequency and power supply voltage and start plant. If the error re-occurs with correct values, the inverter must be replaced.

6.1.1.40 Electro, Timeout Launch Error E3

0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0

(Z0080)

Problem:

It takes too long until the inverter starts

Corrective Actions:

- Using the ecoServ main screen electro panel, check if the intermediate circuit voltages exceed 100 V (in switched off state)
- If yes, check if the mains contactor is welded: measure voltage at the contactor coil (connections at the mains contactor NR A1/ A2). If there is no voltage, and the contactor is switched on nevertheless, the contactor is welded and must be replaced
- If the intermediate circuit voltage is not reached after starting see electro **Z0001**
- Using the ecoServ main screen electro panel, observe output, intermediate circuit voltages and intermediate circuit currents as well as speed and start plant. The output should increase continuously after launching the main contactor. If the ventilating fan below the cooling element of the inverter rotates, but the main contactor does not launch, the connections between contactor coil and inverter must be checked. Check connection at the inverter at the connectors inverter ZD 3 / 4
- If neither the cooling fan nor the main contactor are activated the inverter must be exchanged.

6.1.1.41 Electro, Power Factor Error E6

0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0

(Z0100)

Problem:

Power factor outside the tolerance

The inverter cannot reach the power factor 0.8 – 1 of at least one phase anymore

Corrective Actions:

- Reset error; start plant; using the ecoServ main screen electro panel, observe the three power factors
- If the measured values are outside the tolerance (0.8 – 1.0) with all the three phases, there is an error with the generator:
- Check generator : unplug connector ZA at the inverter
- Resistance phase - starpoint = 0.7 ohm
- Resistance phase - phase = 1.4 ohm
- Resistance phase - earth = interrupt (very high resistance).
- If there are great differences, the generator must be replaced (see repair instructions Service folder)
- If not all the three phases are concerned, the error can be with the inductor (power choke) or the inverter:
- Unplug inductor from power electronics (inverter connector ZB) and measure the resistors of the three coils with an ohmmeter; identical values must be measured between the cables L1B and L1A (etc.) : approx. 0.2 ohm;
- The resistance between the three coils and earth must be high-resistance;
- If there are great differences, the inductor must be replaced;
- If no error can be found with the inductor, replace the inverter.

6.1.1.42 Electro, too Many IGBT-Errors Error E6

0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0

(Z0200)

Problem:

Repeated occurrence of the IGBT error

The IGBT module of the inverter monitors the phase currents, the supply voltage and the temperature of the semi-conductors. If one of the limit values is exceeded, the IGBT module emits an error and switches off; emergency cutouts can impair the IGBT module.

Corrective Actions:

- If the error occurs with the engine switched off, it may be in connection with the monitoring of the supply voltage; reset error and change to ecoServ main screen electro panel; the inverter is now switched on and all the 9 LEDs on the electronics must be red. If they are not, exchange inverter.
- Check when the engine is switched off if the integrated cooling fan can rotate freely; afterwards reset error and start plant; after the launch of the main contactor the fan must start rotating and be audible;
- If the fan does not rotate: check connectors and connections between the inverter module and ventilator (inverter connector ZD 1 / 2); if no error can be found, replace the inverter;
- Can the air circulate freely (check air flow into and out of the electronics compartment of the cabinet). Check for dust buildup in the air circulating fans and heat sinks.

6.1.1.43 Electro, Speed too Low Error E3

0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0

(Z0400)

Problem:

The speed measured by the inverter is too low (the speed is determined based on the generator frequency of phase R)

Corrective Actions:

- Check the automatic cutout LS (circuit breaker) of the generator
- Check generator
- Unplug the connector ZA at the inverter
- Resistance phase – starpoint = 0.7 ohm
- resistance phase - phase = 1.4 ohm
- Resistance phase – earth = interrupt (very high-resistance).
- If great differences are detected, replace the generator (see repair instructions in the Service folder)
- If no error is found replace inverter electronics
- See also
  - Error engine **M0800**
  - Error control-1 **S0004**

6.1.1.44 Electro, Speed too High Error E3

0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0

(Z0800)

Problem:

The speed measured by the inverter is too high (the speed is determined based on the generator frequency of phase R)

Corrective Actions:

See

- Error electro **Z0400**
- Error engine **M0400**

6.1.1.45 Electro, Communication Control Error E3

0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0

(Z1000)

Problem:

Faulty communication to control.

Corrective Actions:

- See error control 1 **S0400**

6.1.1.46 Electro, Output too Low Error E6

0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0

(Z2000)

Problem:

Engine output is too low

The output limits depend on speed

Corrective Actions:

Reset error; start plant. using the ecoServ main screen electro panel, observe the electrical output

Slowly drop output during operation:

- Check air intake path (check for leaks, obstruction, and noises)
- Check exhaust gas pipe (leaks, constrictions in the silencer, and blockages)
- Check outlet valve (measure compression); if defective replace cylinder head (see Service folder chapter repair instructions).

Fast drop of the output during operation:

- Throttle plate is sticking or stepper motor failing. (check see engine **M0010**)
- Gas mixer is defective. (check see engine **M0010**)
- Air intake path or exhaust gas pipe faulty: constrictions, leaks, etc.
- Hose between the engine intake air filter housing and carburetor is defective or not properly installed
- Deposits at the outlet valve (measure compression)
- Deposits at the intake valve (measure compression)
- Check oxygen sensor

No output is gained at all after starting:

- Warm-up position of the gas mixer is too low. Refer to Initial Operation Record.

6.1.1.47 Electro, self-test Error E1

0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0

(Z4000)

Problem:

Error self-test inverter

Corrective Actions:

- Reset error; shut down the microCHP plant and restart; if the error re-occurs, reload program and parameters for the inverter;
- Check grid connection.
- If there is no success: replace inverter.

6.1.1.48 Electro, Reserved, E6

0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0

(Z8000)

Problem: Electro, reserved.

6.1.1.49 Engine, Oil Pressure Error E1

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

(M0001)

Problem: Oil pressure is too low.

Corrective Actions:

- Check oil charge.
- Inspect oil pressure switch; if the engine is not in operation, the oil pressure switch contact must be closed (break contact); if resistance exceeds 20 ohm, the oil pressure switch must be replaced.
- Inspect wiring connectors engine electronics M B 3/4.
- If no error is found, exchange engine electronics.

6.1.1.50 Engine, Coolant Temperature > 95° C (203 °F)

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2

(M0002)

Problem: This error is displayed, if coolant temperature as measured at engine head exceeds 95 °C (203 °F) the plant is shut down.

Corrective Actions:

- Proceed according to co ntrol-1 **S4000**.
- See also engine electronics **Z0004**.

6.1.1.51 Engine, Coolant Temperature > 103 °C (217 °F), E5

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4

(M0004)

Problem:

If coolant temperature measured at engine head is ≥ 103 °C (217 °F) an emergency cutout is carried out

Corrective Actions:

- Proceed according to control-1 **S4000**
- See also engine electronics **M0002**

6.1.1.52 Coolant Temperature Sensor Error E1

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8

(M0008)

Problem:

Temperature sensor of the engine defective

Short circuit or interrupt in the cable, in the connectors and/or in the temperature sensor

Corrective Actions

- Check the temperature sensor. Measuring the resistance at the temperature sensor of the engine (2.2 k ohm at 20 °C (68 °F); 500 ohm at 65 °C (149 °F)).
- Connections sensor - check engine electronics at the connectors engine electronics MB 5/6

6.1.1.53 Multiphase Motor Error E1

0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0

(M0010)

Problem: Gas mixer and/or throttle plate defective.

Corrective Actions

The gas mixer and throttle plate can be tested by the test functions of the ecoServ

Test gas mixer:

- Dismount step motor, so that the movement of the metering cone can be observed
- Activate the test function in the ecoServ; the step motor must extend and retract again; the movement repeats until the test function is cancelled.
- If the gas mixer does not operate correctly, check the wiring (connectors engine electronics MA 5-8); otherwise exchange the step motor.
- If the step motor still does not work, the engine electronics must be exchanged.

Test throttle plate:

- In order to see the movement of the throttle plate the air intake hose at the carburetor must be removed; the movement of the throttle plate can be watched with a flashlight;
- Activate the test function in the ecoServ; the throttle plate opens and closes completely; the movement repeats until the test is cancelled;
- If the throttle plate does not operate correctly, check the wiring (connectors engine electronics MA 9-12); otherwise replace the complete carburetor together with the throttle plate (note the metering cone type; it is specific to natural gas or liquefied petroleum gas).
- If the throttle plate still does not work, the engine electronics must be exchanged.

6.1.1.54 Safety Chain Error E1

0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0

(M0020)

Problem: Gas relay has an incorrect status.

All the safety errors of the inverter and the engine electronics can result in a gas relay error.

Corrective Actions

Procedure according to control **S1000**.

6.1.1.55 Oxygen Sensor Error E1

0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0

(M0040)

Problem: Oxygen sensor is defective (Oxygen sensor voltage or oxygen sensor heating);

The oxygen sensor voltage must be lower than 200 mV at the beginning of the warm-up phase of the engine; If this is not the case, the oxygen sensor or the analysis of the oxygen sensor voltage may be defective;

At the beginning of the starting procedure the oxygen sensor voltage normally is approximately 10 mV; with increasing exhaust gas temperature and richer gas-air mixture the oxygen sensor voltage gradually rises to the target value; the enrichment is apparent by the position of the gas mixer. If the gas mixer position reaches 254 or when 5 minutes have passed and the oxygen sensor voltage is then more than 40 mV lower or higher than the target value, this may also suggest that the oxygen sensor is defective;

During continuous operation of the engine, the oxygen sensor voltage must reach the target value (+/- 40 mV) within every 3 minutes.

If the heating (heater) of the oxygen sensor has an interrupt, an error is also generated;

Corrective Actions

- Measure the resistance of the heating of the oxygen sensor directly at the connector of the oxygen sensor (white cable); while the engine is off the heating shows 2.5 ohm. Check the connection to the engine electronics at connector engine electronics M A3/4;
- Measure the oxygen sensor voltage of the oxygen sensor directly at the connector of the oxygen sensor;

Procedure: unplug connector, start engine and measure the voltage between black (+) and grey (-) cable; if the voltage increases, the oxygen sensor is okay and the connector can be plugged in again;

Check connection to the engine electronics;

Connector engine electronics M B 1(+)/2(-)Nr. J4.

- Check if the oxygen sensor voltage is displayed in the ecoServ; if no voltage is displayed, the engine electronics must be replaced.

6.1.1.56 Program Sequence Error E1

0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0

(M0080)

Problem: The processor has detected an error in the program flow;

Corrective Actions

- Exchange the processor (follow instruction for processor exchange);
- If the error still occurs the engine electronics must be exchanged.

6.1.1.57 Oxygen Sensor Voltage Error E1

0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0

(M0100)

Problem: The measured oxygen sensor voltage of the engine electronics deviates more than 40 mV from the target value for more than 3 minutes.

Corrective Actions

See error control-1 **S0040**

6.1.1.58 Start Failure Engine Error E5

0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0

(M0200)

Problem: The engine has not gained speed for 2.5 seconds or has not exceeded the speed of 1,000 rpm during 10 seconds;

a) No speed and mains fuse defective (the device has no voltage: when you press the control button the display is not illuminated) engine electronics is defective.

b) Speed too low (< 400 rpm) engine torque too high, or engine electronics defective;

c) starting noise normal (400 – 700 rpm), no ignition;

Corrective Actions

a) Switch on mains fuse; test startup with the ecoServ;

– if the mains fuse switches off again immediately, the engine electronics is defective and must be replaced.

b) Check if engine rotates freely, at the same time carefully turn out the spark plug and turn the flywheel carefully;

Can the flywheel be turned?

YES

– NO: engine/generator unit block; dismount generator stator (case); refer to Maintenance Manual.

Does the engine rotate now (without the generator stator)?

– YES: exchange the generator (stator and rotor);
– NO: exchange the engine;

Consult with the factory.

c) Checks:

– Check starting position of the step motor gas mixer (normal approx. NG 30 LPG 45)
– Check functions of the step motors (see description engine **M0010**)
– Check ignition
– Check settings of the step motors and gas path according to Section 5.18 and installation instruction Section 8.

Check the spark plug for moisture, if wet: replace cylinder-head gasket;

– Measure compression according to repair instructions; if the compression is too low, replace the cylinder head.

6.1.1.59 Speed Too High Error E5

0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0

(M0400)

Problem: The throttle plate cannot regulate when starting;

inverter decouples during operation;

Corrective Actions

– If this error occurs only once when starting, this suggests a measuring error;

– Check start position of the throttle plate;

– Observe the speed when starting; if, when starting, “overspeed ” is displayed, the problem is within the throttle plate;

– Test the function of the throttle plate with the test function of the ecoServ; (see description engine **M0010**);

– Check wiring, test sensor at connectors engine electronics M B

Trigger_Cam_Pos+	+/-10V	M B7	Hall sensor+
Trigger_Cam_Pos-	0V	M B8	Hall sensor-

– If the inverter decouples during operation, this occurs in combination with another error (no direct action necessary) or the activation of the main contactor is defective;

– Check wiring inverter.

6.1.1.60 Speed Too Low Error E5

0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0

(M0800)

Problem:- Speed variation during cool off;

– Engine starts normally, but noticeably loses performance and switches off with above error;

Corrective Actions

– Check oxygen sensor voltage (engine **M0040**);

If the voltage does not rise to the target value, although the gas mixer opens more and more, the oxygen sensor may be defective;

– Check warm-up position gas mixer for unusual position. This value may vary, depending on site specific gas pressure and other conditions. But extreme movement may indicate an error condition.

– In combination with error **Z2000** inverter: check exhaust gas system in the device on leak tightness, check throttle plate;

– Check air intake path: air filter, hoses, intake air damper, etc. for leaks, damage, or obstruction.

6.1.1.61 Selftest Error E1

0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0

(M1000)

Problem: Error self-test engine electronics

Corrective Actions

- Reload standard and individual parameter set;
- Replace engine electronics in case of recurrence;

The exhaust gas values must be readjusted.

6.1.1.62 Supply Voltage Error E5

0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0

(M2000)

Problem: The supply voltage of the engine electronics is too low;

A short circuit in the oxygen (Lambda) sensor heater or the ignition triggers a collapse of the supply voltage;

Corrective Actions

- set microCHP on operational mode RPAR (see section 4.5.1), then check Power On LED and 12 V LED (engine electronics); it should be on, strobe @ 30 Hz:
- check supply voltage (in idle speed 14.3 V) engine electronics measuring point J2-1 (12V) and J2-2 (Grnd).
- if not okay.
  - unplug the connectors MA check again;
    - if okay then:
      - measure resistance of the oxygen sensor heater (2.5 ohm), see below for plug connectors;
      - measure resistance of the ignition coil (2.4 ohm), see below.
      - replace defective component;

12V	12V	MA 1	+ ignition coil
Ignition	12V	MA 2	- ignition coil
12V	12V	MA 3	+ oxygen sensor heater
Oxygen sensor Heater	12V	MA 4	- oxygen sensor heater

- If no error as described above is found: replace the engine control board.

6.1.1.63 Communication Control Error E5

0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0

(M4000)

Problem: error communication to control;

Corrective Actions

– See control-1 **S0800**.

6.1.1.64 Activation Engine Electronics Error E5

0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0

(M8000)

Problem: engine electronics has not been released to activation;

Via the release input the control or the inverter can switch off the engine electronics externally;

Corrective Actions

The engine electronics is switched off externally, if an error has occurred in the engine control or in the inverter -> eliminate these errors.

6.2 Warnings

Warnings are displayed on the microCHP LCD along with errors (see Figure 6.3)

Figure 6.3 Warning and Error Messages on microCHP on LCD

Table 6.5 microCHP Warnings

Warning Number	Warning Description	Effect if operated	Subsequent effect	Warning Remains Until:
W1	engine switch in off position	emergency switch-off	Start disabled	engine switch turned to on position
W2	microCHP disabled	microCHP shut down	Start disabled	there is an external activation signal or enable microCHP ProE connector is jumpered
W3	gas pressure too low	emergency switch-off	Start disabled	gas pressure is accurate again (For LPG systems, check fuel storage tanks)
W4	tank temperature too high	shut down	Start disabled	tank temperature is accurate
W5	maintenance due	none	Start disabled	maintenance is performed or W11 is active
W6	coolant cooling - engine temp too high for startup	none	Start disabled	coolant has cooled down
W7	blocked for maintenance	shut down	Start disabled	maintenance has been performed
W8	engine temperature is too high	shut down	Start disabled	microCHP is disabled for 2 hours
W9	heat demand too low	shut down	Start disabled	microCHP is disabled for at least 2 hours

Table 6.5 microCHP Warnings (Continued)

W10	return temperature at microCHP too high	shut down	Start disabled	microCHP is disabled for at least 30 minutes.
W11	maintenance due: emergency operation	speed limited	Speed limited to 2,100 rpm	maintenance is performed or W12 active
W12		shut down	Start disabled	maintenance has been performed
W13	Reserve			
W14	Oil level fuse switch has triggered; engine oil level is low. Please inform your service provider immediately. Contingency operation may continue for up to 170 hours; then the unit is disabled to protect the engine. During contingency operation, engine speed is limited to 2,100 rpm.	checked before every start	Contingency operation limited to 2,100 rpm	maintenance has been performed
W15	Oil Level Low: CHP Blocked	engine is shutdown	Start disabled	maintenance has been performed

6.2.1 W0 00 No Warning Active

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Problem: None. Warnings are no long active.

Corrective Actions None.

6.2.2 W1 01 Engine Switch Off

0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0

Problem: The engine switch is in the off position. The engine switch is located inside the front left cabinet panel, adjacent the electronics compartment.

Corrective action: Turn the engine switch to the “ON” position. If this does not correct the problem, replace the engine switch.

6.2.3 W2 02 microCHP Disabled

0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0

Problem: The microCHP is configured for and has not received an external start signal (operation is blocked).

Corrective Actions: Inspect the external release switch. If no external release switch is used, a jumper wire must be installed at the enable CHP (BHKW) ProE connector, Refer to the Low Voltage section of the ProE connectors (Figure A.2), BHKW Enable.

6.2.4 W3 04 Gas Pressure Too Low

0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0

Problem: The gas pressure at the input side of the gas multiblock is lower than 7 w.c.i.

Corrective Actions: Check if the gas supply valve has been opened. If necessary, open the gas tap.

Check adjustment of the gas pressure from the regulator; this must be adjusted to 7 w.c.i. supply pressure from the regulator; this adjustment is made at the factory. Consult with your service provider and the factory.

The gas pressure must be checked with a manometer at the gage connection in front of the gas multiblock.

If the input gas pressure to the multiblock valve is adequate, then the output pressure from the multiblock must be measured and adjusted, as necessary. Contact your service provider and the factory.

6.2.5 W4 08 Tank temperature too high

0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0

Problem: The temperatures in the tank are too high;

NOTE: If a buffer tank is not configured in a current led installation, the supply temperature of the microCHP is instead monitored. Note: Buffer tank configured installation is typical.

Corrective Actions:

In operation with tank:

– Set the appropriate switch-off temperature for the tank (maximum 75 °C (167 °F); the tank has been supercharged.

In operation without tank:

– Check to see that the heat can be discharged;

– Make sure that all taps have been opened;

– Make sure that the coolant pump, return pump and heating pump are in operation.

6.2.6 W5 10 Maintenance Due

0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0

Problem: Routine oil, filter change, and inspection maintenance is due every 4,000 operating hours or at least once every year.

Corrective Actions: Schedule preventive service maintenance, service provider carry out and acknowledge in software.

6.2.7 W6 20 Coolant Starting Temp Too Hot

0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0

Problem: The coolant temperature is > 90 °C (194 F°) during the start command;

Corrective Actions: Allow coolant to cool to < 90 °C (194 F°) before attempting start.

6.2.8 W7 80 Blocked for Maintenance

0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0

Problem: The device was blocked to cool off (and is awaiting maintenance);

Corrective Actions: After maintenance is carried out: cancel operational blocking with “Settings->Block for Maintenance” in the ecoServ software. Select NO to cancel blocking.

NOTE:

6.2.9 W8 100 Engine Temperature too high

0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0

Problem: The engine temperature is too high, the engine is shut down.

Corrective Actions: microCHP is disabled for two hours

6.2.10 W9 200 Heat Intake Too Low

0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0

Problem: Because engine temperature is too high the microCHP remains blocked for at least 2 hours. This warning indicates the heat is not being transferred/dissipated at a fast enough rate;

Corrective Actions:

- Check the heating system.
- Check the cooling loop inside the microCHP . Observe coolant level and condition.
- Check cooling loop to and from the buffer tank.
- Check the plate heat exchanger for buildup and reduced effiiency

6.2.11 W10 400 CHP Return Temperature at microCHP Too High

0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0

Problem: Because the water return temperature at the microCHP is too high the CHP is blocked from operation for at least 30 minutes;

Corrective Actions:

- Check heating system and CHP loop. Check CHP pump and mixer operation, and storage tank water levels and flow.

6.2.12 W11 800 Maintenance Due: Emergency (Contingency) Operation

0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0

Problem: Maintenance has been due for more than 100 operating hours; during emergency operation the speed is limited to 2,100 RPM;

Corrective Actions:

- Service provider to carry out preventive maintenance procedures.

6.2.13 W12 1000 Maintenance Due: CHP Blocked

0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0

Problem: Maintenance has been due for more than 400 operating hours or more than 28 days; the microCHP is blocked from operation.

Corrective Action:

- Maintenance provider to carry out 4,000 Hour service interval maintenance.

6.2.14 W13 Reserved

0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0

6.2.15 W14 4000 Oil Level Low: Emergency (Contingency) Operation

0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0

Problem: The oil level safety-switch has tripped; Possible reasons include:

- the engine oil level is low
- faulty or damaged switch or loose connector

Please inform your service provider immediately; emergency operation can run up to 170 hours; afterwards the microCHP is blocked from operation to protect the engine; during the emergency operation the speed is limited to 2,100 RPM;

The oil level switch cable plug connector may have been damaged.

Corrective Action:

– Maintenance provider carry out maintenance, including determining cause of oil loss.

– Replace faulty/defective oil level switch/connector.

6.2.16 W15 8000 Oil Level Low: CHP Blocked

0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0

Problem: The oil level safety-switch has tripped. Possible reasons include:

- the engine oil level is low
- faulty switch or loose connector

Please inform your service provider immediately; the emergency operation (low speed) has been active for 170 hours; to protect the engine, the microCHP is now blocked from operation;

Corrective Action:

- Maintenance provider to carry out inspection and maintenance. See the microCHP Maintenance Manual.

7 Factory/Field Settings

7.1 Settings

options: none (depends on installation)

time/date: must be set

language: English

child protection (password): not active

Table 7.1 Factory/Field Settings

Identification	Factory/Field Setting	Range	Unit	Description
options	See Options, Section 2	ON / OFF		Refer to configuration documents.
date / time	manual setting			24 hour format and day/month/year format time example: 23:47:05 date example: (July 21, 2016) 21.07.2016
language	English			Select the interface language from the available languages.
child access protection	Set as needed	ON / OFF		Password can be activated to protect against unauthorized use.
[set operational mode]				
heat feed	Set as needed	ON / OFF		The microCHP operating speed is adjusted based on the heat demand (temp sensor T_VL_ges. and T_SP1_WW)
power feed	Set as needed	ON / OFF		The microCHP operating speed is adjusted based on the RPM program (to adjust electrical output).
[heat driven]				
NP in summer operation (heating loops)	Set as needed	ON / OFF		Forces program defaults for HP and MP production to be overwritten by NP production when the changeover temperature is reached.
frost protection	Set as needed	ON / OFF		If set to ON, frost protection is activated when the outdoor temperature is < 4 °C (39 °F). The heat supply temperature is limited to 50 °C (122 °F) in the frost protection program. Heating programs T_TAG (daytime) and T_KOMFORT (comfort) terminate the frost protection program.
Production Program				
HP	Set as needed	00:00 to 23:59	30 min.	In the high production (HP) mode, the microCHP runs at high rpm, depending on the storage tank temps T_SP2_mitte (middle) and T_SP3_unten (lower)

Table 7.1 Factory Settings (Continued)

Identification	Factory/Field Setting	Range	Unit	Description
MP	Set as needed	00:00 to 23:59.	30 min.	In the medium production (MP) mode, the microCHP runs at middle RPM, depending on storage tank temps T_ SP2_mitte (middle) and T_SP3_unten (lower). The RPM is run to T_SP3_ unten_max(MP).
NP	Set as needed	00:00 to 23:59..	30 min.	In the low production (NP) mode, the microCHP runs only for the heat demand. If the heat demand is already met, the engine runs at low RPM (1,200 RPM).
KP	Set as needed	00:00 to 23:59.	30 min.	In the no production (KP) mode, the heat demand is met by an external heater or peak load tank (options). The microCHP is switched off.
[buffer tank]				
T_SP3_unten_ max(HP)	Set as needed)	40 – 75 (104 - 167)	°C (°F)	The microCHP is ready to start if the T_ SP3_unten_max(HP) drops 10 K lower than the set point (e.g. 65 °C (149 °F))
T_SP3_unten_ max(MP/NP)	Set as needed	40 – 75 (104 - 167)	°C (°F)	The microCHP is ready to start if the T_SP3_unten_max(MP) drops 10 °C lower than the set point (e.g., 60 °C (140 °F))
changeover summer/ winter	Set as needed	5 – 40 (41 – 104)	°C (°F)	When the outdoor temperature average for 24 hour period falls below the set temperature.
[circ / discharge (unload) pump]				
T_SP2_mitteEIN (unload pump only)	Set as needed, typically: 70 (158)	4 – 90 (39 – 194)	°C (°F)	At the medium buffer tank set temperature the discharge pump is switched on if the program is set to on in the corresponding period.
T_SP2_mitteAUS (unload pump only)	Set as needed, typically: 40 (104)	4 – 90 (39 – 194)	°C (°F)	At the medium buffer tank set temperature the discharge pump is switched off if the program is set to off in the corresponding period.
[on-off program]	Set as needed	ON / OFF		The time program is continuously monitored. for all days / hours. The program can be changed at 30 min. intervals.
[heating loop 1]				
priority	OFF	ON / OFF		
heating curve	1.2	0.2 – 4.0	K / °C	Gradient of the heating curve adjustment.
TempVLMax	70 (158)	25 – 90 (77 – 194)	°C (°F)	
changeover summer/winter	17 (63)	5 – 30 (41 – 86)	°C (°F)	When the outdoor temperature average for 24 hour period falls below the set temperature.
mode	outdoor temperature normal			Set as needed.
room temperature target - night	Set as needed	5 – 40 (41 – 104)	°C (°F)	Target room temperature for night time.

Table 7.1 Factory Settings (Continued)

Identification	Factory/Field Setting	Range	Unit	Description
room temperature target - day	20 (68)	5 – 40 (41 – 104)	°C (°F)	Target room temperature for day time.
room temperature target - convenience	22 (72)	5 – 40 (41 – 104)	°C (°F)	Target room temperature for convenience / comfort level.
set holiday program	0	0 – 6 holiday periods	day/mo./ yr hr:min	Set date / time range to activate heating circuit at night temperature target.
[heating loop 2]				
priority	OFF	ON / OFF		
heating curve	0.6	0.2 – 4.0		Gradient of the heating curve adjustment for modes: Outside Temp Normal; Outside Temp Night Switch Off; Outside- and Room Temp w Night Switch Off
TempVLMax	50 (122)	25 – 90 (77 – 194)	°C (°F)	For modes: Outside Temp Normal; Outside Temp Night Switch Off; Outside- and Room Temp w Night Switch Off
changeover summer/winter	Set as needed, typical 17 (63)	5 – 30 (41 – 86)	°C (°F)	When the outdoor temperature average for 24 hour period falls below the set temperature.
mode	Set as needed			Modes available: Constant Flow Temp; Outside Temp Normal; Outside Temp Night Switch Off; Outside-and Room Temp w Night Switch Off; Heating Off
room temperature target - night	Set as needed	5 – 40 (41 – 104)	°C (°F)	Room temperature target for night time.
room temperature target - day	Set as needed	5 – 40 (41 – 104)	°C (°F)	Room temperature target for day time.
room temperature target - convenience	Set as needed	5 – 40 (41 – 104)	°C (°F)	Room temperature target for convenience / comfort level.
Set holiday program	Set as needed	0 – 6 holiday periods	day/mo./ yr hr:min	Set date / time to activate heating circuit at night temperature target.
[power feed]				
impulse mode	OFF	Self consumption 1 meter or power peaks		Determines impulse mode parameter for starting of the engine. Used in Power Driven mode only.
min switch on power	0		kW	If consumed power falls below 1 kW, CHP is shut off.
connection power (peak power)	OFF		kW	
energy meter impulse	10	10 – 5,000	Imp. kWh	Pulses per kWH. Used in Power Driven mode only.
priority heating	OFF	ON/OFF		If activated, the speed is increased until the thermal heat demand is satisfied.
priority hot water	OFF	ON/OFF		If activated, the speed is increased until the hot water and heat demand are satisfied.

Table 7.1 Factory Settings (Continued)

Identification	Factory/Field Setting	Range	Unit	Description
[RPM Program]				
speed default high	3,400	1,200 – 3,400	rpm	Sets the high speed used by the speed program. Recommended maximum.
speed default middle	2,000	1,200 – 3,400	rpm	Sets the medium speed used by speed program.
speed default low and Impulse Program “low”	1,200	1,200 – 3,400	rpm	Sets the low speed used by speed program.
Impulse Program	OFF	ON / OFF		
[hot water]				
hot water program level (step) 1	Set as needed	5 – 70 (41 – 158)	°C (°F)	Hot water temperature setpoint.
hot water program level (step) 2	Set as needed	5 – 70 (41 – 158)	°C (°F)	Hot water temperature setpoint.
hot water program level (step) 3	Set as needed	5 – 70 (41 – 158)	°C (°F)	Hot water temperature setpoint.
hot water preparation	Set as needed	ON / OFF		
priority hot water	OFF	ON / OFF		Hot water tank loaded and heating loop switched off. (Normally both run in parallel.)
weekly disinfection	OFF	ON / OFF		If activated, water heated to 70 °C (158 °F) once per week..
hot water pump (Delay)	Set as needed, typically 1	0-10	minute	Pump runs after loading to transfer heat from buffer tank to hot water tank.
[complementary heater / tank]				
switch-on hysteresis	set as needed, typically 8	5- 10	K	
switch-off hysteresis	set as needed, typically 2	1 - 10	K	
delay heating	set as needed, typically 0	0 - 30	min	
delay hot water	set as needed, typically 0	0 - 30	min	
minimal turn on time	set as needed, typically 3	2 - 30	min	
minimal turn off time	set as needed, typically 3	2 - 30	min	
hot water program step 1	Set as needed	5 — 70 (41 – 158)	°C (°F)	
hot water program step 2	Set as needed	5 — 70 (41 – 158)	°C (°F)	
hot water program step 3	Set as needed	5 — 70 (41 – 158)	°C (°F)	
charge pump hot water lag (overrun)	1	0 — 10	min	

Table 7.1 Factory Settings (Continued)

Identification	Factory/Field Setting	Range	Unit	Description
[error memory]				
amount of errors (lines)	0	0 — 50	amount of saved errors	Most recent errors displayed.
[programs]				
heating program heating loop 1	Set as needed, typically always day			
heating program heating loop 2	Set as needed, typically always day			
production program	Set as needed			
impulse program	Set as needed	ON/OFF		
hot water program	Set as needed, typically always high			
circulating pump / discharge pump	Set as needed, typically always ON			

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