Manual

Beer brewing plant software

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Contents

1. Introduction

Contents of this service manual describe the configuration and operation of the brewing plant software.

This software offers the ability to brew a tasty beer, with the help of a simple configuration.

With the flexible configuration it is possible to brew a variety of beers. Existing recipes can be loaded in to the configuration and new recipes entered easily.

All recipes can be saved in the program folder and be reloaded as required.

The software makes the process control possible for a semi-automated beer brewing plant, i.e. the control covers only the processing of the individual steps of the Mash, including the temperature control, the control from heating and agitator and the brewing master call.

Activities like e.g. additions and filtering (lautering) lay in the field of the brewer.

Contents of the following chapters are the configuration and operation of the beer brewing plant with the help of the software and a detailed description of functionality.

Good Luck!!!

2. Installation

The supplied Zip file 'Brausoftware_PCM' must be unzipped on the computer which is to be used for the process control. Recently also a setup file (.exe) for the software is available.
This can be double-clicked to activate and the user is led gradually through the installation of the software.

Note:
– The following files must be in the program folder (this is the folder, in which the application Brauanlage_38.exe is): Brauanlage_38.exe
  Brauanlage.cfg
  Cygwin1.dll
  Inpout32.dll
  All recipe files (ending .rez)
– An Icon should be put on the desktop, make certain (under the Icons options) that the application path (this is the path in which the Brauanlage_ xx.exe is located) is correct.

After unpacking the file Copyright.txt is to be read!!!
This is in the project file as well as the control program Brauanlage_xx.exe.

Contained in the package is the program DigiTemp by Brian Lane, which reads the temperature of the sensor and writes it into a log file. Included in the package is the INPOUT32.dll, which is required for using the parallel port.

So that the program is executable, two further components should be installed still before:
– The VB6-Runtime-Module
– Microsoft Office (if available, do not see chapter 11 .3)
The VB6-Runtime-Module can be downloaded on the Internet and is not contained in the package.

Now both the cygwin1.dll and the INPOUT32.dll are in the project file. If the program does not run correctly, these two files should be moved into the Windows file.

Now everything should work properly.

3 User Interface

The following block screen shows the structure of the user interface of the software:
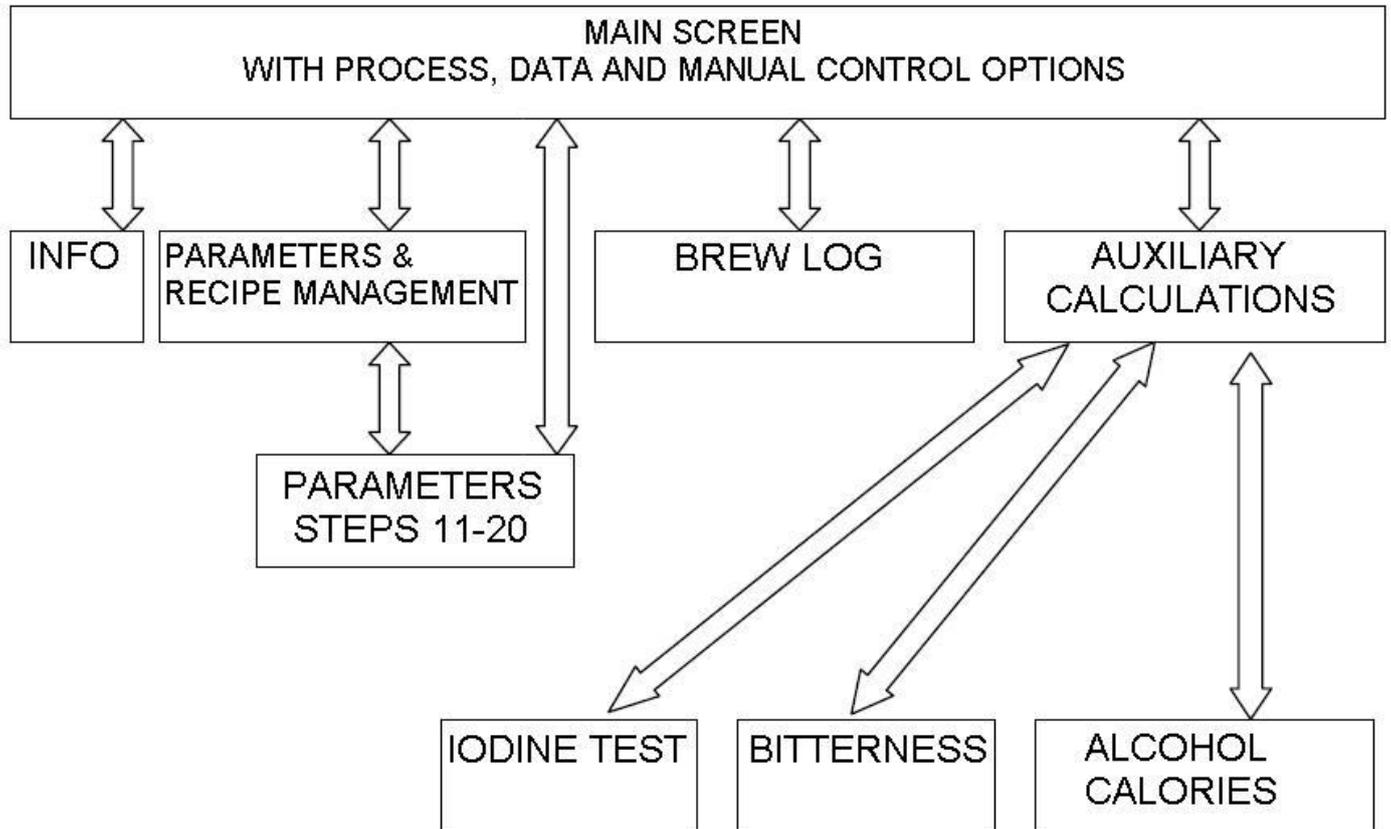
4 Start the Program

After clicking the file 'Brauanlage_38.exe' or the shortcut on the Desktop, the program is executed.
First a configuration window appears:

In this window the individual settings of the plant are made.

- – Language setting: Here a language can be selected. All display elements including all messages appear in the selected language.

- – Port relais-card: Here the LPT/USB port is selected for interfacing with the relay card. 2 fixed addresses and a freely selectable address are provided for the selection. Alternatively 2 options are also provided for compatible USB relay cards.

- – Port temp.sensor: Here the COM port is selected for reading the temperature with the help of the Dallas sensor DS1820. 4 fixed addresses options exist.

- – Definition Extra buttons: Here the functions can be labelled for the 4 extra Buttons. These buttons can be assigned to incorporate manual functions like valves, pumps etc.

- Name of DigiTemp file for temperature readings from DS1820: Here the name of the used DigiTemp file is registered (recommended: default setting).

- Name of log file of DigiTemp: Here the name of the used log file is registered. It refers to the file into which the measured temperature levels are automatically recorded during the process (recommended: default setting).

- Acoustic Signal: Here you can define whether the acoustic signal (relay output 8) should permanently sound or clocking.

- Temperature gradient: Used to select whether the temperature gradient should be active or inactive. The temperature gradient is used exclusively in active heating phases and restricts the temperature rise to the desired value to around a Kelvin (1° Celsius) per minute up to the final desired value. If the gradient is deactivated, the current desired value is immediately equal to the END desired value and the temperature will rise as fast as your equipment capabilities allow.

After confirmation by selecting 'OK' the current settings are stored into the configuration file Brauanlage.cfg, so that they are always available in the future.

After confirmation of the configuration a window appears with a user agreement, which must be accepted. Should this user agreement not be accepted, the software will not function:

Nutzungs-Vereinbarung

End-User License Agreement (EULA)

- This software is freeware.

- This software is for personal use only. Commercial use is prohibited

- UNDER NO CIRCUMSTANCES SHALL THE AUTHOR OR HIS SUPPLIERS BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES ARISING OUT OF OR RELATING TO THIS LICENSE.

- THE ENTIRE RISK ARISING OUT OF USE OR PERFORMANCE OF THE SOFTWARE REMAINS WITH THE USER OF THIS SOFTWARE

- ALL SECURITY FOR THE EQUIPMENT WHICH IS CONTROLLED BY THIS SOFTWARE AS WELL AS SECURITY FOR LIFE AND HEALTH MUST BE COMPLETELY GARANTIED BY THE HARDWARE OF THE CONTROLLED EQUIPMENT.

- THE USER HAS THE FULL RESPONSIBILITY FOR THIS EQUIPMENT.

[I agree]   [I do not agree]

After the confirmation of the user agreement the hardware is initialized. This procedure takes about 15 seconds:
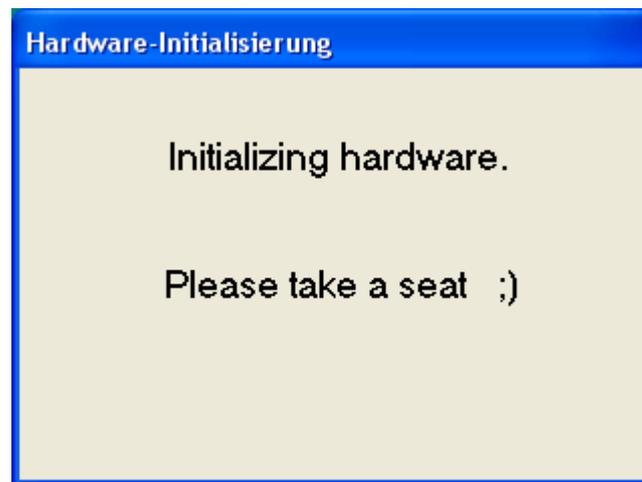
5. The Main Screen

The following illustration shows the Main Screen:
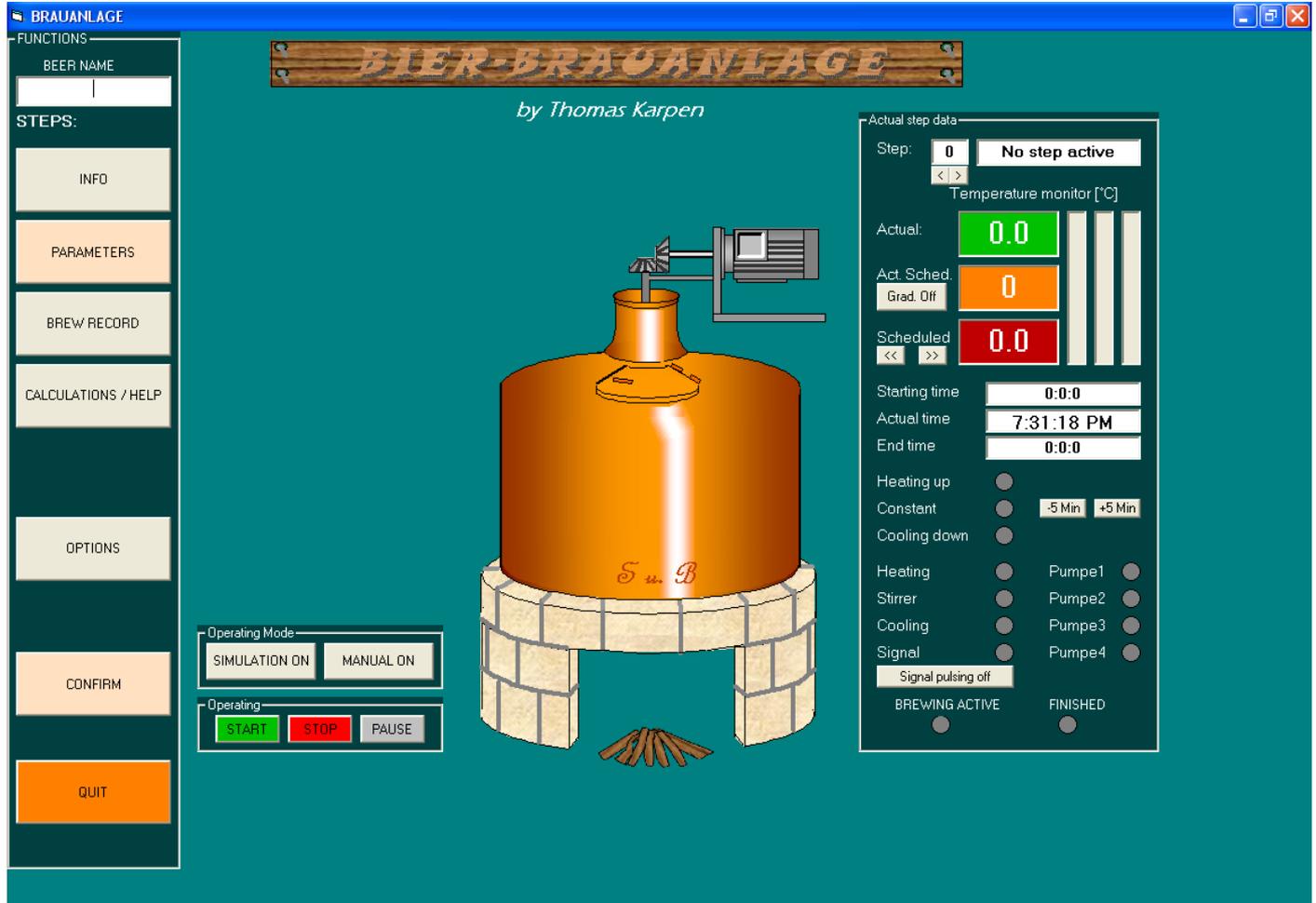
5.1 The Menu

On the left side is the menu.
Pressing the appropriate button allows selection of the various features.

5.2 The Control Panel

The control panel makes the operation of the software possible:
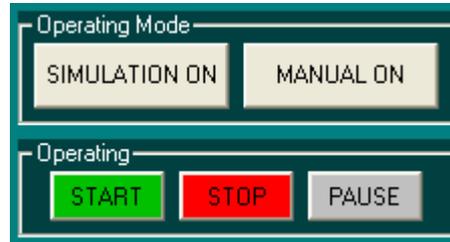
The control panel contains the following functions:

- Manual operation
- Simulation mode
- Control functions for the process

5.2.1 Manual Operation

By selecting the 'MANUAL ON' button the manual functions are made accessible.
Heating, agitator and cooling are only manually controllable, if:

- The brewing process is not active
- A brewing master call during the brewing process is active.

The manual extra functions are however always accessible.
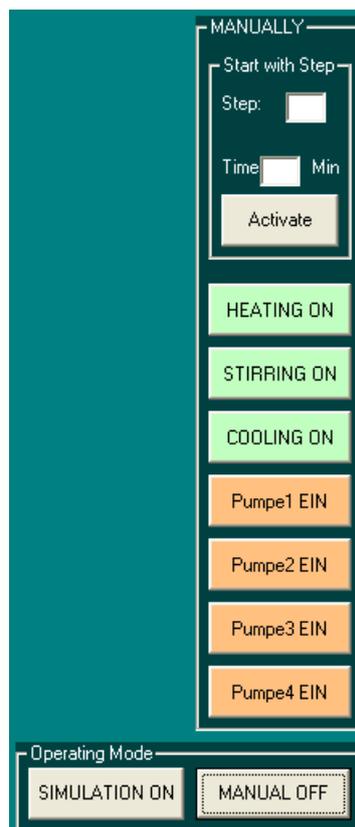
Starting the brewing process from a defined step with a defined remainder time is possible here.

Example: Phase 5, time 10 min means:
                After pressing the 'START' button the brewing process in step 5 begins, and should then
   remain active for a duration of 10 minutes, this step is a constant step.
                With heating or cooling steps the step ends with reaching the temperature defined for the
                step.

This function is e.g. useful with a power failure or a restart of the computer.

By selecting 'MANUAL OFF' the manual functions are made inaccessible.

In the automatic mode the manual functions for heating, agitator and cooling automatically become
deactivated after acknowledgment of a brewing master call.

5.2.2 Temperature Simulation

Temperature simulation is switched on by the pressing 'SIMULATION ON':
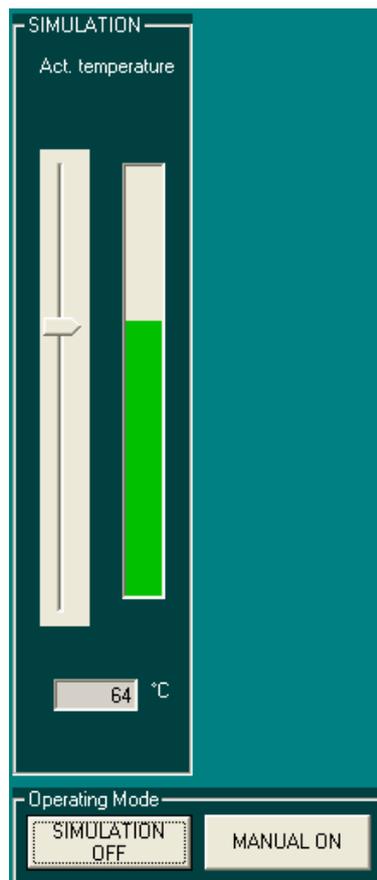
This function can be used if a brewing process is to be simulated without a temperature sensor.

By pressing 'SIMULATION OFF' the actual temperature is determined again by the temperature sensor.

5.2.3 Control Functions

The control functions are used to control the automatic operation:

By selecting 'START' the automatic brewing process is started. A condition for it is that a complete configuration is present.

By selecting 'STOP' the automatic brewing process can be stopped at any time. Thus the brewing process is terminated.

By selecting 'PAUSE' the automatic brewing process can be interrupted at any time and be continued by selecting 'START' again. With constant phases the configured step time automatically extends by the amount of time paused.

5.3 The Process Display Area

This displays the data relevant during the brewing process:
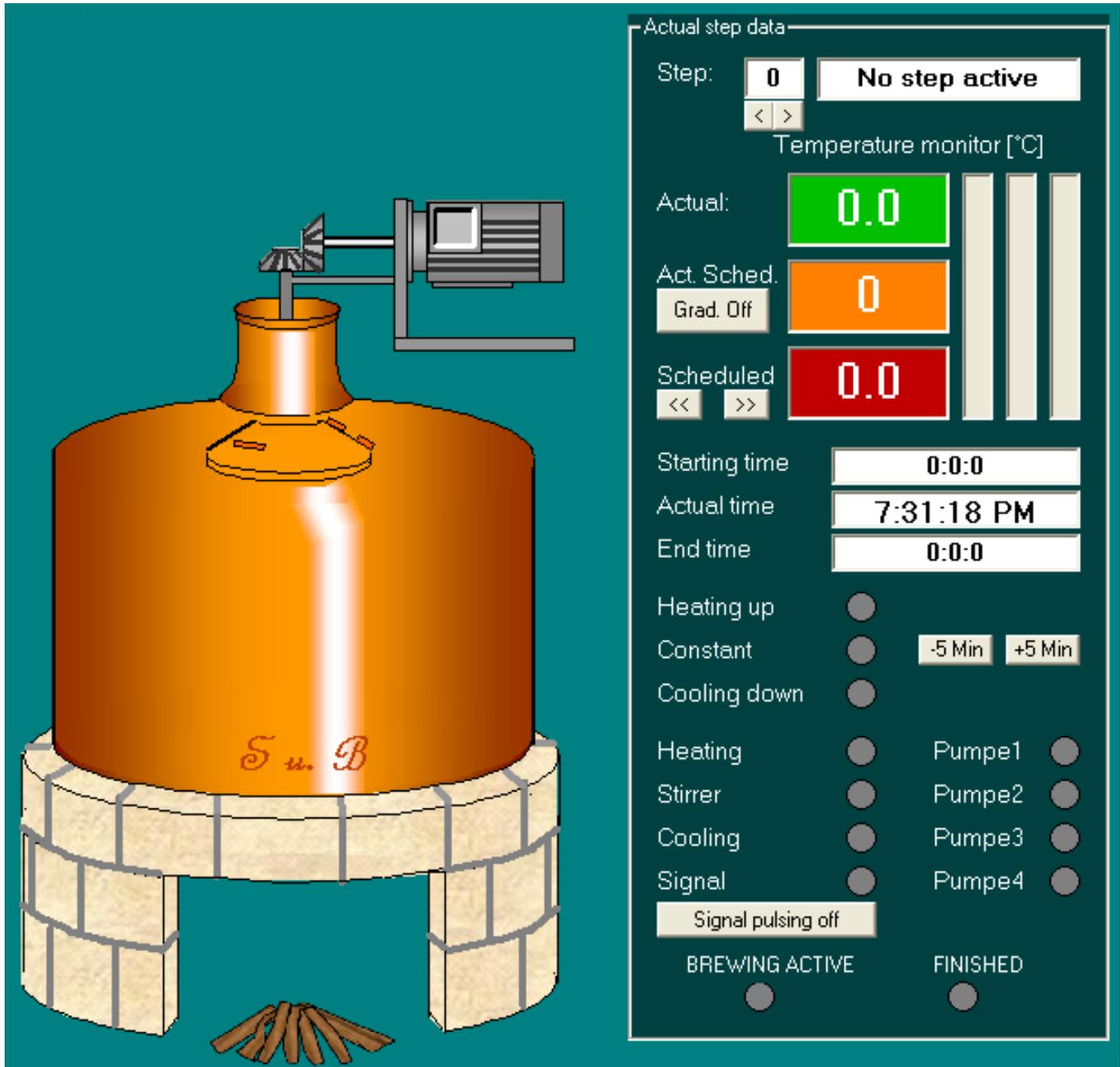
The brewing boiler has three indicator functions:
- Fire: With the heating switched on a fire appears over the firewood.
- Agitator: With agitator switched on the engine axle appears green.
- Steam: With Temperature >30°C steam clouds appear over the boiler, whose size increases with increasing temperature.

The indicating panel on the right side contains the most important process data of the current step:

- Step number: Number of the current step

−   Step description: Short description of the current step

−   Actual temperature (green): This is the current Temperature

−   Current target temperature (orange): This is the temperature, which must be kept at the momentary time

−   END target temperature (red): This is the temperature, which must be achieved at the end of the step.

−   Starting time: Point of starting time of the step (date and time)

−   Brewing time up-to-date remainder time phase:
    Possibility 1: Brewing time up-to-date: Current time (date and time)
    Possibility 2: Remainder time phase, actively with constant phases

−   End time: Time, at which the step will be completed (date and time), only indicated with constant steps (phases).

−   Step type: It is differentiated between three phase types: heating phase, constant phase, cooling phase. The current phase type is signalled by a green light.

−   Heating: The green light signals the switching on of the heating (Actual Temperature < Setpoint temperature). The heating is however only switched on if this green signal light has a stable signal - 15 seconds long (signal delay).

−   Agitator: The green light signals the switching on of the agitator/pump.

−   Cooling: The green light signals the switching on of the cooling equipment.

−   Extra functions: The green light signals the switching on of the appropriate extra function.

−   Brewing active: The green light signals that a brewing process is active (flashing in 1-second pulses).

−   Finished: The red light signals, if the brewing process is finished, i.e. when the last step of the process is completed.

Note:

The current target temperature in constant phases is equal to the END target temperature.

The current target temperature at the beginning of a heating phase is equal to the actual temperature and increases at 1K/min to the END target temperature.

With gradient deactivated in heating phases the current _target_ temperature (orange) is immediately equal to the END target temperature (red).

Auxiliary functions in the process normal range:

The process normal range has various auxiliary functions:

- Phase change-over `< >` : With it a preceding step or a following step can be selected during the current process. The selected step then starts from the beginning.

- Gradient activation `Grad. Off` : Here the temperature gradient can be activated or deactivated during production.

- Desired value correction `<< >>` : Here the desired temperature value can be corrected and/or changed during production in 0.1 °-steps.

- Phase time correction `-5 Min` `+5 Min` The current constant phase can be extended or shortened in duration in 5-Minute increments.

- The kind of the acoustic signal can be defined `Signal pulsing off` ither pulsed or continuous signal.

6. Configuration

The software offers the possibility of very flexible configurations. This allows for diversity in brewing techniques and recipes at breweries.

Parameter sets can be stored in the form of recipes on the hard disk and be loaded from there at any time. In this chapter all parameters are described.

The following illustration shows the parameter concept:
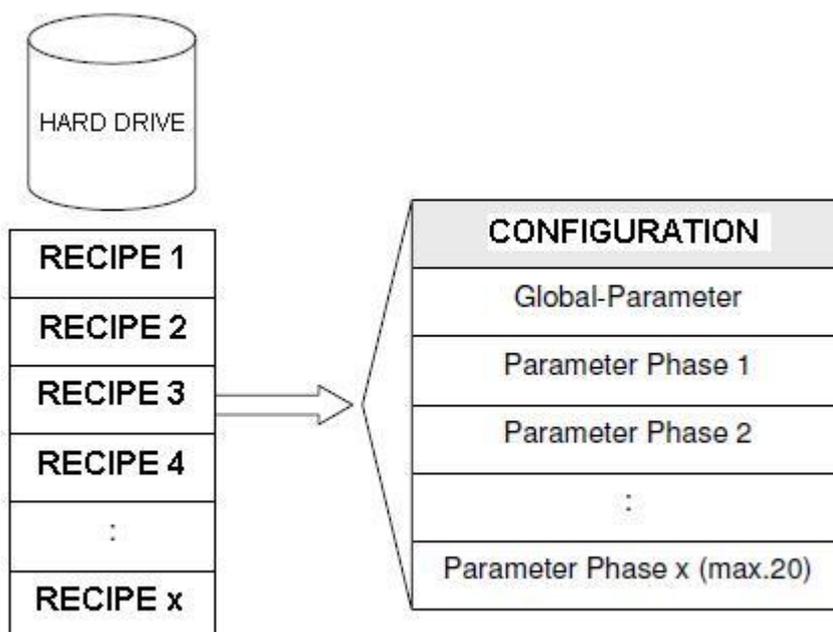
Each recipe a maximum of 20 phases can be configured.

Open the configuration window by clicking the 'PARAMETERS' button from the Functions menu:
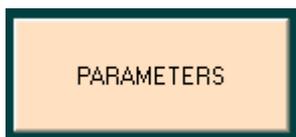
From here you can configure the entire brewing process.
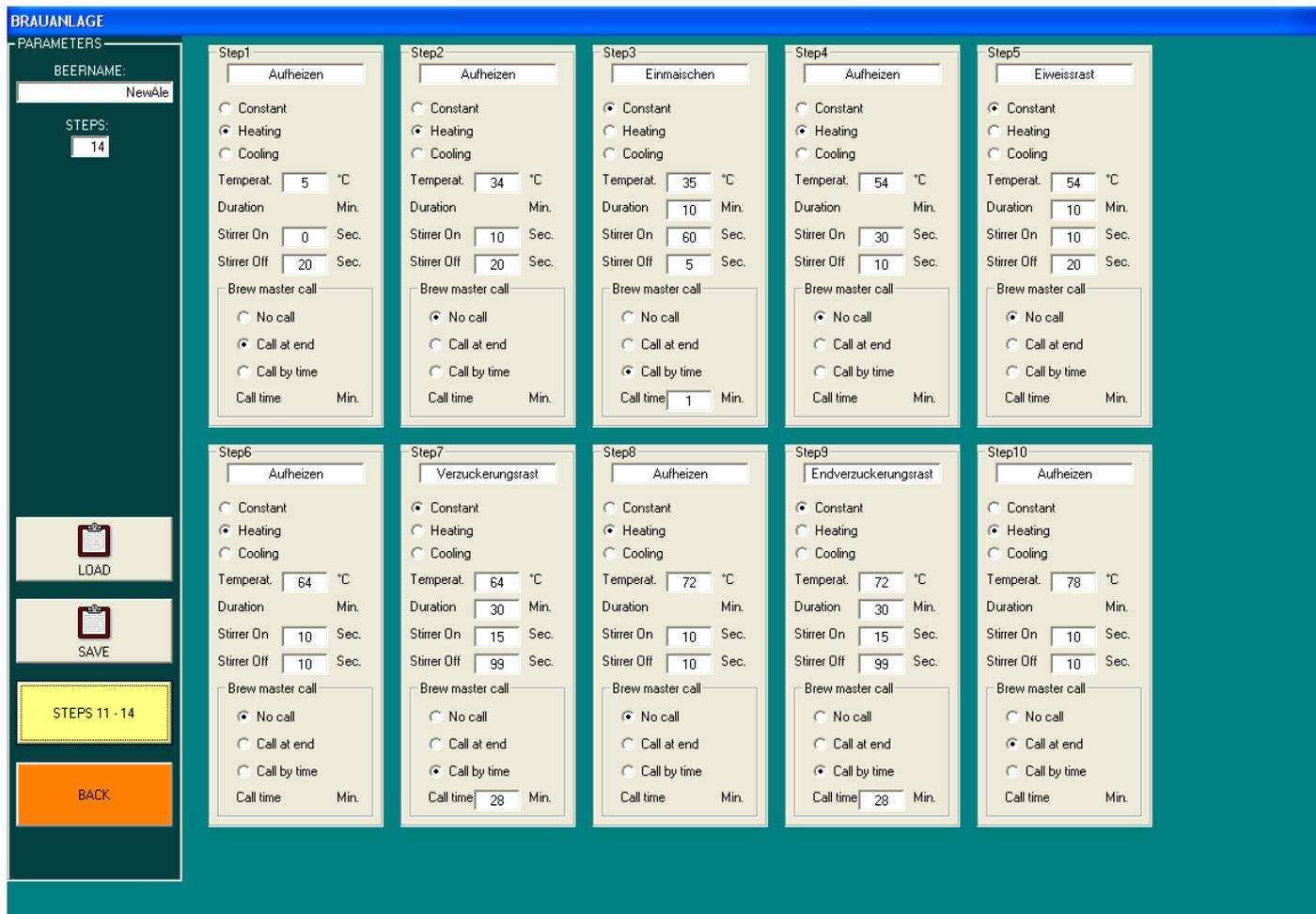
6.1 Global Parameters

The global parameters are phase/step independent:

  − BEERNAME: Here a name can be given to the beer
  − STEPS: With this parameter the number of steps of a brewing process is defined.

6.2 Step Parameters

For each step of the brewing process a similar set of parameters are available:

Description of the parameters:

− Step description: First a short description can be given to the step. Those could e.g. be called:
Mash-In or Saccharification-rest etc.

− Step type: It is differentiated between three phase types: Heating phase, constant phase (e.g. rest),
and cooling phase.
With a heating phase it heats from the current temperature to a higher target temperature.
A constant phase keeps the temperature constant during a defined period.
With a cooling phase it cools-down from the current temperature to a lower target temperature.

− Temperature: This is the target temperature of the step. With constant steps this is the rest
temperature, with heating and cooling steps this is the END target temperature.

− Heating time: This parameter is only active with constant phases. It is the time interval during which
the temperature is to be kept constant.

− Stirrer On/Stirrer Off: These two parameters determine the length of time the agitator (or e.g. also pump with Speidel Braumeister…) is to remain switched on and off for each cycle.
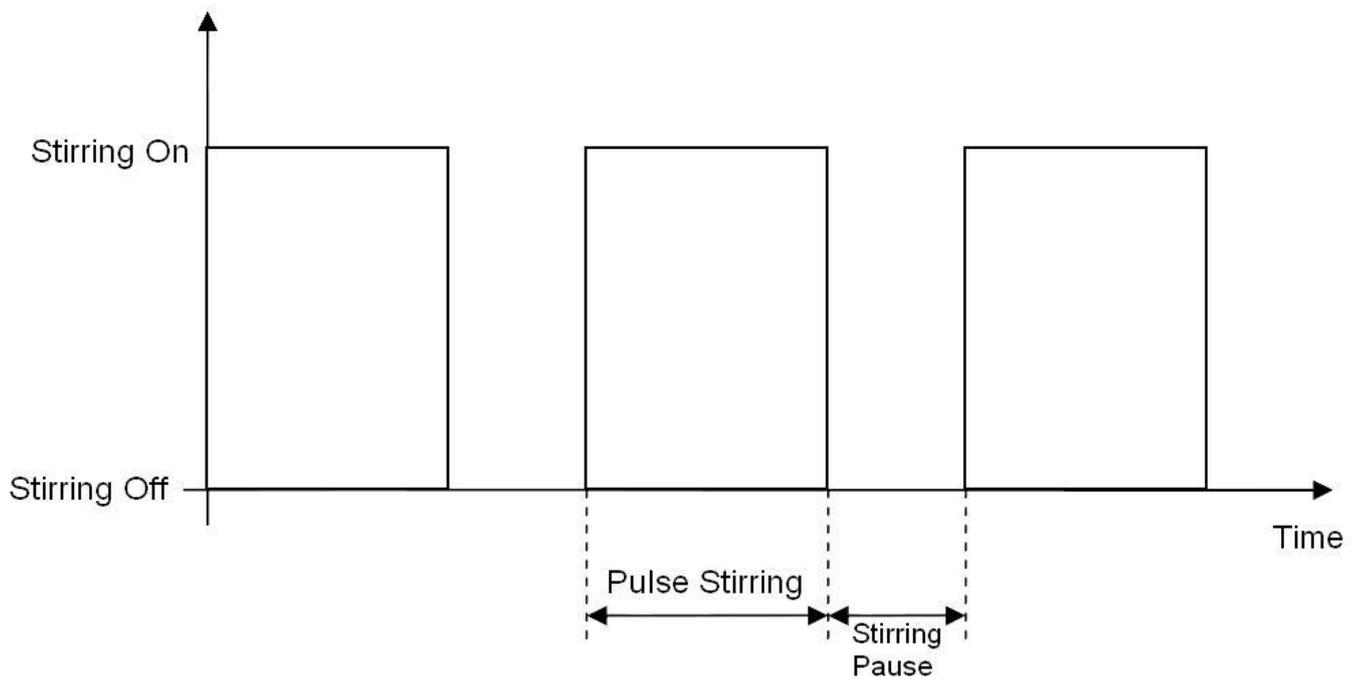
− Brewing master call: The brewer call appears during the brewing process to print a message, which you can define. The following possibilities exist:

No call: No call is issued during or after completion of the step.

Call end of phase: After completion of the step a call is issued.

Call after defined time: A call is issued after a defined time from the beginning of the step.

− Call time: This parameter is only active, when a call after time is defined. At expiration of this time after beginning of the step a call is issued.

Once a call is selected it opens an input window:

Here the text can be defined. It may be a reminder to the brewer to e.g. add the sparge water or an instruction of an ingredient addition.

In general:

− Only the number of steps defined under global parameters will be offered for configuration.

− Only 10 steps can be indicated per parameter window. More if than 10 steps are required, these are displayed in a second parameter window.

6.3 Recipe Database

The software has a recipe database. As many beer recipes as desired can be saved on the hard drive.

The recipe database can be accessed via the following two buttons in the parameter window:

Important: The recipes must be stored in the project file!!!

6.3.1 Loading of Recipes

A recipe can be selected by operation of the load button as follows:
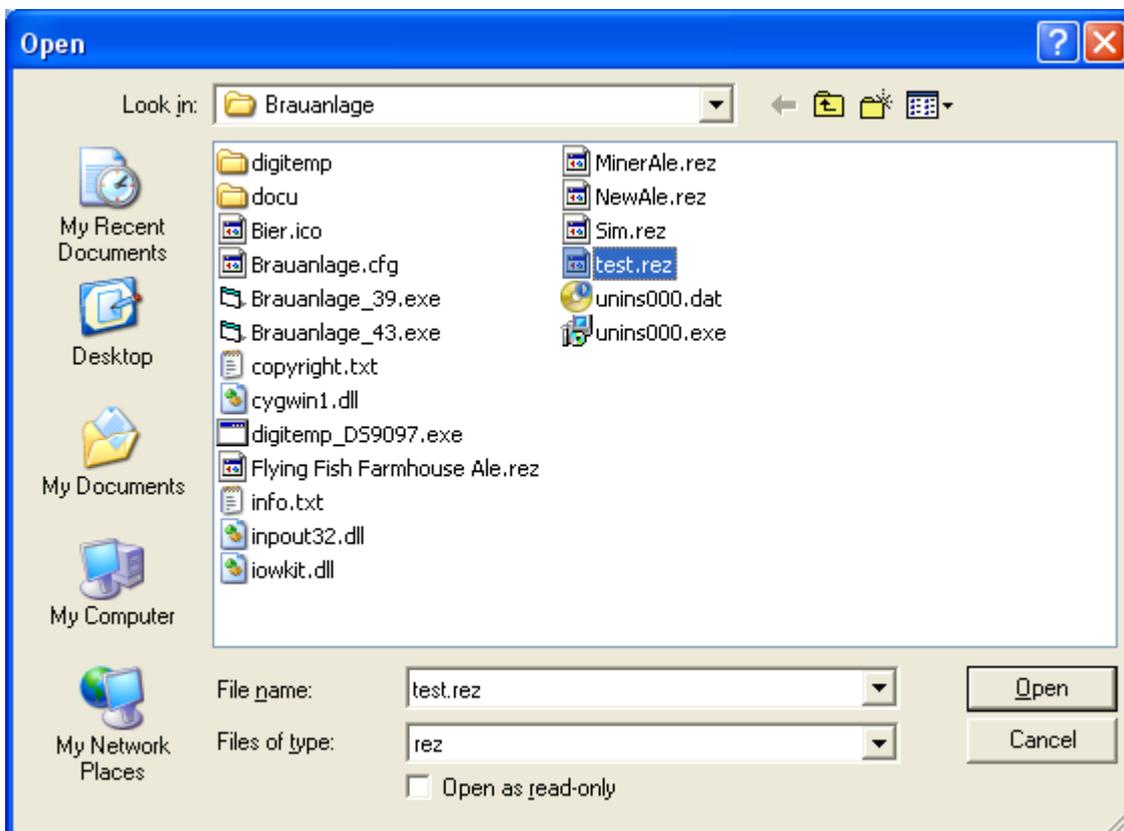
In the project file example recipes are already present. They have the file ending .rez.

The recipe is selected, whereupon automatically the configuration of this selected beer is loaded into the system.

If the configuration is complete you can start the brewing process.

6.3.2 Creating and Saving New Recipes

New recipes can be created in two ways:

- Complete new parameterization of a beer
- Load an existing recipe and storing under a new name

The latter is easiest, since many recipes resemble each other.

Example:

By loading the example recipes you will see the following configuration:
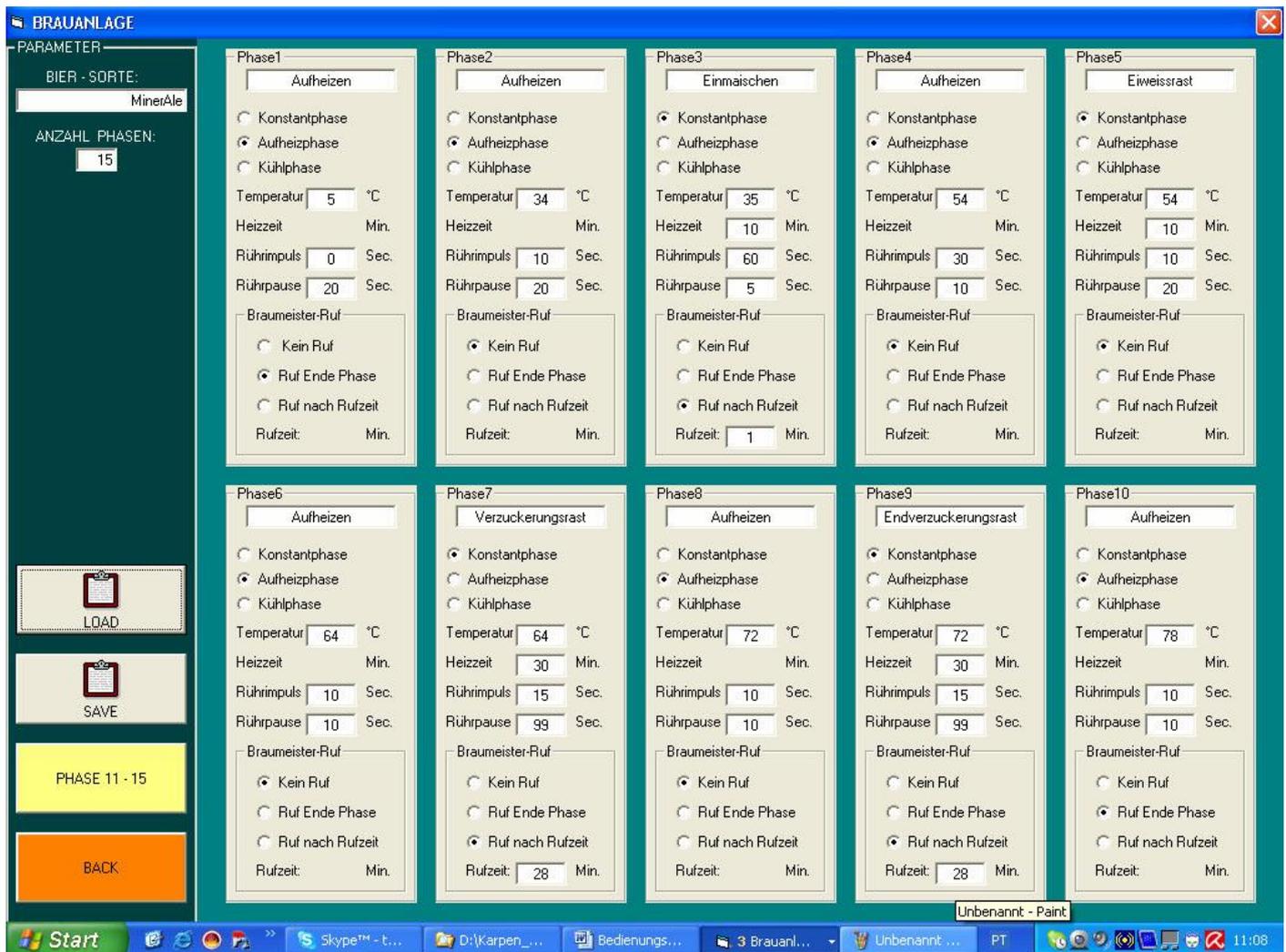
For storing a new similar recipe, first a new name is required and afterwards press the save button. A new recipe with this new beer name is saved in the project file.

Now the recipe can be worked on and be saved again by pressing the save button.

6.4 Example Configuration

The Mash curve consists of heating steps and constant steps (phases)

The following example shows a portion from the Mash curve, and how this portion is to be configured. With heating the agitator is to be switched on longer and with the constant phase agitate occasionally.
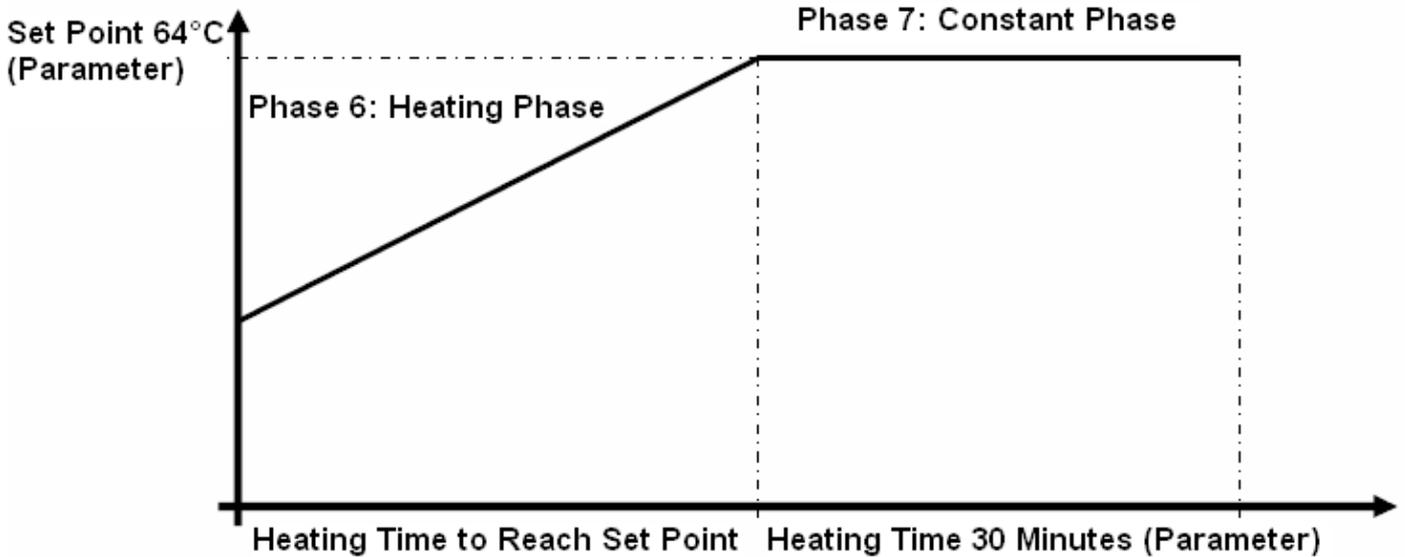
The configuration for it would look e.g. as follows:

7. The Brewing Log

In the brewing log additional information can be registered, which is stored together with the recipe:

Some data is generated automatically like e.g.:

  − Date and time
  − Beer
  − Steps (phases)

All other entries can be defined freely.

The quantity conversion button is a function that allows amounts of ingredients to be converted to a different brew size.

8. Calculations and Assistance

The software has different assistance for brewing:

Iodine sample

Bitterness

Alcohol/calories

8.1 Iodine Sample

The assistance for the iodine sample contains 3 example pictures, in order to be able to estimate the degree of the Saccharification better:
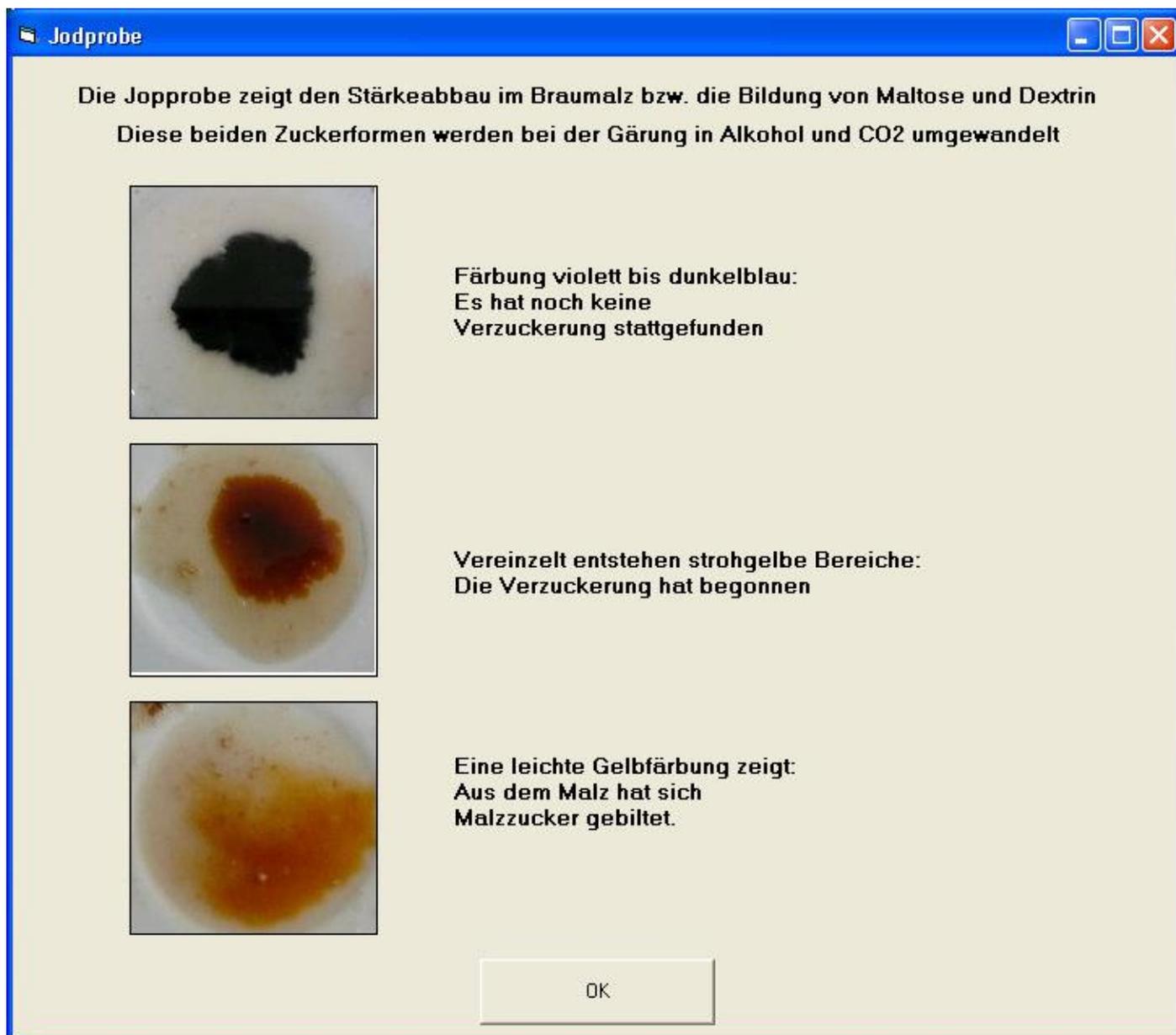
8.2 Bitterness

This is a very important assistance. With this function adjusting can be achieved to obtain desired beer-bitterness. Many know the problem: 'My beer is too bitter' etc.

In order for the beer to reach a desired bitterness, first some basic data must be available:

– Bitterness is calculated using a specific range, which is indicated in IBU. From this range is already recognizable, as different the tastes can be. But this range it is a reference point.
  e.g. A Pils is to be brewed but personal taste goes toward 'a little bitter'. Then one could select an IBU between 25 and 30.

- %Alpha of the hop
  The hop is a plant and has thus from year to year, depending on for example, climatic influence
  have a different influence on the alpha acid of the hop and thus on the bitterness of the beer.
  The indicative value of the hop is the alpha acid (% Alpha).
  The supplier usually indicates this value for the distribution. The more highly this value, the more
  bitter the beer becomes with same hop quantity.
- The brew size: This is determined by the brewer.
- The original gravity: This is typical for the beer style.
- The Cooking time. This is the time of the wort boiling with the hop, it can vary between 60 minutes
  and 90 minutes.

If this data is known, it can be registered into the appropriate input fields.

By pressing the CALC Button the program recommends a bitter hop quantity addition and a flavour hop
quantity addition in grams. The bitter hop quantity is important. The flavour hop quantity hardly changes
the bitterness of the beer, it only affects the flavour.

With some beers only flavour hop is used. The recommended bitter hop quantity is to be ignored in this
case and the recommended flavour hop to be added to the flavour hop quantity.

The recommended quantities can be transferred to brewing minutes.

8.3 Calories/Energy

With this auxiliary function the calorie and/or the energy value can be calculated for the brewed beer:

9 Messages

Apart from the brewing master calls defined by the brewer the program has further messages, which are listed below:

Message Nr.1: Function yet does not integrate.
This message appears, if a button is pushed, to which no function is assigned.

Message Nr.2: They did not accept the use agreement.
The program is terminated!!! This message signals that the user did not agree with the use agreement. Brewing without accepting the use agreement is not possible.

Message Nr.5: Inputs for the computation are incomplete.
This message appears, if a calculation is to be carried out, but required information is still missing.

Message Nr.1 1: Wrong input!!! Certified only values between 0.0 and 99.0
Message Nr.12: Wrong input!!! Certified only values between 0 and 999
Message Nr.13: Wrong input!!! Certified only values between 0 and 9999
Message Nr.14: Wrong input!!! Certified only values between 1 and 20
Message Nr.15: Wrong input!!! Certified only values between 0 and 110
These messages refer to the permitted input format. If an incorrect input took place, the previous input is erased automatically and a new input is required.

Message Nr.20: Parameter Error!!! Define please number of phases .
This message is shown when the brewing process has been started, but no number of steps (phases) has been defined.

Message Nr.21: Parameter Error!!! Heating phase Nr.1 not completely parameterized.
Message Nr.22: Parameter Error!!! Heating phase Nr.2 not completely parameterized.
Message Nr.23: Parameter Error!!! Heating phase Nr.3 not completely parameterized.
Message Nr.24: Parameter Error!!! Heating phase Nr.4 not completely parameterized.
Message Nr.25: Parameter Error!!! Heating phase Nr.5 not completely parameterized.
Message Nr.26: Parameter Error!!! Heating phase Nr.6 not completely parameterized.
Message Nr.27: Parameter Error!!! Heating phase Nr.7 not completely parameterized.
Message Nr.28: Parameter Error!!! Heating phase Nr.8 not completely parameterized.
Message Nr.29: Parameter Error!!! Heating phase Nr.9 not completely parameterized.
Message Nr.30: Parameter Error!!! Heating phase Nr.1 0 not completely parameterized.
Message Nr.31: Parameter Error!!! Heating phase Nr.1 1 not completely parameterized.
Message Nr.32: Parameter Error!!! Heating phase Nr.1 2 not completely parameterized.
Message Nr.33: Parameter Error!!! Heating phase Nr.1 3 not completely parameterized.
Message Nr.34: Parameter Error!!! Heating phase Nr.1 4 not completely parameterized.
Message Nr.35: Parameter Error!!! Heating phase Nr.1 5 not completely parameterized.
Message Nr.36: Parameter Error!!! Heating phase Nr.1 6 not completely parameterized.
Message Nr.37: Parameter Error!!! Heating phase Nr.1 7 not completely parameterized.
Message Nr.38: Parameter Error!!! Heating phase Nr.1 8 not completely parameterized.
Message Nr.39: Parameter Error!!! Heating phase Nr.1 9 not completely parameterized.
Message Nr.40: Parameter Error!!! Heating phase Nr.20 not completely parameterized.
Message Nr.40: Parameter Error!!! Heating phase Nr.20 not completely parameterized.
This message will appear if the brewing process has been started, but one of the defined steps was not fully configured.

Note!
The brewing process can be only started, if a complete configuration is present!!!

10 Application Circuit

The following illustration shows a circuit example for a Hobbybrau plant with two gas burners.

Burner 2 serves for preparing the sparge water and for the mash out.

Relay switch S4 disables the burner automation on burner 1 or burner 2.

Contact R3 results from an external two-point action controller, which is activated by the sparge water temperature.

The second burner can be needed thus over S5 directly for the sparge water, or with opened S5 and closed S4 for the hop cooking.
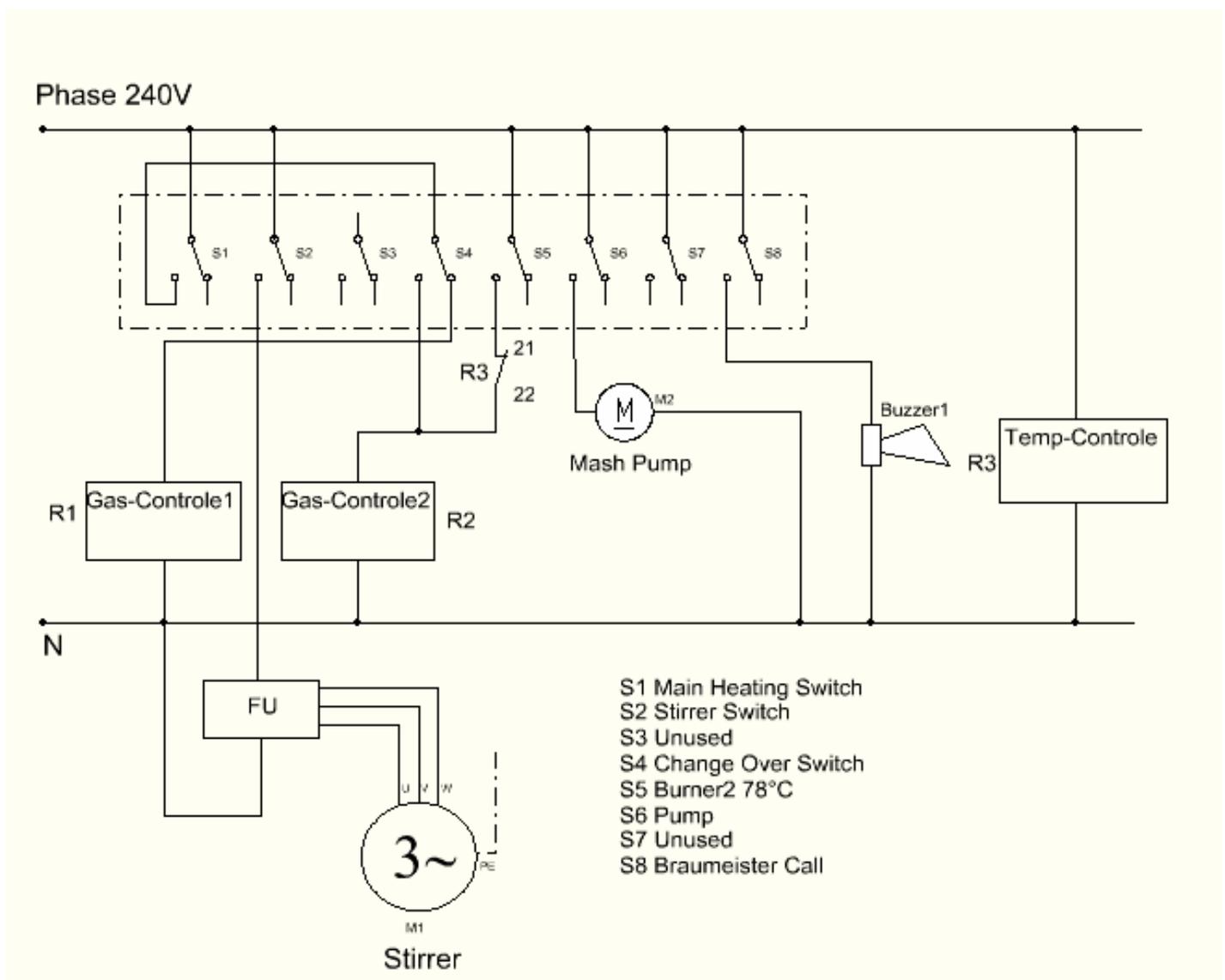
11. Recommended hardware components

To operate this brewing equipment control software, additional hardware is required. Most can be purchased, but with some simple means you may even make it yourself.

1. **Temperature measurement**
   Using a temperature sensor such as the DS18S20 from Maxim Semiconductors. The sensor pictured here was cast in a stainless steel sleeve.
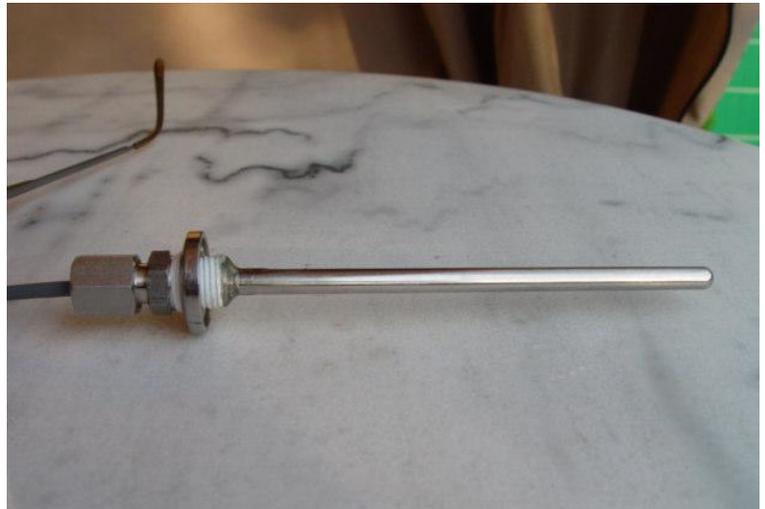
2. **Relay card for the connection to the parallel haven (LPT1: or LPT2: or USB:)**
   It serves heating of the MASH or brew kettle, pumps, cooling etc. for heading for different equipment such as agitator.
   The card can either be acquired ready-made or quite simply be built. First method is to be preferred for safety reasons!
   As an example, in the picture is a relay card from gwr-elektronik.

3. **Electrical controlling of the heating of the Mashtun.**
   For this, different types systems are feasible and depend on the equipment and/or the abilities of the brewer. Direct or indirect, electrical or gas-claimant heating systems are conceivable. Electrical heating elements are simplest to use, in addition, gas digesters can be automated accordingly (see for example gas firing automat Satronic TFI81 2.2).

A DIY building guide for the adapter for the sensor DS18S20 can be found under this link:
http://lena.franken.de/hardware/temperaturmessung.html

Proposal for the design of a sensor housing for immersion purposes:
The wiring, including sensor were inserted into a high-grade steel case (e.g. Thermo well or Chopsticks made of high-grade steel of the Japanese/Chinese) and cast in with epoxy resin. The epoxy resin was injected with the help of a syringe. (solder connections and insulate well!!!)

Electronics can be accommodated in the 9-pin Sub D plug.

Pin allocation parallel port:
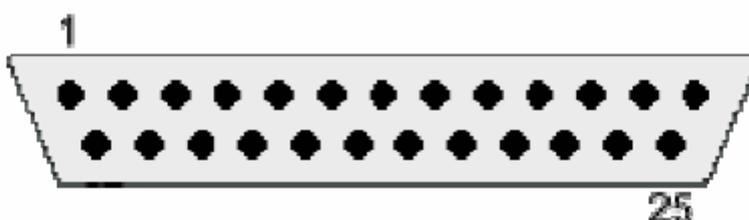
Abbildung 1: Vorderansicht

Pin	Belegung	Pin	Belegung
1	Strobe	14	Automatische Papierzufuhr (Auto Feed)
2	Ausgang 0	15	Fehler/Error
3	Ausgang 1	16	Initialize
4	Ausgang 2	17	Select Printer
5	Ausgang 3	18	Masse
6	Ausgang 4	19	Masse
7	Ausgang 5	20	Masse
8	Ausgang 6	21	Masse
9	Ausgang 7	22	Masse
10	.	23	Masse
11	Busy	24	Masse
12	Papiermangel	25	Masse
13	Bereit/Online		

12 Frequent problems and their recovery

In this chapter the most frequent problems with start-up and their recovery are pointed out.

12.1 Sensor has repeatedly made an incorrect measurement

This message arises, if the Dallas sensor repeats an error code caused, thus a faulty measurement accomplished.
Such faulty measurements are characterized in the log files by the code 85.00

Examine please the wiring of the DALLAS DS1820 for correctness.

12.2 Stop of the temperature indication after prescription call

In addition the following remedy:

− The following files must be in the project folder (this is the folder, in which the application Brauanlage_38.exe is):
  Brauanlage_38.exe
  Brauanlage.cfg
  Cygwin1.dll
  Inpout32.dll
  All prescription files (ending .rez)

− If a desktop icon will be created, make absolutely sure that "Start in" (under properties of the program icons), is the path the application is installed under (this is the path where the Brauanlage_38.exe is located)

12.3 Run time error 7 Out OF MEMORY

Here there are two possibilities of repairing the problem:

1. Microsoft Office install

2. Go through the following routine:

− VB6.0 install
− Look after whether the files MSCOMCTL.OLX, COMDLG32.OCX, MSSTDFMT.DLL and FM20.DLL are registered in Windows. If not, then register them.
− Active X control PAD install
  http://msdn2.microsoft.com/en-us/library/ms968493.aspx

− Now install the brewing software again.
− If it still does not work, remove the listed files from the registry and re-register.
  Find more on the registration procedure here:
  http://www.ascentive.com/support/new/support_dll.phtml?dllname=COMDLG32.OCX

12.4 run time error 5

The problem run time error 5 is that it states nothing at all and gives no reference to the cause.

In addition to the software, you need the VB6-Runtime-Module and the Cygwin1.dll. If these components are already installed, just copy the entire project to a new folder and start fresh.
This has helped with some users.

Download and install the VB6-Runtime-Module again separately.

Alternatively also download the software package again and reinstall the software.