Arimatic 200
User Manual

1 OVERVIEW

The Arimatic 200 control center is designed for controlling the 40–500 kW bio heating systems supplied by Ariterm Oy. The control center is excellently suited for the HakeJet, Biojet and MultiJet burners, amongst others. Special attention has been given to designing the control center so that it not only allows the user to control the burner but also to flexibly introduce several extra options to the system.

This manual describes the basic operating principles of the automated controls of a bio heating system, as well as the key things to bear in mind when operating the system. The control center is based on programmable logic. The user interface of the control center comprises a graphical operating panel (touch screen).

References to a specific menu or a certain parameter on the control panel are given in italics, e.g. *FUNNEL'S FILLINGDELAY*.

Starting up the system (i.e. igniting the burner) is described in section 2.5.

2 OPERATING THE SYSTEM

The graphical user interface makes the system easy to operate. The user interface is divided into four main menus between which the user can change using the buttons at the bottom of the screen. The bar at the top of the screen remains visible in all menus and shows the date, the time, the name of the active menu, the status of the burner, the water temperature in the boiler, and the percentage of power output in use for the burner. The control panel is operated by touching the active fields on the screen.

All of Ariterm Oy's bio heating systems share the same basic operating principles. The control logic has readiness for several extra options that improve the usability of the system. The control automation software is designed to work with both pellet-based and woodchip-based systems, although the storage automation for the two is different. When the system is first set up, the user must select which type of fuel will be used and which extra options will be enabled.

The initial set-up takes place under *SETTINGS → OPTIONS1* and *OPTIONS2* on the control panel. The initial set-up determines which menus of the control panel will be available to the user and which options will be enabled.
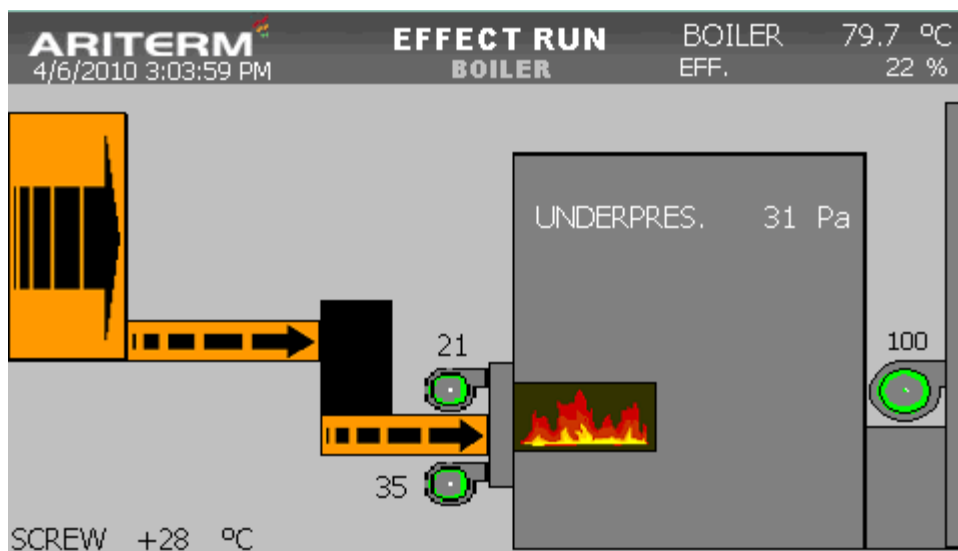
PLEASE NOTE: THE INITIAL SET-UP MUST BE COMPLETED BEFORE STARTING UP THE SYSTEM!

PLEASE NOTE: THE CONTROL CENTER IS ALWAYS MADE TO ORDER. THE CENTRES DO NOT INCLUDE COMPONENTS FOR ADDING EXTRA MOTORS, FOR EXAMPLE!

2.1 *BOILER*

The *BOILER* **screen gives the user an overview of the system's status:**

- The burner status is shown at the top of the page. The screenshot above shows the *EFFECT RUN* **mode (***EFF.* **= power output = 21–100%). The other modes are** *UPKEEPING* **(power output = 20%),** *MANUAL* **and** *POWER CUT***.**
- Water temperature in the boiler
- Percentage of power output in use
- Revolutions of the primary and secondary fans
- Oxygen level in the flue gas (if the oxygen measuring equipment is included to system and has been enabled in *OPTIONS1* **-menu)**
- Flame status (when the flue gas sensor detects a flame in the burner, a picture of a flame will be displayed inside the boiler)
- Status of the automated sweeper function (if the sweeper system has been enabled)
- Flue gas temperature (if the flue gas temperature sensor has been enabled)

- Surface temperature of the feed auger (if the feed auger temperature sensor has been enabled)
- The 'strength' of the flame (if optical flame control has been enabled)

Any changes to settings relating to the operation of the system must be made under *SETTINGS***.**

2.2 *SAFETY DEVICES*

The status of the safety devices/alarms connected to the control logic is shown under *SAFETY DEVICES***. A line next to the component name indicates that an alarm is active. When a plus sign precedes the name of the component, the alarm is inactive.**

If the system identifies a fault, the word *ALARM!* **will appear in the top left corner of the screen. Press this button to open the** *ALARMS* **-menu. Investigate and eliminate the cause of the fault, and then reset the alarm using the** *RESET* **-button. The system will resume normal operation. The screenshot shows the control panel after a power cut, which is also indicated in the burner status field.**
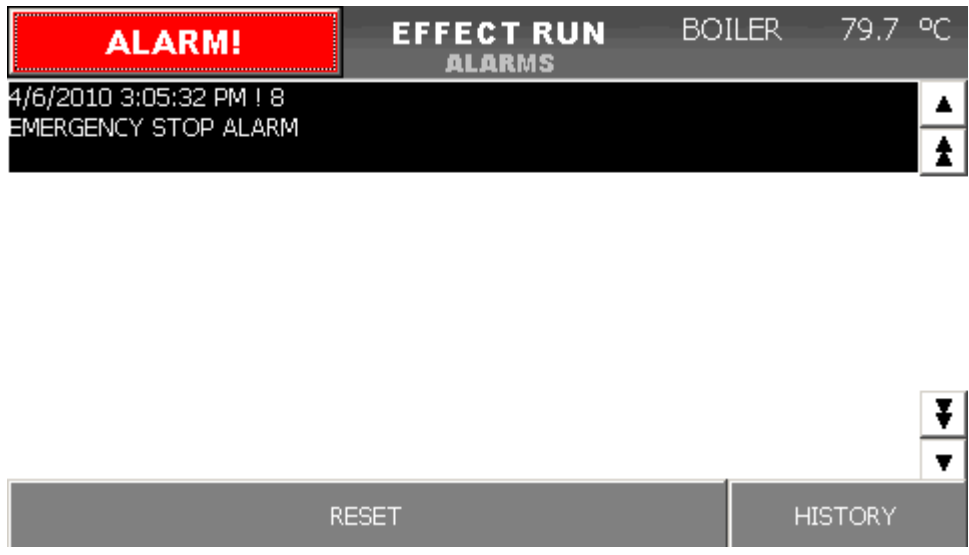
The *ALARMS* screen shows a list of all active alarms in chronological order. Thanks to the timed entries, the user can easily tell which of the alarms was activated first, which may help to identify the cause of the fault. If several alarms are listed, the user can scroll up and down using the arrows to the right of the screen.
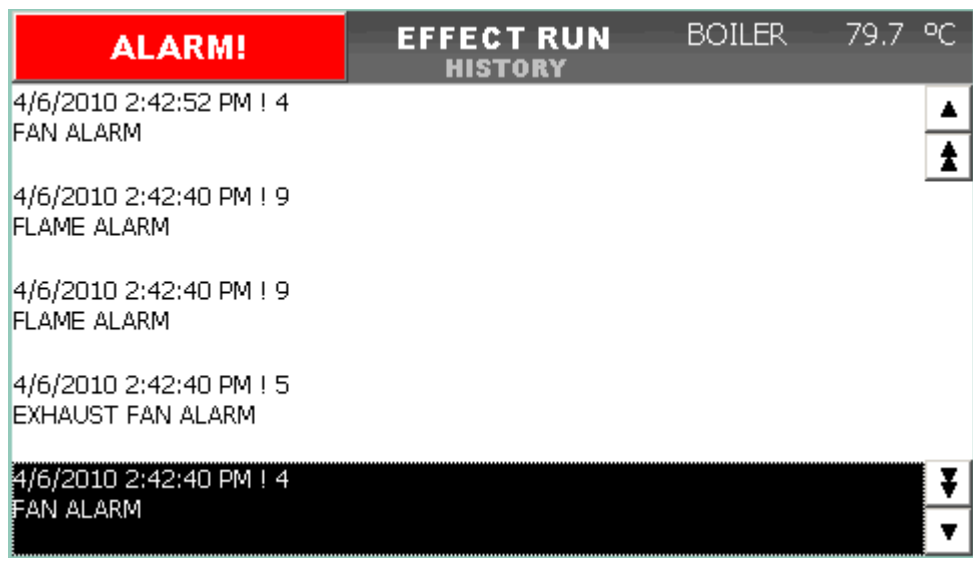
Previously reset alarms can be browsed under *HISTORY*.

2.3 *SETTINGS*

The submenus listed under *SETTINGS* **depend on which properties have been enabled under** *OPTIONS***. The following submenus are nevertheless always visible:** *ALARMS, CLOCK&LANGUAGE, TEMP.SETTINGS, EFFECT SETTINGS, STORAGE, SAVE SETTINGS* **and** *HIDE/SHOW EXTRA SETTINGS***.**

2.3.2 *CLOCK & LANGUAGE*

To set the time and date, fill in the six fields under *CLOCK***. To accept changes, click on** *CONFIRM***.**

DD **= day**
MM **= month**
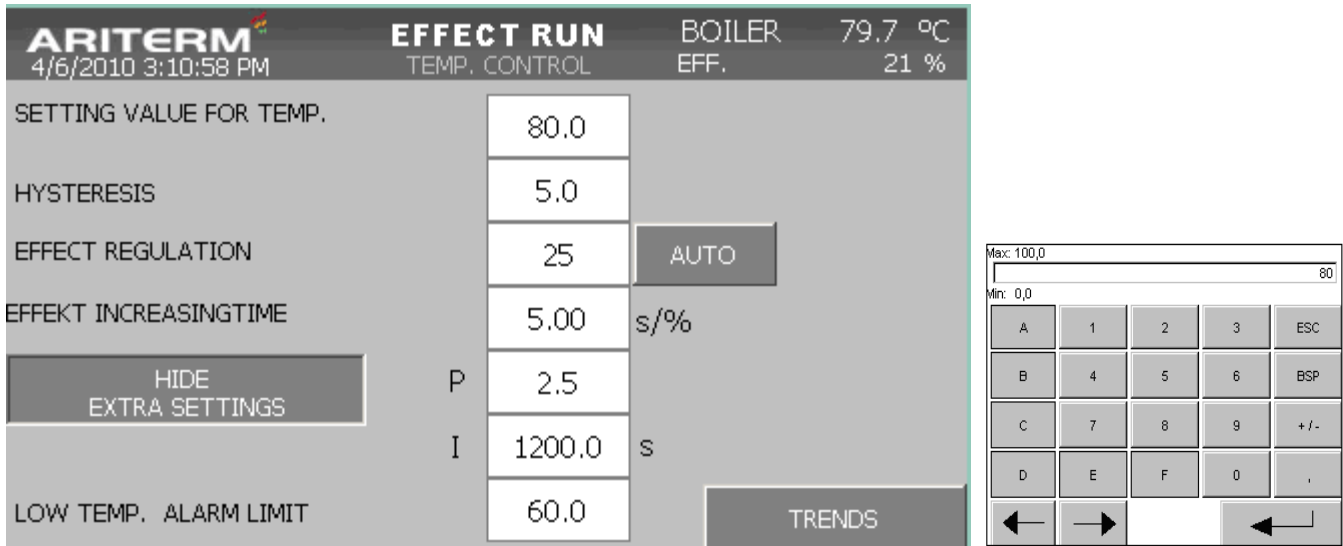*YY* **= year**
HH **= hours**
MM **= minutes**
SS **= seconds**

2.3.3 *TEMP.CONTROL*

The value entered into the *SETTING VALUE FOR TEMP.* **field is the water temperature that the PI-controller, which regulates the burner power output, strives to maintain in the boiler. The** *HYSTERESIS* **-setting determines the margin after which the burner will switch to standby mode (power output = 20%). For example, if the** *SETTING VALUES FOR TEMP.* **is 80 °C and** *HYSTERESIS* **is set at 5 °C, the burner will go to standby when the temperature exceeds 85 °C. Once the temperature has dropped by 0.5 x the set** *HYSTERESIS* **value (i.e. in this case 2.5 °C), the burner will switch back on (power output = 21%).**

The right-hand side screenshot shows how the user can set a target value for the water temperature in the boiler. The maximum water temperature setting is 100 °C.

In normal use the burner's power output is regulated automatically by demand. The power output range is divided into 1% gradients and varies between 20% and 100%. The burner can also be operated at a fixed power output. The power output percentage is entered into the *EFFECT REGULATION* **field and the** *AUTO/MAN* **setting is switched to** *MAN***. In this mode the burner maintains the set power output percentage whenever it is on, and alternates between power on and standby.**

The *EFFECT INCREASINGTIME* **allows the user to limit the speed at which the power output of the burner can increase. The setting determines how many seconds must pass at a certain power output level before the power output percentage can increase again.**

The P and I parameters control the speed and accuracy at which power output is regulated. These parameters can be hidden using the *HIDE EXTRA SETTINGS* **-button.**

The *TRENDS* **-button opens a page that shows any changes in the power output and water temperature in the last hour or 24-hour period. This tool is especially useful when the system is first started up, as the power output parameters may need to be adjusted.**
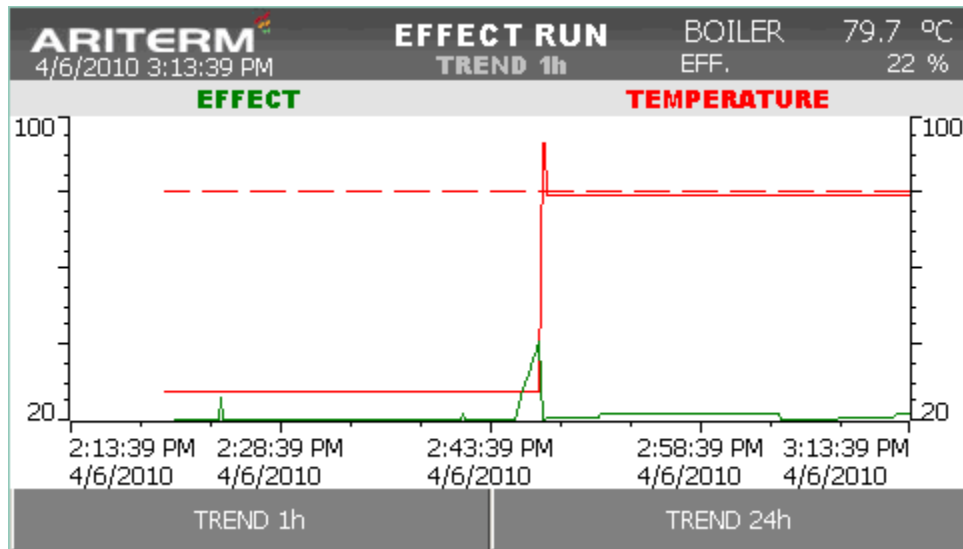
2.3.4 *EFFECT SETTINGS*

EFFECT-%	FEEDING			BLOWERS		
	PAUS s	PULS s	FEED%	PRI1 %	PRI2 %	SEC %
UPKEEPING	199.0	1.0	0.5	20.0		10.0
21%	1.1	10.0	90.0	35.0		20.0
50%	19.0	1.0	5.0	45.0		45.0
75%	12.3	1.0	7.5	60.0		65.0
100%	9.0	1.0	10.0	75.0		80.0

The control logic regulates the boiler's power output by adjusting the fuel feed rate. The power setting is based on a PT100 -sensor, which measures the temperature of the water in the boiler.

The control logic software is divided into 80 power gradients (21–100% + standby). The settings on the control panel determine the basic parameters for the length of the pulse and the length of the pause between the pulses of the feed auger, and the revolutions of both the primary and secondary fans (0–100%). These are divided into four power ranges (21%, 50%, 75% and 100%). Parameters are also set for the feed rate and fan revolutions during standby (*UPKEEPING*). The logic software uses these basic parameters to calculate the gradients in between (e.g. 22%, 23%, 24%, 25%, etc.).

Before start-up, put in right settings for *SPEED-%*. These feeding values depend on concerned burner type, measurements of burner screw and fuel. Basic effect setting tables are in Appendix 1.

As an example Biojet 500 burner for pellets (diameter of burner screw pipe is 114mm).

2.3.5 *RECIPES*

RECIPES-**button on** *EFFECT SETTINGS* **page gives an access to tool, which make possible the saving of recipes and re-using earlier saved settings. Left/right-arrows are used for the browsing of saved recipes. It's possible to save six recipes.**

RECIPE 1					
NAME1					
	FEEDING		FANS %		
EFFECT-%	FEED%	PRI. 1		SEC.	
UPKEEPING	0.1	20.0		20.0	
21%	2.1	35.0		30.0	
50%	5.0	45.0		50.0	
75%	7.5	55.0		65.0	
100%	10.0	65.0		80.0	

Buttons: TAKE RECIPES IN USE · READ CURRENT VALUES TO RECIPE · EFFECT-SETTINGS

RECIPE 1

OVERWRITE OLD VALUES ?

EXIT   TAKE RECIPES IN USE

2.3.6 *OXYGEN REGULATOR*

ARITERM	EFFECT RUN	BOILER	79.7 °C
4/6/2010 3:18:16 PM	O2-CONTROL	EFF.	22 %

O2-CONTROLLER
NOT IN USE

O2/DESIRED VALUE		8.0	%		
EFFECT ON SECONDARYFAN	-	15.0	%	+	15.0 %

HIDE
EXTRA SETTINGS

	P	1.0	
	I	90.0	s

O2 LOW ALARM VALUE	4.0	%

The oxygen level in the flue gas is measured with an oxygen sensor (optional accessory). To use the oxygen counter, enter a *O2/DESIRED VALUE* under *02- REGULATOR*. The recommended level of oxygen is around 8%. The level of oxygen remaining in the flue gases is shown under *BOILER* on the control panel. When the oxygen counter is in use (*O2-CONTROLLER IN USE*), it regulates the operation of the secondary fan, and as a result, the fan's set values will not be shown under *EFFECT SETTINGS*. If *O2-CONTROLLER NOT IN USE,* O2-measuring doesn't control secondary fan, but oxygen-value is seen on *BOILER-*page.

The parameters under *EFFECT ON SECONDARY FAN* determine the extent to which the oxygen counter is allowed to regulate the operation of the secondary fan. The purpose of these parameters is to ensure that the secondary fan does not stop completely when power output is low, and that the fan's revolutions cannot get too high if the sensor becomes dirty.

The additional PI-parameters control the speed at which oxygen levels can be regulated.

Tips:

If too much unburned fuel has accumulated on the grate and/or in the ash, the feed rate of fuel to the burner auger should be cut and/or the fan revolutions increased.
If the tip of the flame is black and the boiler is getting dirty quickly, the secondary fan revolutions should be increased and/or the fuel feed rate cut.
If the flame is bluish and burns unevenly, the secondary fan revolutions should be reduced.
If the fuel includes lightweight particles, some of them may fly out of the burner with airflow before the fuel has burned completely. This is evidenced by sparks in the firebox and increased ash production. To prevent this from happening, the volume of airflow can be lowered (fans).

PLEASE NOTE: Any changes to the settings will take at least a couple of minutes to take effect.

PLEASE NOTE: When the consistency of fuel changes, the settings must be readjusted.

2.3.7 *STORAGE*

STORAGE ALARM TIME DELAY	600	s
FUNNEL'S FILLINGDELAY	15	s
FUNNEL'S OVERFILLINGDELAY	2	s
FUNNEL'S FORCEFILLING DELAY	60	s
FUNNEL'S FORFCEFILLING TIME	3	s
DELAY FOR HYDRAULIC UNIT	5	s
RUNNING TIME OF HYDRAULIC UNIT	60	s

*STORAGE ALARM TIME DELAY***: If the photocell (in a woodchip-based system) or the capacitive sensor (in a pellet-based system) has not reacted to the rising fuel level in the hopper when the stoker auger has been running for a certain period of time, the control logic will issue a storage fault alarm.**

*FUNNEL'S FILLINGDELAY***: The fuel level at which the stoker auger begins to refill the hopper is determined on the basis of the running time of the feed auger (combined running time of the augers based on the length of the pulses). When the computed time limit is reached, the stoker auger will start up and run until the level of fuel in the hopper reaches the photoemissive cell/capacitive sensor.**

*FUNNEL'S OVERFILLINGTIME***: The stoker auger can be configured so that it continues to run for a set period of time after the fuel level in the hopper has reached the photoemissive cell/capacitive sensor. This can help to eliminate false alarms resulting from coarse woodchips, for example.**

*FUNNEL'S FORCEFILLING DELAY***: If the fuel level in the hopper does not appear to be going down even though the feed auger has been running for a set time, the stoker auger is turned on for a couple of seconds (***FUNNEL'S FORCEFILLING TIME***).**

2.3.8 *ASHSCREWS*

OPERATIONTIME 1 IN USE/NOT IN USE: **The user can specify four times of the day when the ash removal augers will be activated. To activate the set times, click on the button to replace the text** *NOT IN USE* **with the text** *IN USE.*

ASHSCREW RUNNINGTIME : **The ash removal augers can be set to run for a specific period of time.**

RUNS WHEN SWEEPING IN USE/NOT IN USE: **If the automated sweeper function is enabled, the ash removal augers can be set to run during the sweeper cycle also. The user can specify up to eight different times of day for when the sweeper function will be activated.**

2.3.9 *SWEEPER SETTINGS*
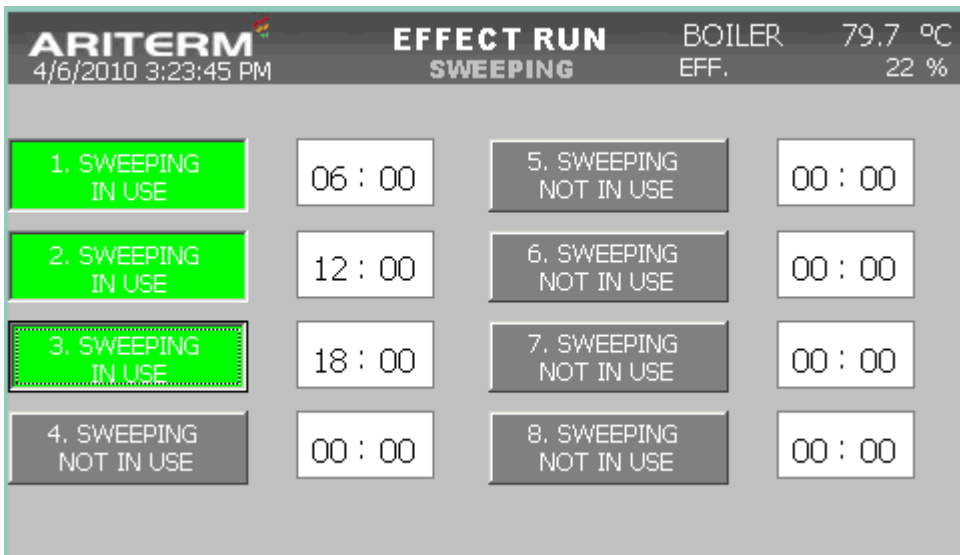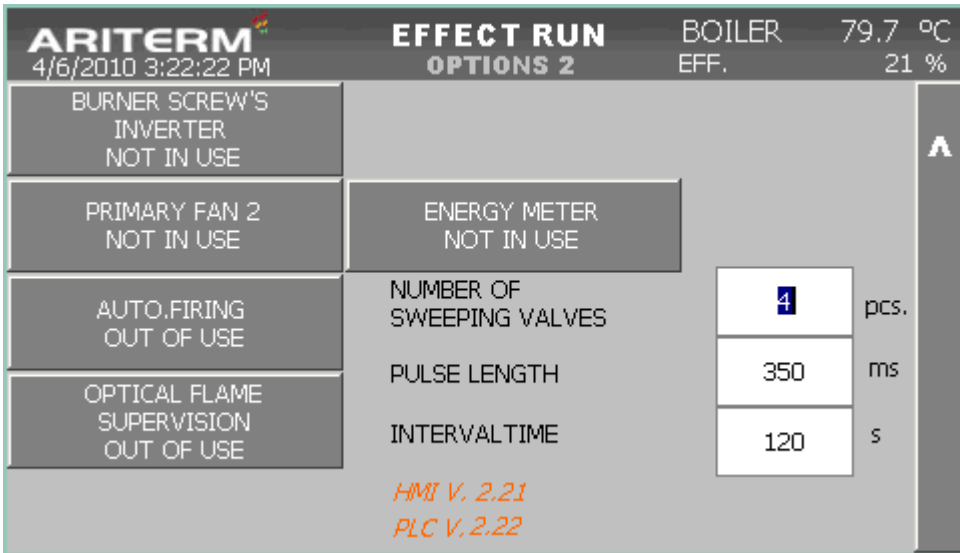
The pneumatic sweeper system is activated under *OPTIONS 2* **-menu, which is accessed by scrolling down the page under** *OPTIONS 1***.**

The *NUMBER OF SWEEPING VALVES* **parameter determines how many of the sweeper system's pneumatic nozzles are in use.**

The *PULSE LENGTH* **parameter determines the length of the stroke of each of the nozzles. The recommended value is 350 ms.**

The *INTERVALTIME* **parameter determines the length of time that elapses between the pneumatic strokes of the nozzles. The time depends on the charge-up time of the system's pneumatic compressor. Usually this time is between 60 and 120 seconds.**

SWEEPING:

SWEEPER CYCLE 1–8 IN USE/NOT IN USE: **The user can specify up to eight different times of day for when the sweeper function will be activated.**

2.3.10 *SAVE SETTINGS*

Any changes to the system settings should ideally be stored in the system's permanent memory. Otherwise the settings will remain in the battery-powered memory for around one week. If the control logic and panel are without power for longer, the settings will be lost. Saving the settings takes approximately 10 seconds.
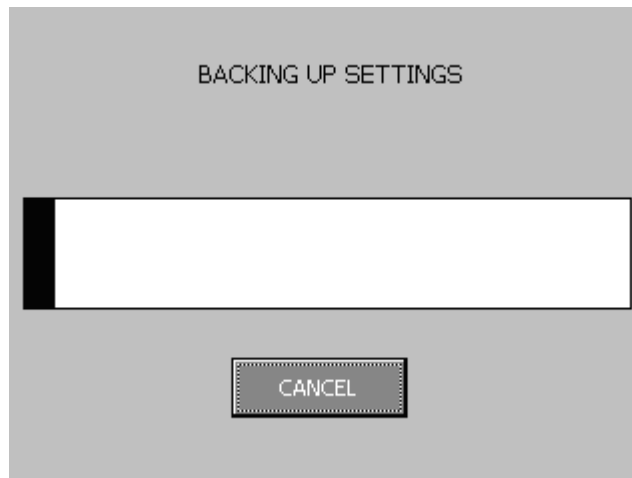
2.3.11 *HIDE/SHOW EXTRA SETTINGS*

The user can choose to hide settings that are critical to the safe operation of the system or that are only needed temporarily during start-up or troubleshooting. To restore these settings in the menu, the system requires a password, which is 'USER'.
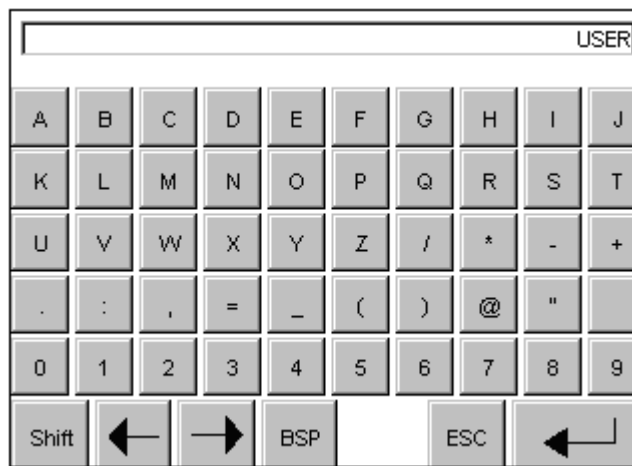
2.3.12 *FLAME SUPERVISION*

The flame status is based on the temperature of the flue gases, which is taken with the help of a capillary thermostat. The system does not issue flame status while the burner is on standby. The flame status information is overridden for a set period of time (*FLAME STATUS DELAY***) when the system first starts up or when the burner switches from standby (power output = 20%) to ON (power output = 21–100%). The delay gives the temperature of the flue gases a chance to rise above the thermostat's setting. The thermostat is activated by switching its status to ***IN USE*** under ***EXTERNAL THERMOSTAT***.**

2.3.13 *BACKFIRE PROTECTION*

A thermostat also measures the surface temperature of the feed auger. If the auger's temperature exceeds the thermostat's setting, the feed auger is switched on for the period of time specified under ***BURNER SCREWS' EMPTYING TIME* to allow any fire creeping back along the auger to be pushed forward towards the firebox.**

2.3.14 *EXTINGUISHING*

The pulse extinguisher is designed to prevent backfire by moistening the fuel with water when a set auger temperature is exceeded. The user can configure two temperature limits at which the extinguisher will be activated.

When the first temperature limit (*LEVEL 1 TEMPERATURE***) is reached, a magnetic valve will operate the pulse extinguisher for the period of time specified under *LEVEL 1 EXTINGUISHING PULSE* , followed by a pause as specified under *LEVEL 1 PAUSE TIME*. This cycle will be repeated until the temperature has dropped below the set limit. If the temperature continues to rise despite the level 1 extinguisher cycle, the level 2 extinguisher cycle will be activated.**

PLEASE NOTE: The water-based pulse extinguisher cannot be used with pellets!

2.3.15 GRATE

The grate in the MultiJet burner is operated by means of a linear actuator, which in turn is controlled with the help of three internal limit switches. The actuator operates cyclically. The length of the active pulse and the pause between the pulses is adjusted according to the power output of the burner. A short pulse is mostly used on both sides of the limit switch that determines the middle point of the movement. Once the number of these pulses reaches the figure entered under *COUNTER/SHORT MOVE*, the actuator will run one long pulse between the extremes of the movement.

2.3.16 EXHAUST FAN

2.3.17 *OPTIONS*

ARITERM	EFFECT RUN	BOILER 79.7 °C	
4/6/2010 3:29:34 PM	OPTIONS 1	EFF. 22 %	

			O
HYDRAULIC UNIT IN USE	ASHSCREWS IN USE	O2-MEASURING NOT IN USE	P
EXHAUST FAN IN USE	COOLING PUMP NOT IN USE	SCREW TEMP. SENS. IN USE	T I
PUSHER NOT IN USE	MIXING PUMP IN USE	EXTINGUISHING SENS. IN USE	O N
MOVING GRATE IN USE	WATERPRESSURE- ALARM NC	SMOKEGAS TEMP. OUT OF USE	S
GRATE 2.MOTOR NOT IN USE	EXTINGUISHING ALARM NC	SENSORS	2

ARITERM	NOT IN USE	BOILER 79.7 °C	
4/6/2010 3:30:52 PM	OPTIONS 2		

BURNER SCREW'S INVERTER IN USE	FREQUENCY CONTROL LOWLIMIT	20 %	Λ
PRIMARY FAN 2 NOT IN USE	ENERGY METER NOT IN USE		
AUTO.FIRING OUT OF USE	NUMBER OF SWEEPING VALVES	4 pcs.	
	PULSE LENGTH	350 ms	
OPTICAL FLAME SUPERVISION IN USE	INTERVALTIME	120 s	

HMI V. 2.21
PLC V. 2.22

The OPTIONS menus display the functions that are enabled in the system.
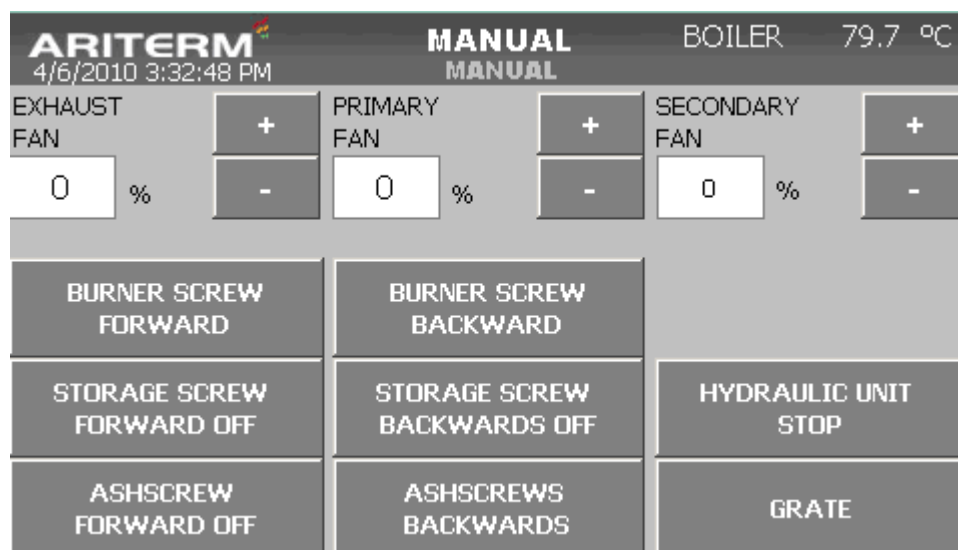
2.4 *OPERATION*
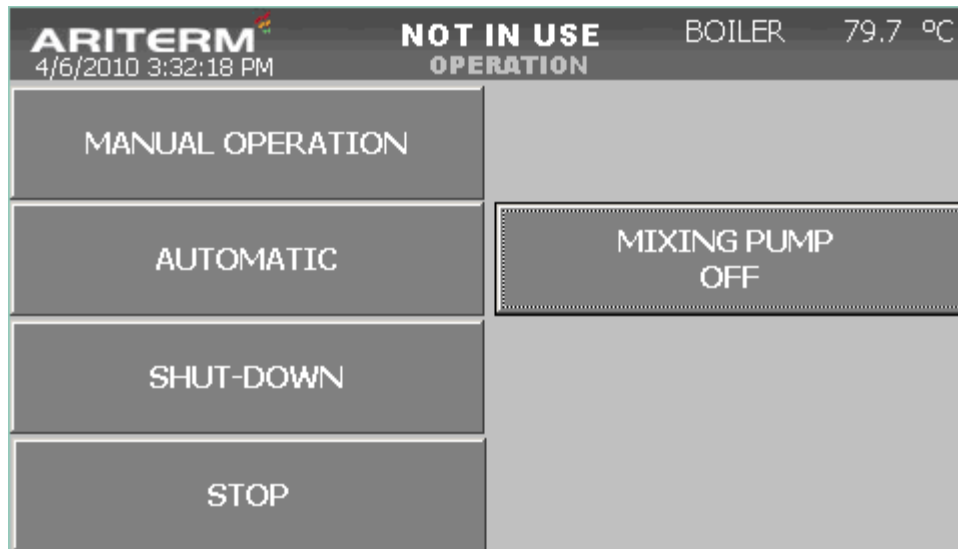
The *OPERATION* **menu allows the user to select how the system is controlled.**

2.4.1 *MANUAL OPERATION*

The system should be run manually when it is first started up or when it is being serviced, for example. During manual mode, the user can control the following functions:

- Running the screws forward/back
- Turning the fans on/off; when the fans are on, the user can set the revolutions for both the primary and secondary fan by clicking on the -/+ buttons; the revolutions decrease/increase by 5% each time the user clicks on the button
- Turning the exhaust fan on/off
- Turning the hydraulic unit on
- Running the stoker of a Biojet T burner or the linear actuator for moving the grate in a MultiJet system

2.4.2 *AUTOMATIC*

The *AUTOMATIC* button under *OPERATION* switches the burner on, if the flue gas thermostat detects a flame in the burner. In this mode, the power output of the burner will be between 20% and 100%. If there is no flame, the user is instructed on how to ignite the burner (see section 2.5).

During the automatic mode, the user can override the timers for ash removal augers and the automated sweeper function.

2.4.3 *SHUT-DOWN*

The *SHUT-DOWN* button allows the user to stop the funnel refill function. The system will remain operational for as long as there is fuel in the feed auger and in the funnel. Ultimately, a flame status alarm will stop the system. The button can be used to prepare for servicing the boiler and the burner, for example.

2.4.4 *ON/OFF-MODE IN USE / OUT OF USE*

When this function is in use and system is equipped with automatic ignition system, boiler/accumulator tank is first heated up and then burning process will be controlled down with shut-down –sequence. When boiler temperature goes below the temperature, which is set with parameter *STARTING TEMPERATURE*, starts new ignition process. Using of external start command is described in chapter 2.5.2.

2.4.5 *STOP*

The *STOP* button stops all devices that are connected to the boiler with the exception of the flue gas extractor and the pumps, which must be switched off manually if required.

2.5 *START UP*

It's possible to start up burner in two ways. Normally ignition is made manually. This operation method is advised by the "wizard"-program, which helps user to start-up the system. This process is described in chapters 2.5.1 and 2.5.2 (when igniting is made with the help of hot air gun).

Biojet and Hakejet burners can be equipped with the automatic ignition system. It's possible to use ignition system in two alternative ways:

1. **Ignition is started by the user and burner runs until it stops by the shut-down - command made by user or some alarm**
2. **ON-OFF –mode, which is started by the user, but after that, system makes automatic ignitions and shut-downs based on temperature in boiler or/and external start command (for example thermostat in accumulator tank).**

Instructions for configuration and using of automatic ignition system are in chapter 2.5.2.

2.5.1 MANUAL IGNITION
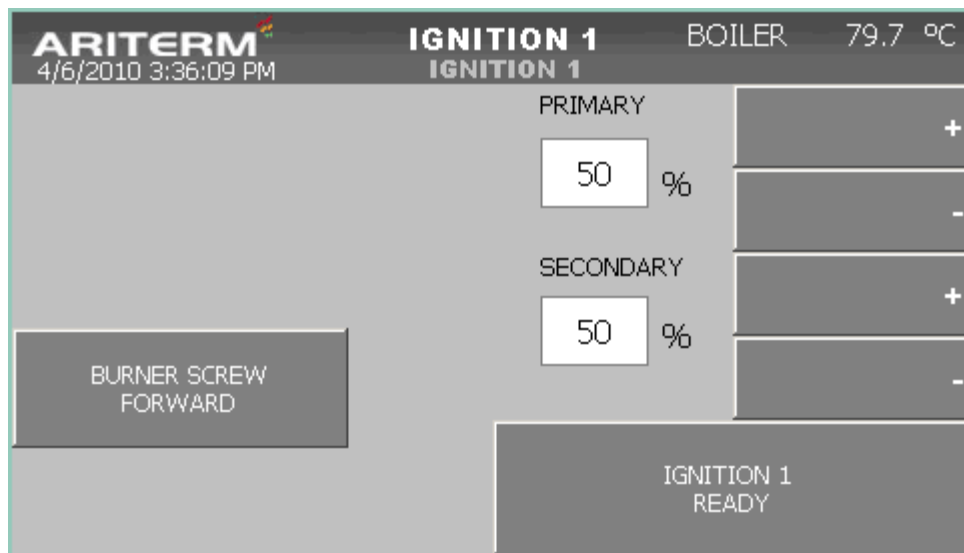
When the *AUTO* **mode is activated, but there is no flame in the boiler, the user is instructed on how to ignite the burner (***IGNITION1***). This mode allows the user to run the feed auger and to activate the primary and secondary fans (the -/+ buttons allow the user to decrease/increase the fan revolutions). Siloscrew fills fuel hopper/pellet feeder automatically based on level sensor.**

Once the fuel is lit and the flame has been established, the user should click on the *IGNITION1 READY* **button to proceed to the next step (***IGNITION2***).**
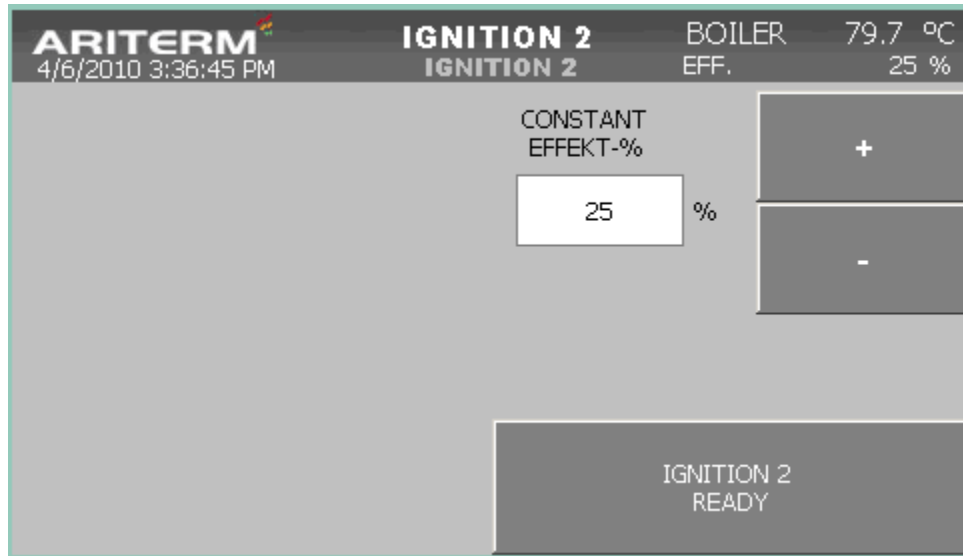
In the phace *IGNITION* burner is run at a fixed power output (*CONSTANT EFFECT*) which the user can increase as appropriate. The fuel feed rate and fan revolutions are controlled automatically. When the system detects a flame in the burner, a flame symbol will appear to the screen. The user can then click on the *IGNITION2 READY* button, which switches the burner's power output regulation to automatic. The user does not have to wait for the flame status report but can click on the *IGNITION2 READY* button before.

2.5.2   MANUAL IGNITION WITH THE HOT AIR GUN

When automatic firing system has been taken in use in *OPTIONS 2*-menu, there is two new buttons available on the *IGNITION 1* –page. In the upper left corner is selection button, which is used for choosing of mode, how ignition is wanted to be done. In the following picture this button is in mode *MANUAL IGNITION ON*. When this button is pressed, starts the automatic ignition procedure *AUTOM. FIRING RUNNING*, which is described in chapter 2.5.4.

When mode *MANUAL IGNITION ON* is active, you can start up the burner manually with the help of hot air gun. This starting method is useful for example in case, when burner has gone out and there already is fuel in the burner screw and you don't want to make automatic ignition from the beginning. You can feed fuel manually to the burner, put combustion fans to run and start hot air gun. When fuel is burning, click *IGNITION 1 READY* to proceed to the next step (*IGNITION 2,* see chapter 2.5.1).
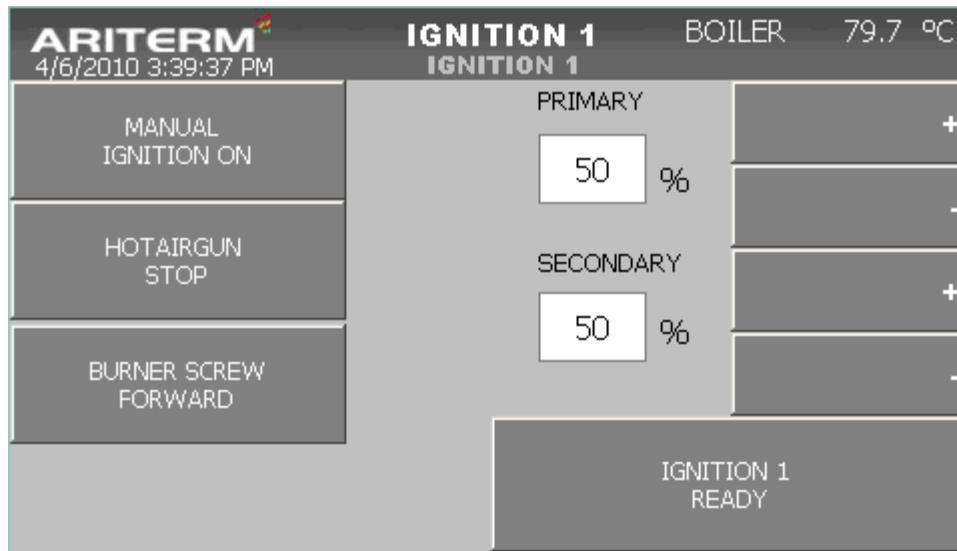
2.5.3 AUTOMATIC IGNITION (optional accessory)

When automatic firing system has been taken in use in *OPTIONS 2*-**menu and system is equipped with hot air gun, optical flame sensor and flue gas fan, it's possible to start up burner automatically.**

Settings for automatic ignition are in menu *AUTOFIRING*.
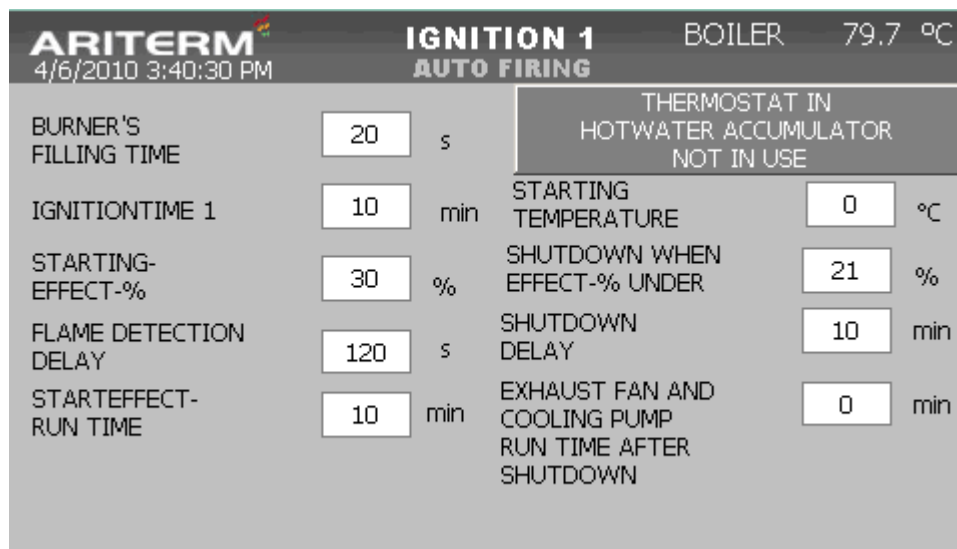
It's possible to set two operation modes for full-automatic ignition.

1. **ON-mode: Ignition process is started by the user and burner runs until it stops after the shut-down -command (given by user) or some alarm. When you want to use ON-mode, check first, that on** *OPERATION*-**page button** *ON/OFF MODE* –**button is in position** *NOT IN USE*.
2. **ON-OFF –mode, which is started by the user, but after that, system makes automatic ignitions and shut-downs based on temperature in boiler or/and external start command (for example thermostat in accumulator tank). When you want to use ON-OFF -mode, check first, that on** *OPERATION*-**page button** *ON/OFF MODE* –**button is in position** *IN USE*.

In both of these methods, hot air gun makes cleaning air burst (20 seconds) every 20 minutes. Addition to this, hot air gun is cooled and ventilated with the air intake from the primary combustion fan.

1. ON-mode:

This ignition method includes the following phases:

1.1 When you want to start burner, open "*OPERATION*"-page. Press *AUTOMATIC*-button. If the flame supervision doesn't see flame, page *IGNITION 1* pops up.

1.2 Press -2-state selection button *MANUAL IGNITION ON* . State of button changes for *AUTOM. FIRING RUNNING* . After this control system goes through the following phases without user's actions. In following picture ignition is just started.
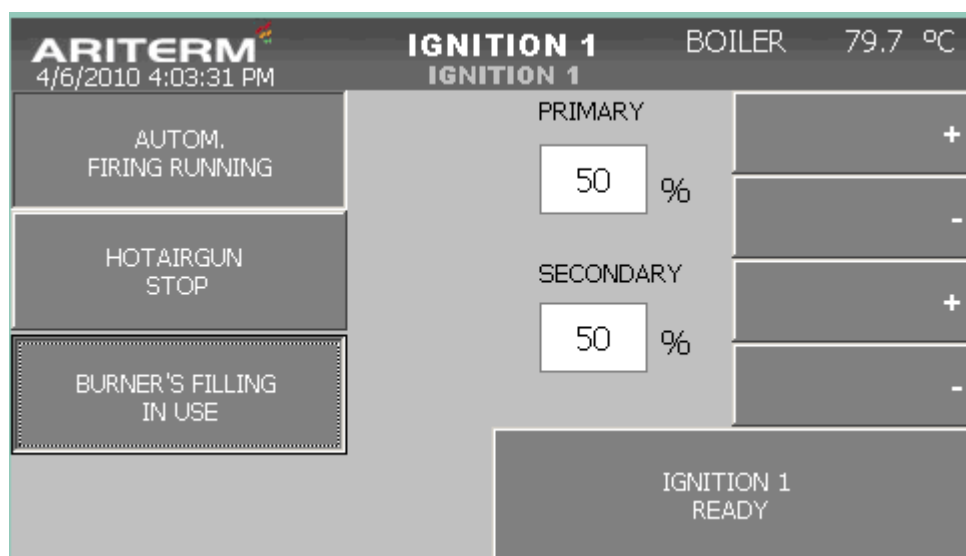
If capacitive sensor doesn't sense pellets, starts siloscrew, which runs as long as funnel/pellet feeder has been filled. Then starts pre-dosing period and feeding screw runs the time, which is set for the parameter *BURNER'S FILLING TIME* in *AUTOFIRING*-menu.

It's possible to stop pre-dosing by pressing button *BURNER'S FILLING IN USE* and control jumps to the next step.

NOTE! The right length of *BURNER'S FILLING TIME* has to be checked by authorized service man in the first start-up! If time is too short, there isn't fuel in the front of hot air pipes and ignition phase ends with the alarm, when *IGNITIONTIME* -time has ran out. If filling time is too long, there is too much fuel in the burner, which causes delay in ignition or possibly fails it.

1.3 After pre-dosing feeding screw stops. Hot air gun and combustion fans start. When flame sensor has recognized the flame continuously the time, which is set for *FLAME DETECTION DELAY*, hot air gun stops and control jumps to the next step.

If sensor doesn't see flame during the time, which is set for *IGNITIONTIME* , system gives alarm.

Hot air gun can be stopped manually by pressing button *HOTAIRGUN RUNNING***.**
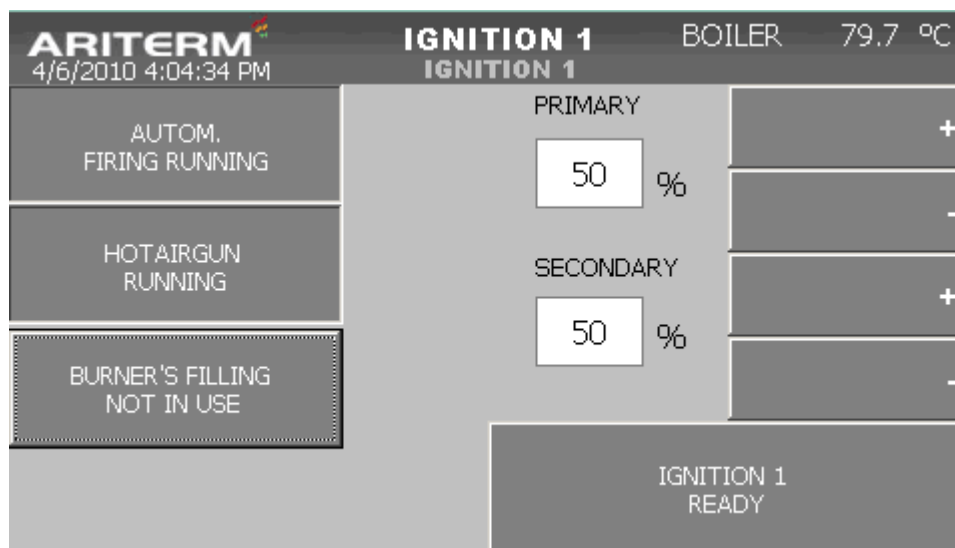
1.4 **Then burner will be driven with the constant effect, which is set for parameter** *STARTING EFFECT-%.* **This phase lasts as long as is set for** *STARTEFFECT RUNTIME.* **Then control system continues operation in mode, which is set for parameter** *EFFECT REGULATIONSTARTEFFECT RUNTIME* **in** *TEMP.CONTROL-* **menu.**

ON/OFF -mode: This ignition method includes the following phases:

Is the same as ON-mode regarding ignition procedure, but moreover, burner can be driven down and up again based on boiler temperature and/or external accumulator thermostat. ON/OFF-control can be made based on boiler sensor only (see example 1) or based on combination of boiler sensor and accumulator thermostat (see example 2).
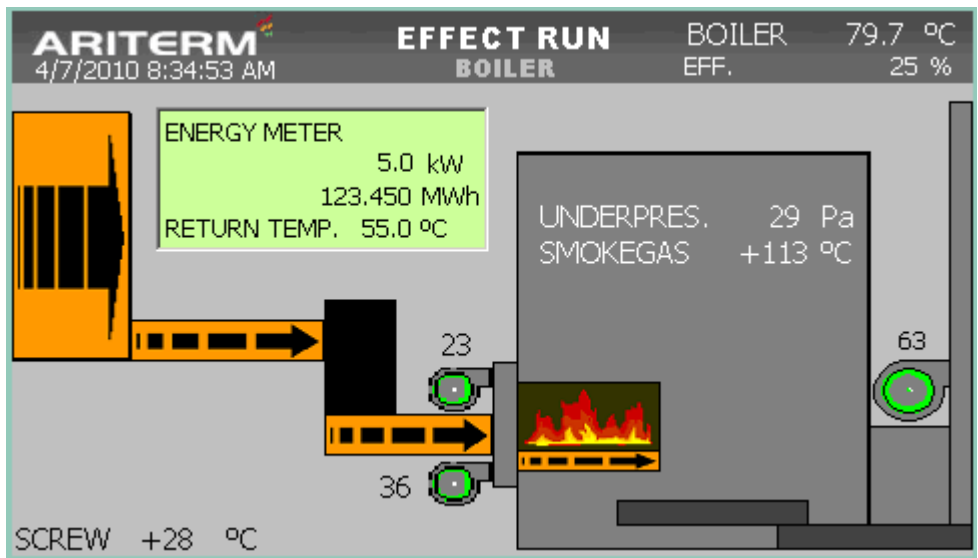
Example 1: on *OPERATION-***page button** *ON/OFF MODE* **–button is in position** *IN USE***. Function** *THERMOSTAT IN HOTWATER ACCUMULATOR* **is in mode** *NOT IN USE***. With these settings ignition process is started as written in chapter XXX. Burner runs until water boiler temperature goes above** *SETTING VALUE FOR TEMP."* **+ (**uid*HYSTERESIS" /* **2). After that control program starts to wait until effect-% goes under the value, which is set for parameter** *SHUTDOWN WHEN EFFECT-% UNDER***. Then burner will turn to standby-mode, when flame supervision doesn't see flame anymore. When boiler temperature has fallen under** *STARTING TEMPERATURE***, burner will be ignited automatically again.**

As an example, setting value for boiler water is 80°C and hysteresis is 4°C. *SHUTDOWN WHEN EFFECT-% UNDER* **is set to value 30%. In this case permission to shut-down is given at 82°C. And shut-down period starts when temperature regulation goes below 30%. Under shut-down period, silo screw doesn't run. Burner uses the pellet amount, which is stored to the funnel/pellet feeder on that moment, when control system gives command to start shut-down period. Shut-down period is active as long as flame supervision recognizes the flame. When flame goes off, flue gas fan and cooling pump (used in Biojet burner) run the time, which has been set for the parameter** *EXHAUST FAN AND COLLING PUMP RUNTIME AFTER SHUTDOWN***.**

Example 2: Same as in example 1, but new ignition is started, when boiler water temperature has fallen under *STARTING TEMPERATURE* and control system gets external start command (Normally open contact) from thermostat in accumulator tank. If you want to use burner in this mode, check that button *THERMOSTAT IN HOTWATER ACCUMULATOR* is in state *IN USE*.

Sensor scaling

Boiler screen view with energy meter option