anhydro

Original

Functional Description

Small Scale Spray Dryer

Type: MS400-1

anhydro

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1 Introduction

This Functional Description contains information about the different functions of the control system for the small scale spray dryer. Therefore, it is recommended to read this description before starting up the small scale spray dryer in order to ensure safe and correct operation. It is the responsible manager's duty to ensure that the operators and the technical personnel read and understand this description before start-up of the small scale spray dryer.

This description must be kept during the entire life of the small scale spray dryer so that it is at hand when needed by the operator or the technical personnel. It is the company's duty to ensure that any updates of this description received from Anhydro A/S during the entire life of the small scale spray dryer are added to the description. The Functional Description is considered part of the small scale spray dryer and must therefore always accompany this plant.

Note:

The information contained in this description must neither be reproduced nor passed on to a third party without the permission of Anhydro A/S.

1.1 Pictograms in the description

The following pictograms are used in the description to highlight aspects which require special attention:

Note: Pay attention.

Important: Failure to observe the precautions may affect the functioning of the small scale spray dryer.

2 The control system

The control system of the plant is operated by means of a touch screen. In the following, the different screen displays of the control system are described.

2.1 The main screen displays

When the main power on the electrical cabinet is switched on (the switch is placed on the side of the electrical cabinet), the touch screen will illuminate after 30-60 seconds. A screen display showing the Anhydro logo appears. Touch the screen anywhere to continue (see Figure 1Figure 1).

Figure 1: The Anhydro logo screen display

When touching the screen, a new screen display is shown (see Figure 2). On this screen display, the operator can choose one of the following setups:

- Atomizer setup
- 2 fluid nozzle.

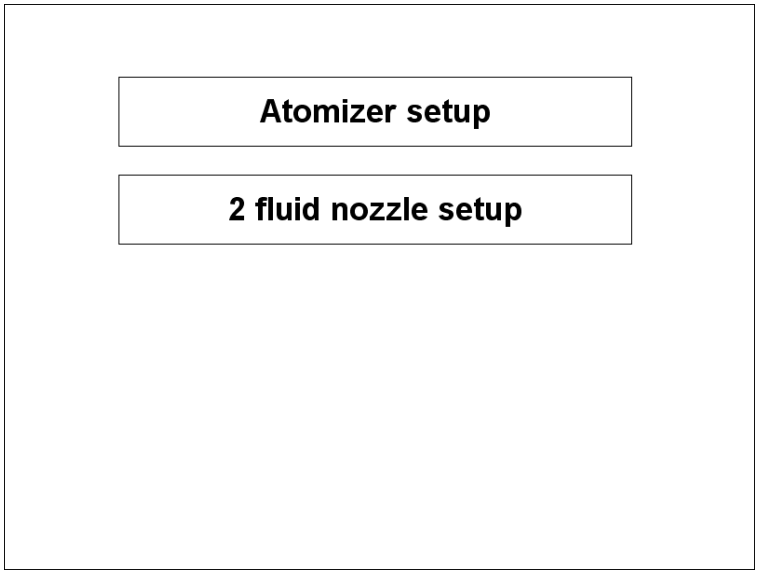

Figure 2: The Setup Menu screen display

When a setup is chosen, a new screen display is displayed. Whatever setup is chosen, the new screen display looks like one of the screen displays illustrated in figures 3 and 4. These screen displays show an overview of the plant and the components which can be controlled by the operator. The screen displays also show the actual values such as temperature, output etc.

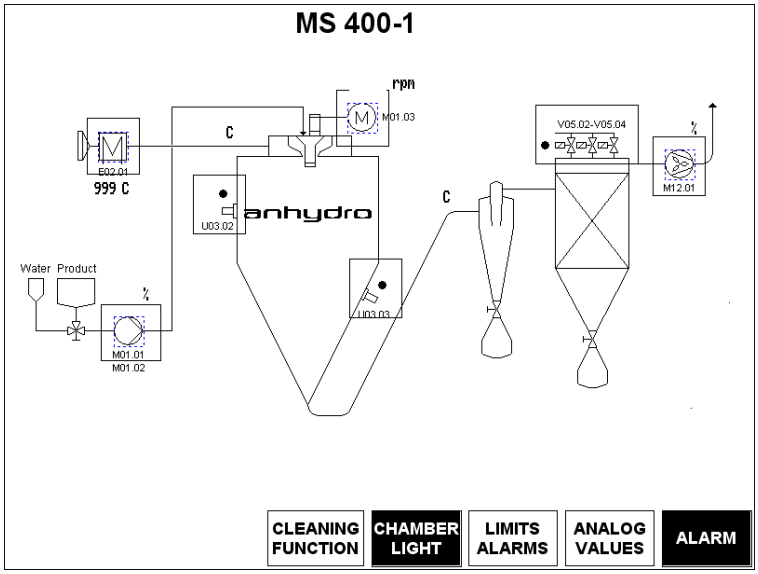

Figure 3: The Atomizer Setup main screen display

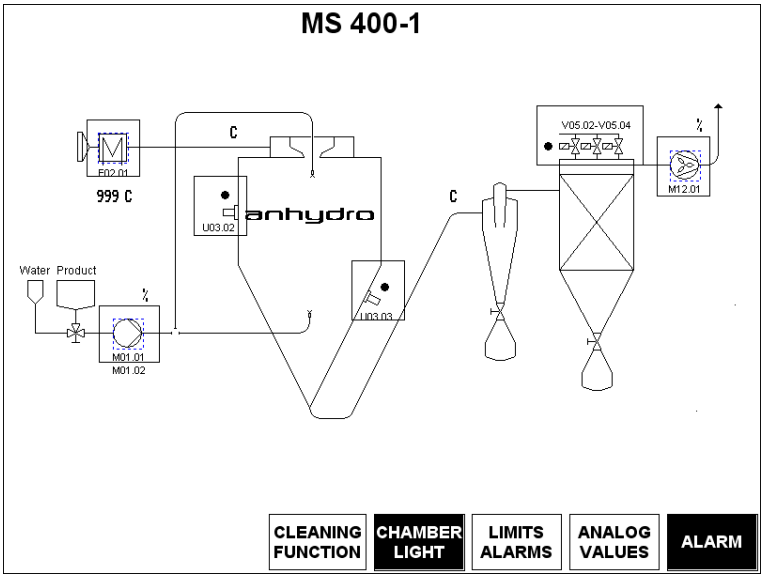

Figure 4: The Counter Current Setup main screen display

The components are controlled by pressing the component symbols on the screen, e.g. start and stop of the components. On the main screens for the different setups, the component symbols are pressure sensitive boxes. This means that, when a component is pressed, a new screen display is displayed from where the component in question can be controlled. The main screen displays and the control of each component are described on the following pages and apply to the above-mentioned setups.

At the bottom of all main screen displays, five buttons are displayed which give access to different functions.

When pressing the CLEANING FUNCTION button, a screen display showing the cleaning function is displayed. In this screen display, it is possible to start or stop the feed pump, the feed pump must be operating while cleaning is taking place. For further information on the screen display see section “The Cleaning Function screen display”.

When pressing the CHAMBER LIGHT button, the light in the chamber is switched on/off.

When pressing the LIMITS ALARMS button, a screen display showing the alarm limits is displayed. In this screen display, it is possible to change the set point values of different alarms.

When pressing the ANALOG VALVES button, a screen display showing values such as actual inlet air temperature, actual outlet air temperature and actual surface temperature of the main heater etc. is displayed.

When pressing the ALARM button, a screen display showing an alarm list is displayed. The ALARM button has a red colour if there is an alarm. In the alarm list, all active alarms are displayed. Alarms that have not been acknowledged are flashing. A specific alarm remains in the alarm list until the fault releasing the alarm has been corrected and the alarm has been acknowledged.

2.2 The Feed Pump screen display (option)

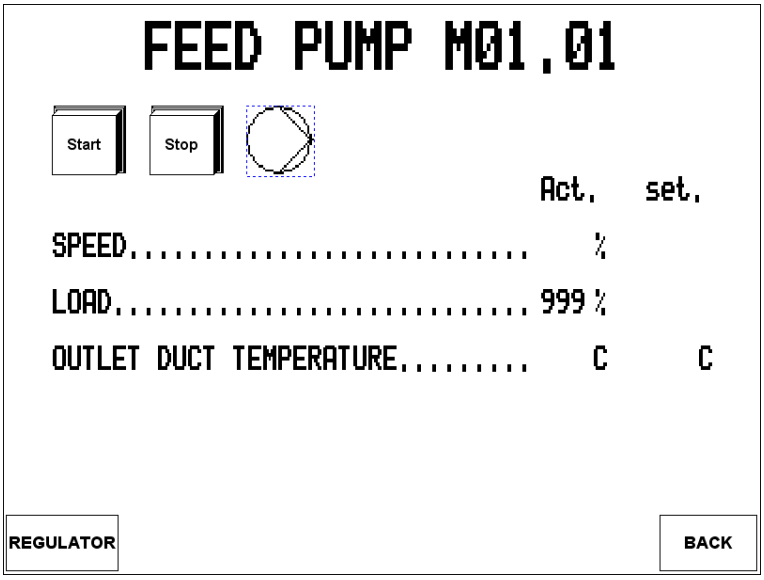

Figure 5: The Feed Pump screen display

The feed pump is started and stopped by pressing the (green) START button and the (red) STOP button respectively.

The feed pump is linked to the outlet temperature. When adjusting the outlet temperature, the pump automatically controls the speed of the feed in order to maintain the correct outlet temperature. The set point value of the outlet temperature can be changed by pressing the set point value on the screen. Subsequently, a numerical keypad is displayed by means of which the desired value can be entered. The value is changed by pressing the ENTER button.

The feed pump is limited by an interlock, which means that the pump can only be started when the outlet temperature is at least 50ºC. The value of this interlock can only be set between 50ºC and 80ºC. The interlock values can be changed in the Limits Alarms screen display.

The trend curve of the feed pump can be displayed by pressing the REGULATOR button displayed in the bottom left hand corner of the Feed Pump screen display. The trend curve displays the output in percentage, the actual outlet temperature and the outlet temperature set point.

By pressing the BACK button displayed in the bottom right hand corner of the Feed Pump screen display, the main screen display for the setup chosen is displayed.

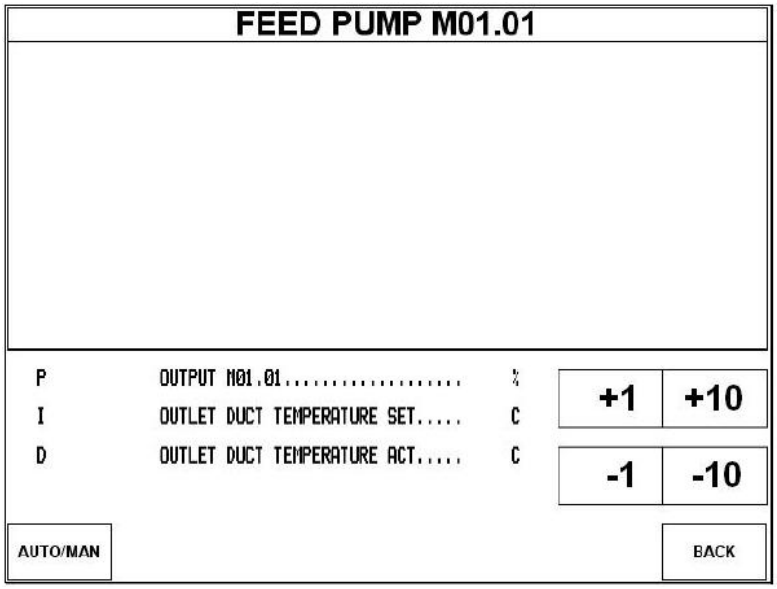

Figure 6: The Feed Pump Regulator screen display

The feed pump is as default set to automatic control. It can, however, be switched to manual control by pressing the button AUTO/MAN, displayed in the bottom left hand corner of the Feed Pump Regulator screen display. When the feed pump is controlled manually, the speed can be increased or decreased by 10% and 1% at a time respectively as occasion requires.

Note:

Normally, it is not necessary to adjust the PID parameters once they have been adjusted by the commissioning engineer.

By pressing the BACK button displayed in the bottom right hand corner of the Feed Pump Regulator screen display, the main screen display for the setup chosen is displayed.

2.3 The Heater screen display

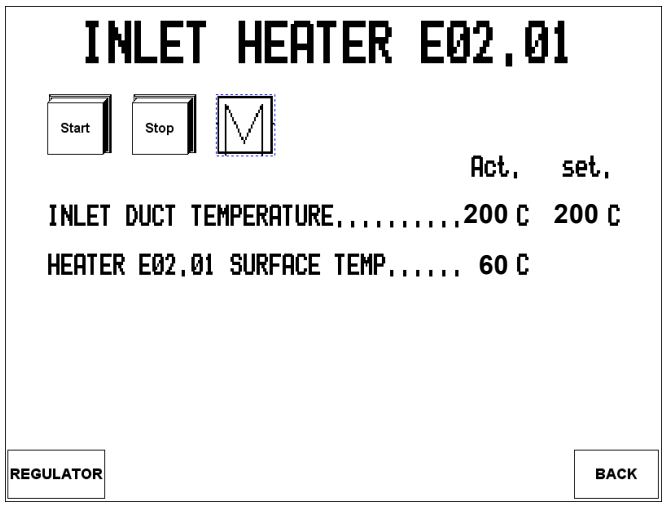

Figure 7: The Heater screen display

The heater is started and stopped by pressing the (green) START button and the (red) STOP button respectively.

The inlet temperature set point value can be changed by pressing the set point value on the screen. Subsequently, a numerical keypad is displayed by means of which the desired value can be entered. The value is changed by pressing the ENTER button.

In order to avoid damage to the heater elements, an interlock has been made. This interlock only enables the heater to start once the suction fan, M12.01, has been started.

The trend curve of the chamber heat can be displayed by pressing the REGULATOR button displayed in the bottom left hand corner of the Heater screen display. The trend curve displays the output in percentage, the actual inlet temperature and the inlet temperature set point.

By pressing the BACK button displayed in the bottom right hand corner of the Heater screen display, the main screen display for the setup chosen is displayed.

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Important:

The atomizer must be started before the heater is turned on.

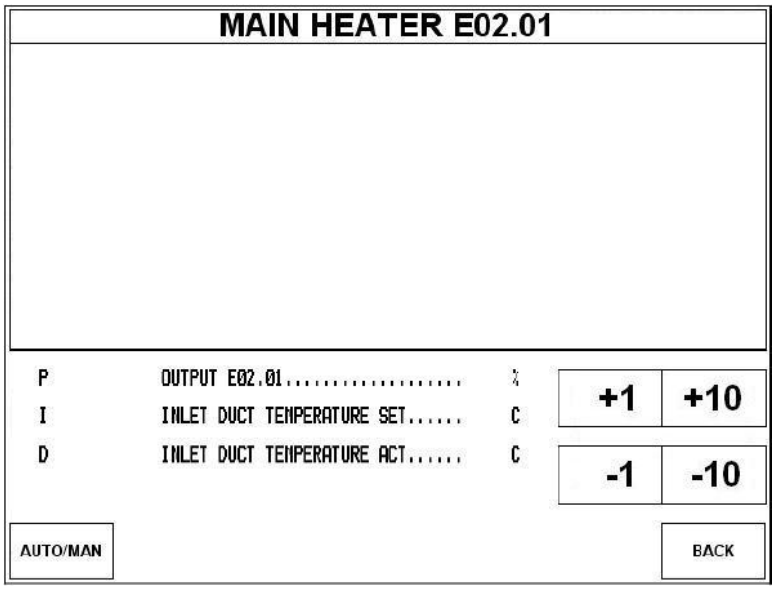

Figure 8: The Heater Regulator screen display

The chamber heat is as default set to automatic control. It can, however, be set to manual control by pressing the button AUTO/MAN, displayed in the bottom left hand corner of the Heater Regulator screen display. When the chamber heat is controlled manually, the speed can be increased or decreased by 10% and 1% at a time respectively as occasion requires.

Note:

Normally, it is not necessary to adjust the PID parameters once they have been adjusted by the commissioning engineer.

By pressing the BACK button displayed in the bottom right hand corner of the Heater Regulator screen display, the main screen display for the setup chosen is displayed.

2.4 The Suction Ventilator screen display

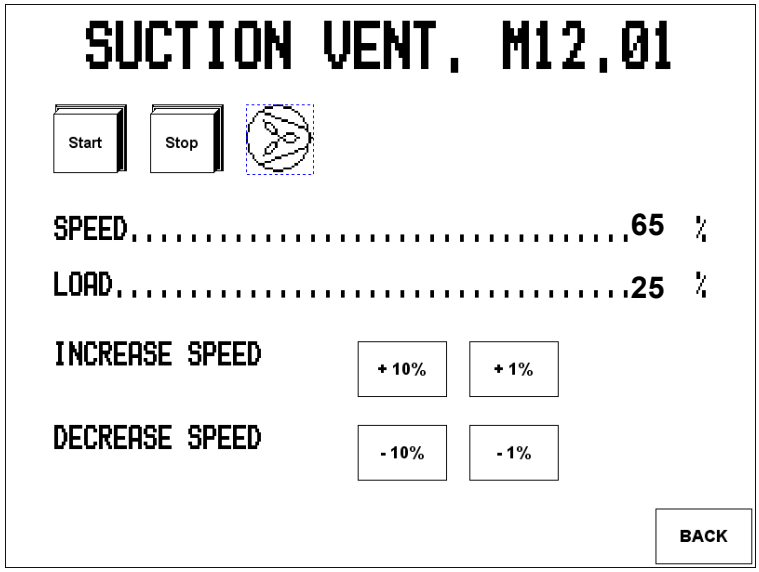

Figure 9: The Suction Ventilator screen display

The suction ventilator is started and stopped by pressing the (green) START button and the (red) STOP button respectively.

The speed of the fan can be increased or decreased manually by 10% and 1% at a time respectively as occasion requires.

The suction ventilator is limited by an interlock. This means that the fan can only be stopped when the outlet temperature of the plant is below 80ºC.

If the STOP button is activated when the outlet temperature is above 80ºC, the suction ventilator will continue operating and will not stop before the outlet temperature is below 80ºC.

Note:

The atomizer should not be stopped before the suction ventilator is turned off.

The load value displayed in the Suction ventilator screen display is information only and cannot be changed.

By pressing the BACK button displayed in the bottom right hand corner of the Suction ventilator screen display, the main screen display for the setup chosen is displayed.

2.5 The Atomizer screen display (option)

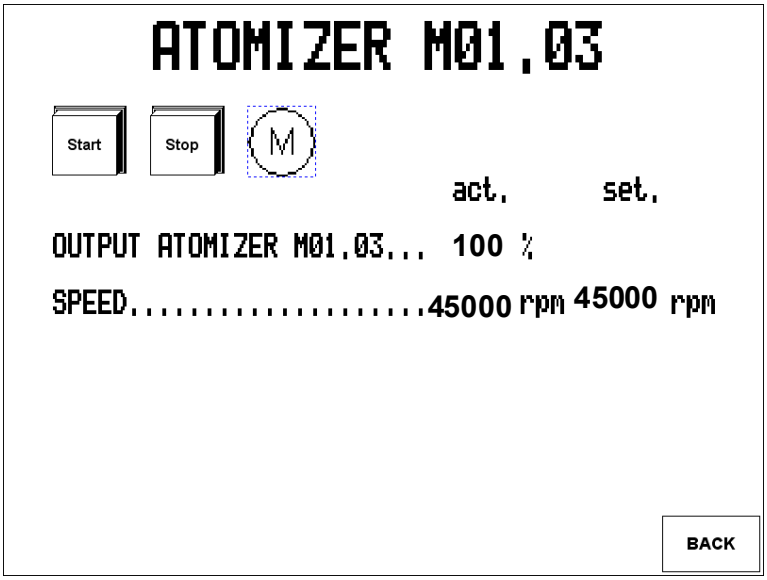

Figure 10: The Atomizer screen display

The atomizer is started and stopped by pressing the (green) START button and the (red) STOP button respectively.

The speed set point value can be changed by pressing the set point value on the screen. Subsequently, a numerical keypad is displayed by means of which the desired value can be entered. The value is changed by pressing the ENTER button.

The output atomizer and actual speed values displayed in the Atomizer screen display are information only and cannot be changed.

Important:

The atomizer must be started before the heater is turned on.

Note:

The atomizer cannot be started before the compressed air pressure corresponds to 6 bar. The atomizer should not be stopped before the suction ventilator is turned off.

By pressing the BACK button displayed in the bottom right hand corner of the Atomizer screen display, the main screen display for the setup chosen is displayed.

2.6 The Hammer Chamber screen display

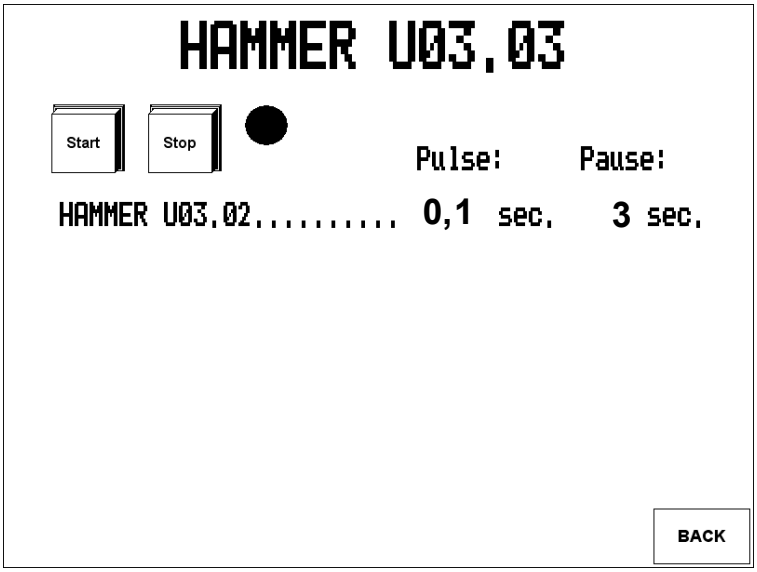

Figure 11: The Hammer Chamber screen display

The hammer is started and stopped by pressing the (green) START button and the (red) STOP button respectively.

The pulse and pause values can be changed by pressing the values on the screen. Subsequently, a numerical keypad is displayed by means of which the desired value can be entered. The value is changed by pressing the ENTER button.

By pressing the BACK button displayed in the bottom right hand corner of the Hammer Chamber screen display, the main screen display for the setup chosen is displayed.

The instructions for the hammer screen display also apply to the other hammer U03.02.

2.7 The Cleaning Function screen display

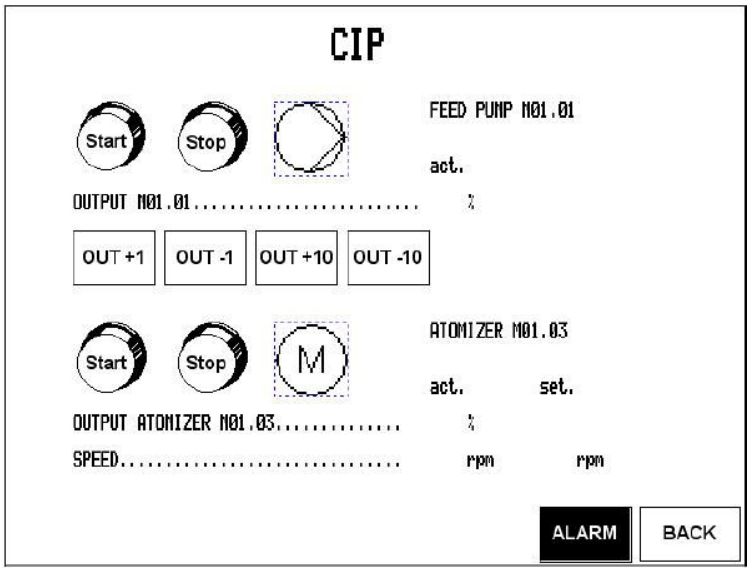

Figure 12: The Cleaning Function screen display

When cleaning the plant with water, the feed pump must be running. Normally, the feed pump is linked to a certain outlet temperature. With this function, the pump is able to run independently of the outlet temperature.

The feed pump is started and stopped by pressing the (green) START button and the (red) STOP button respectively.

In the Cleaning Function screen display it is possible to increase or decrease the speed of the feed pump by 10% and 1% at a time respectively as occasion requires.

By pressing the BACK button displayed in the bottom right hand corner of the Cleaning Function screen display, the main screen display for the setup chosen is displayed.

2.8 The Analog Values screen display

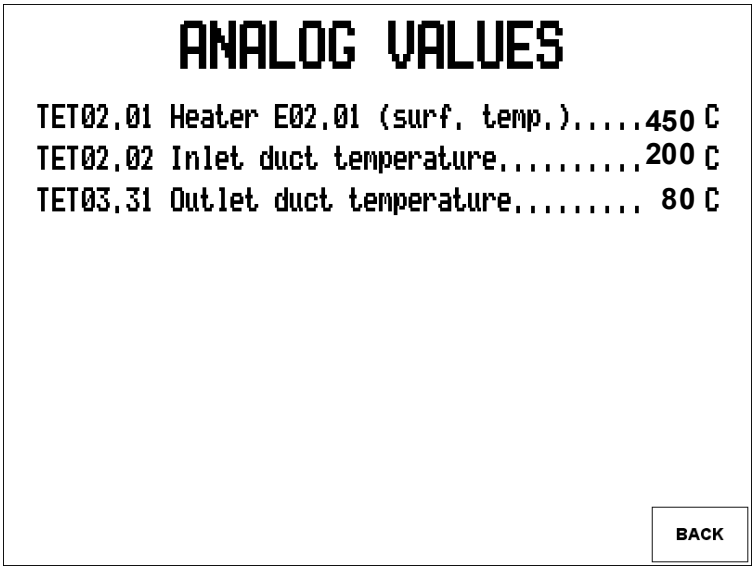

Figure 13: The Analog Values screen display

In the Analog Values screen display, all analog values of the entire plant are displayed. The values are actual inlet air temperature, actual outlet air temperature and the actual surface temperature of the heater.

By pressing the BACK button displayed in the bottom right hand corner of the Analog Values screen display, the main screen display for the setup chosen is displayed.

3 Alarms

3.1 The Limits Alarms screen display

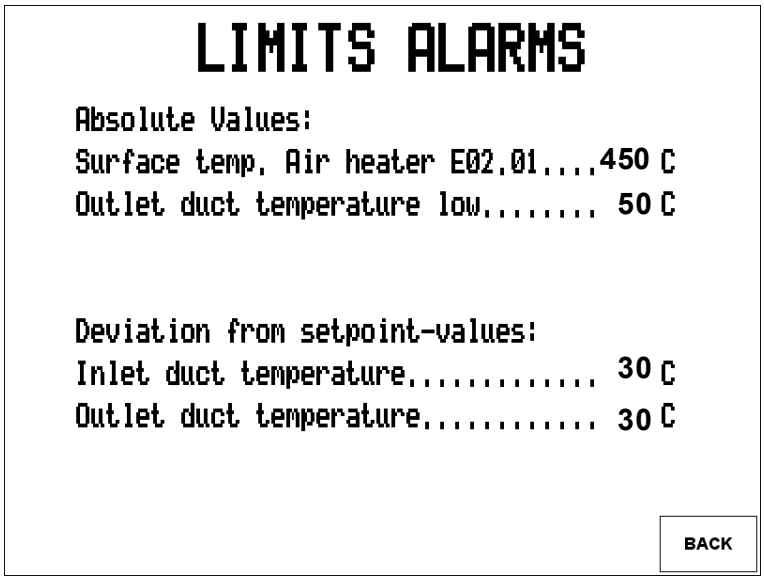

Figure 14: The Alarm Limits screen display

In the Limits Alarms screen display, alarm set point values for heater surface temperature and outlet temperature/feed pump can be changed. When pressing the set point value in question, a numerical keypad is display by means of which the desired value can be entered. The selected value is confirmed by pressing the ENTER button.

If the heater surface temperature exceeds the entered set point, the heater switches off automatically. If the outlet temperature is below the entered set point value, the feed pump will not start. These two set points are preset before the spray dryer is shipped from Anhydro A/S. It is not recommended that these values are changed.

In the Limits Alarms screen display, the operator can also change the Deviation from set point values for the inlet and outlet temperature. As standard, these values are set to 30°C. This means that if the actual inlet or outlet temperature deviates more than 30°C from the set point value, an alarm will occur.

By pressing the Back button displayed in the bottom right hand corner of the Limits Alarms screen display, the main screen display for the setup chosen is displayed.

3.2 Error page

The screen display shows an example of an error page.

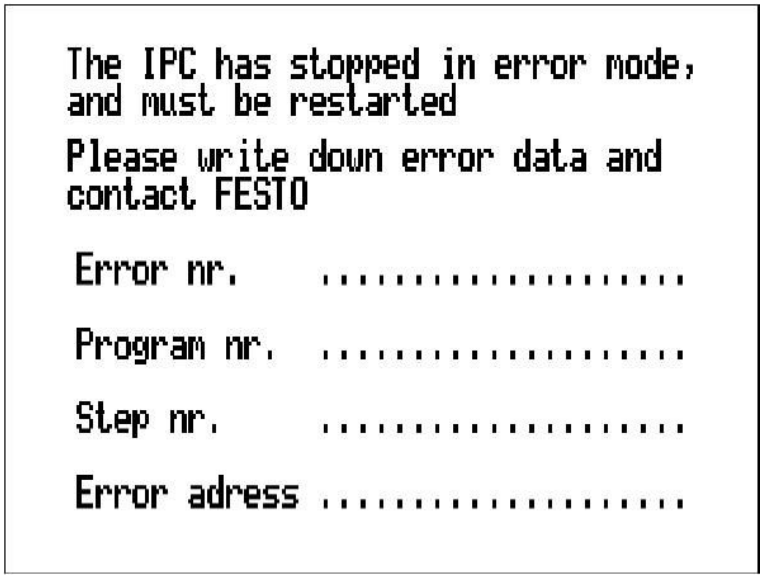

Figure 15: Error page screen display

3.3 The Alarm List screen display

In the Alarm List screen display all alarms on the plant are displayed.

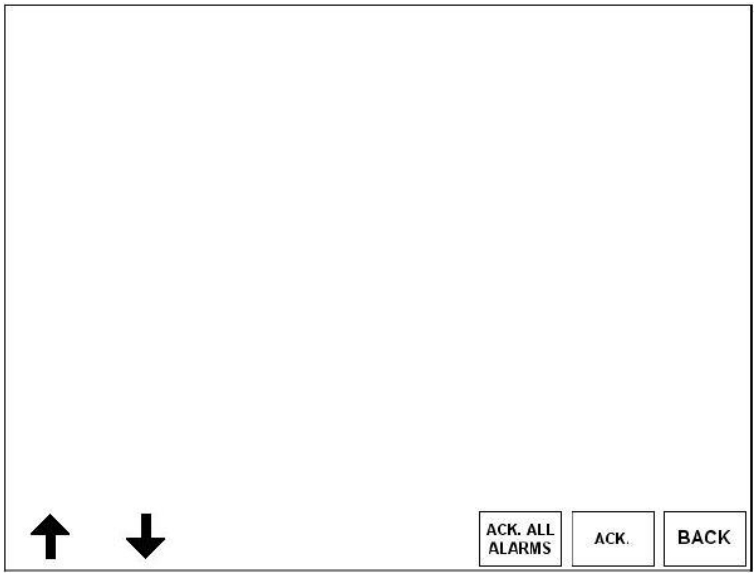

Figure 16: The Alarm List screen display

A specific alarm is selected by means of the arrow buttons displayed in the bottom left hand corner of the Alarm List screen display. By pressing the ACK ALL ALARMS button, all alarms are acknowledged at once. By pressing the ACK button, the alarms are acknowledged one at a time. The alarms disappear from the list when they are no longer applicable.

By pressing the BACK button displayed in the bottom right hand corner of the Alarm List screen display, the main screen display for the setup chosen is displayed.

3.4 Alarm types

Errors – An error occurs and the component stops

Error - Emergency stop
Error - Rupture disc
Error - Feed Pump M01.01
Error - Cooling pump Feed pump M01.02
Error - Inlet duct Heater E2.01
Error - Suction Ventilator M12.01
Error - Atomizer M01.03
Error - Atomizer cooling press. low

Warnings – A warning occurs but the component still operates

WARNING - Inlet duct temp. High
WARNING - Outlet duct temp. High

Alarms – An alarm occurs and the component stops

ALARM - Heater E2.01 surface temp.
ALARM - Inlet duct temperature High
ALARM - Outlet duct temperature High
ALARM - Outlet duct temp. low

Note:

All alarms require acknowledgement.

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