iSCAPE®

AUC3400

Reference guide

Version 6.1A

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August 2019

Index

(*) indicates new item in version 5.9E *(**) indicates altered or revised information*

1 Introduction

The iSCAPE®AUC3400 is a pump controller that incorporates new technologies and algorithms to deliver state of the art pressure control.

The main reasons for installing an iSCAPE® AUC3400 controller in your application are:

- **The AUC3400 controller will save you money and energy.**
  That's because pumps are running at the best efficiency. Each main pump is frequency controlled and pumps will only run when needed. The AUC3400 can calculate exactly at which speed to start and stop a pump.
  The AUC3400 applies a dead band around the setpoint, which allow very small pressure fluctuations, often caused by vibrations and turbulence. As a result it will not accelerate nor decelerate the pump motors unnecessary and save energy.

- **The AUC3400 controller offers superior 'Fuzzy Wise' pressure control.**
  The pressure is controlled in a step less, smooth way, without pressure shocks and with no overshoot.

- **The AUC3400 controller offers a great price / performance ratio.**
  The AUC300 controller is cheap, but offers a lot of functionality to deal with most commons application in pressure boosting and irrigation.

- **The AUC3400 controller offers scalability.**
  One controller to control just a single pump or up to 8 main or jockey pumps and possibly up to 8 pre-pressure pumps! Furthermore, you can purchase your control panel with a full manual control option for all of these pumps. All that is possible, due to the scalable hardware and software of the AUC3400. Hardware modules can be added and the control software comes prepared to control most of the possible combination of pumps.

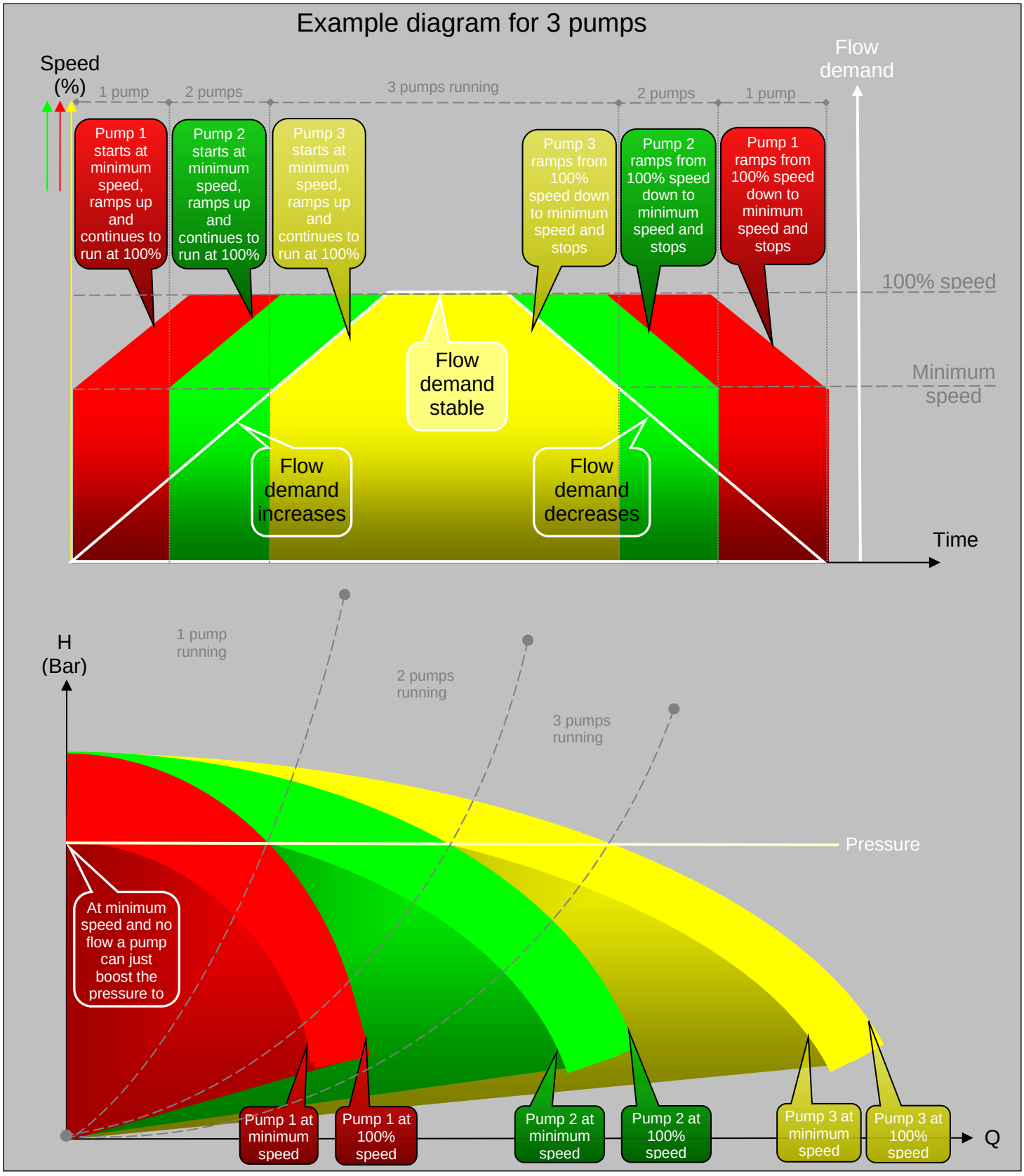
- **The AUC3400 controller offers remote control capabilities.**
  There is a free PC program that will allow you to monitor and control the AUC3400 controller remotely. It let's you manoeuvre through the menu, create trends and list alarm.
  Furthermore, the AUC3400 can send text SMS messages to you cell phone when there is an alarm or situation that needs attention. Vice versa you can send SMS to the AUC3400 to request a status update or to request the last 10 error messages or to acknowledge and reset alarms.

- **The AUC3400 controller offers redundancy.**
  Each individual drive can have a hand switch with potentiometer to adjust speed.
  When the AUC3400 fails, each drive can be operated manually, in depend of other drives.

- **The AUC3400 controller saves you valuable time commissioning your application.**
  There is a Quick Setup and Quick Commissioning menu with preset default values for all parameters. For most application it suffices to step through the Quick menus to successfully complete commissioning.

All this will be explained in detail in this reference guide.

2 AUC3400 control strategy



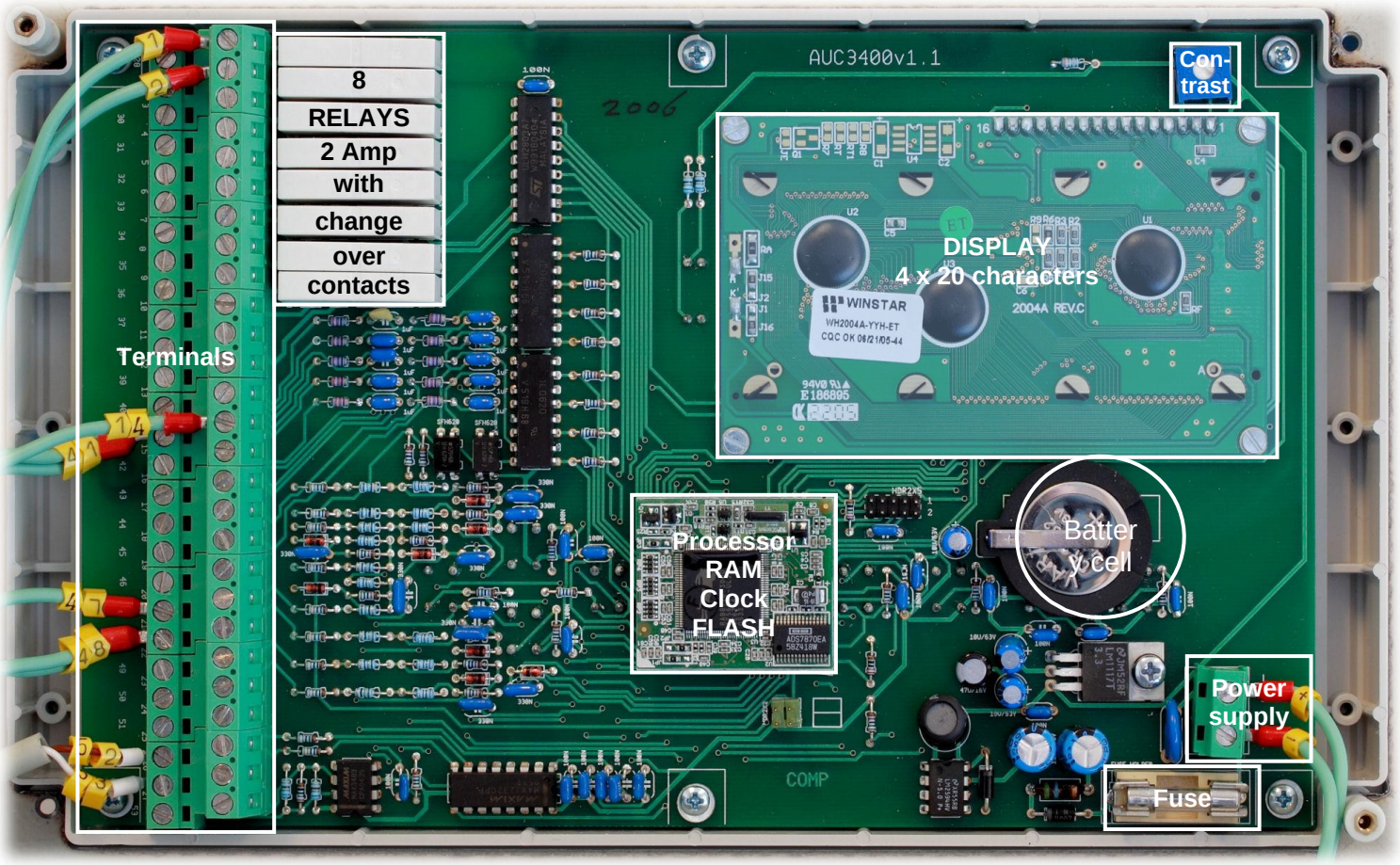
3 AUC3400 front & back view

Front

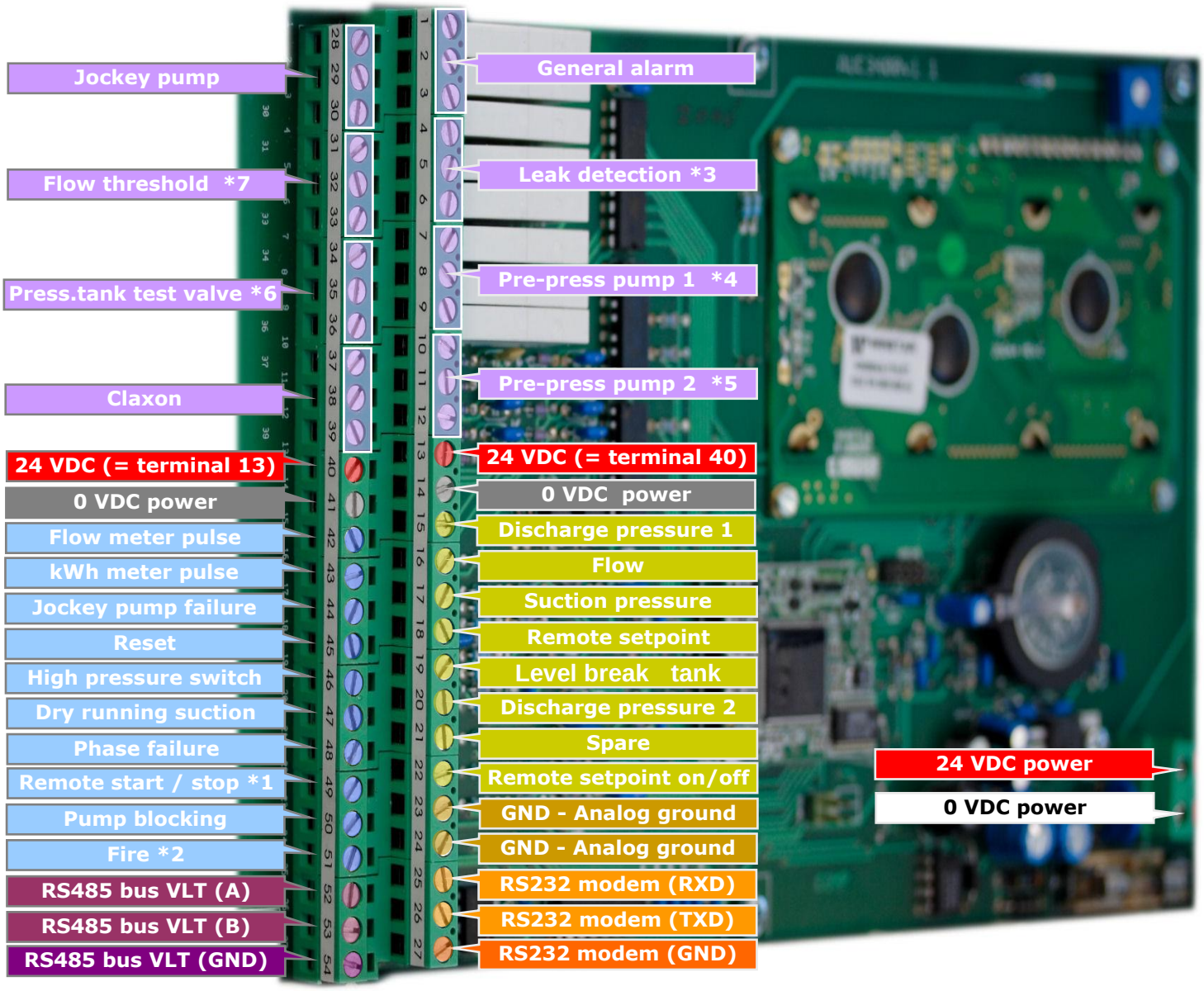
Back

4 AUC3400 Technical specifications

Features	**Controller Specifications**
Processor	Z-world Rabbit RCM3400
Flash Memory	512K
SRAM	512K
Backup Battery	Varta CR2032 or equivalent, 3V lithium coin type.
Digital Inputs	10 inputs 24VDC, low current, < 5 mA.
Digital Outputs	8 relays, Maximum +230 V / 2 Amp per channel.
Analogue Inputs	8 channels 12-bit res., 4 - 40 mA DC
Serial Ports	1 x RS485, 1 x RS-232
Real-time Clock	Yes
Watchdog/Supervisor	Yes
Power	24V DC
Operating Temperature	0° C to +50 °C
Humidity	5 – 95%, non condensing
Dimension	155 (H) x 255 (W) x 45 (D)



5 AUC3400 Terminal connections



INPUTS | Outputs (relays) | Analogue inputs

*1 optionally this input can be programmed to signal a pressure tank switch for low air
*2 optionally this input can be programmed to signal an external high water detection switch
*3 – 7 optionally this output can be programmed to signal MGE motor 1-5 running.

6 AUC3400 control options

Jockey pump (DOL control)

1 – 8 frequency controlled pumps by Danfoss, ABB, Vacon or Grundfos drives.
Any number of these 8 available pumps can be configured to operate as main pumps, standby (spare) pumps or jockey pumps.

1 – 8 direct on line (DOL) controlled pre-pressure pumps.
Optionally each pump can have separate HAND-OFF-AUTO switches.

Suction sensor

Suction switch

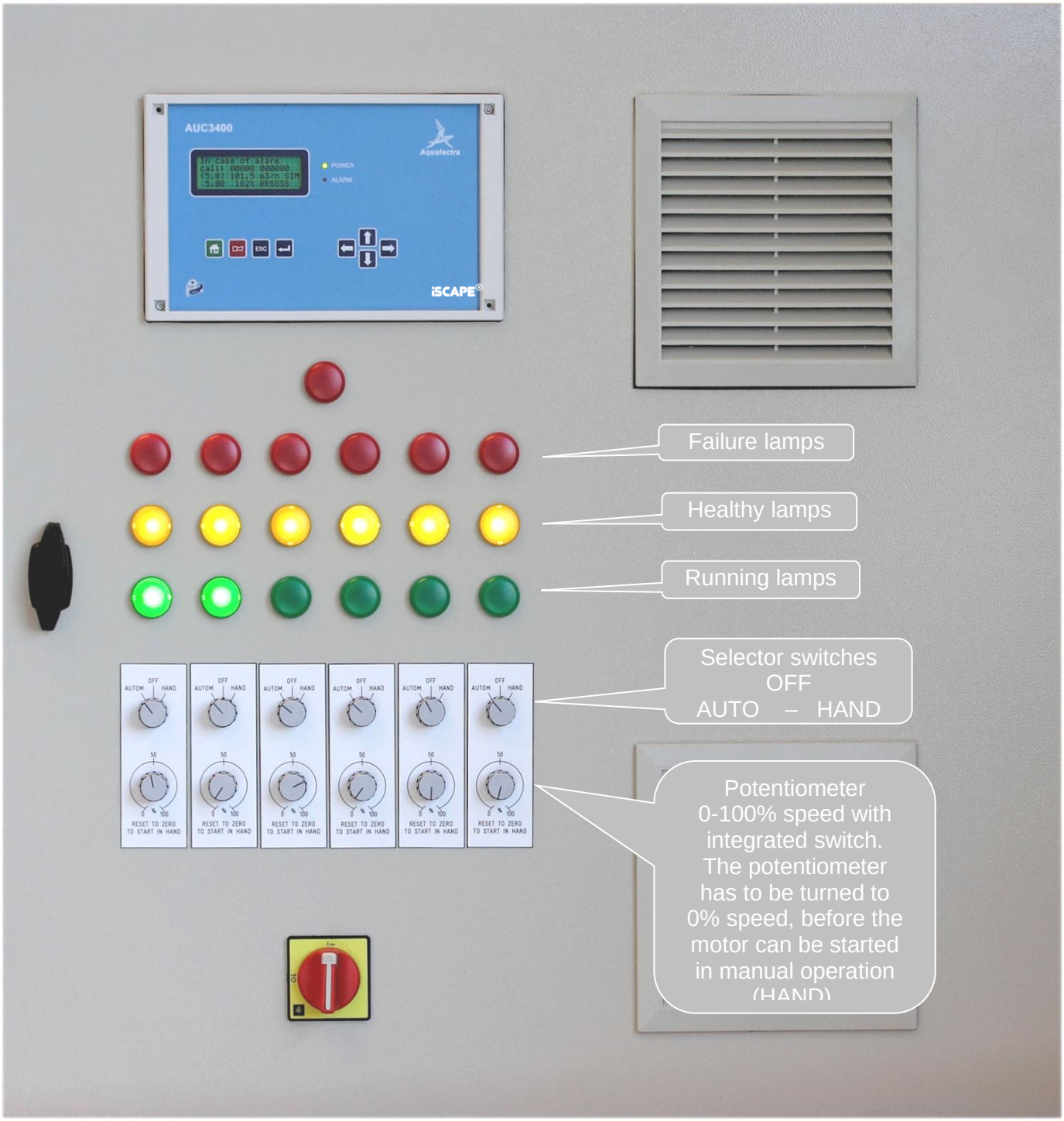
Discharge sensor

Discharge switch

Flow meter
Analogue / pulses

KWh meter

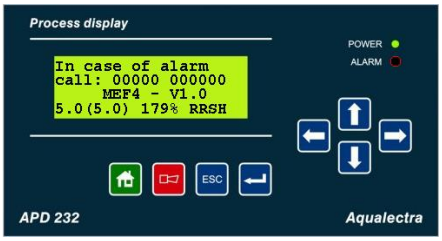
The AUC3400 control panel can have full manual control options.



Notes

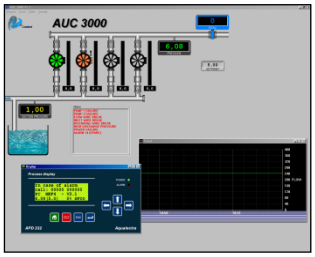
- The manual control options are not necessary for the operation of the pumps. The AUC3400 can be ordered without those options.
- The manual options provide a level of redundancy: if the AUC3400 fails the pumps can still be operation manually in HAND.

7 AUC3400 communication options



Connect a second local HMI…
(APD 232)

Read / control
frequency converters
over RS485 bus

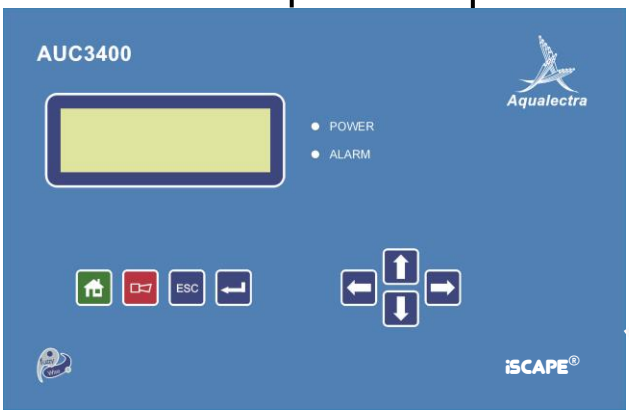


…or a local laptop running the
iSCAPE® AUC3400 visualization

…or a low cost GSM modem for remote connection to a PC running the AUC3400 visualization program modem and for generating SMS text messages on your mobile phone.

RS485
Port

Serial
Port2



…or use a modem
pool with up to 5
recipients and and
alarm call cycle.

…or use your mobile
phone.to send a SMS text
messages TO the
AUC3400. You can:
-Ackneledge or reset
alarms
- Request the AUC3400 to
send back an SMS with a
status report or send up to
5 SMS messages with the
most recent alarm history.

8 AUC3400 control features

- ✓ Up to 8 frequency controlled pumps. Any number of these pumps can be configured to operate as main pumps, standby (spare) pumps or jockey pumps
- ✓ Supported drives are currently: Danfoss VLT2800, VLT600 and FC201 series.
  ABB ACS500 and ACS800 series. Vacon 100 series.
  Additionally the AUC3400 support Danfoss FCM300 motors and Grundfos MGE motors with integrated frequency converters.
- ✓ Up to 8 direct on line controlled pre-pressure pumps.
- ✓ 1 optional DOL operated jockey pump with programmable start / stop pressure levels (no external pressure switch needed).
- ✓ Optional HAND-OFF-AUTO switches for each pump. We developed a special electronic print which accommodates a switch and a potentiometer for manual adjustment of the pump speed. For safety the potentiometer knob must be turned to zero speed before manual start is effectuated. The print is wired directly to terminals of the Danfoss drives without intervention of the AUC3400.
- ✓ ***Fuzzy Wise* control** offers state of the art adaptive pressure control. Very easy to commission, only one parameter (ramp time) is required. The control algorithm calculates required pumps speeds for starting, stopping and ramping up and down the pumps with minimum hydraulic shocks.
- ✓ Fast Fuzzy option. If you have the need for a slow and gentle overall control of your system, for example in irrigation, you still need a fast reaction of the system when the flow demand is abruptly stopped (when the irrigators shut down fast). Fast fuzzy brings the solution.
- ✓ Danfoss and Grundfos drives are controlled by the AUC3400 over RS485 bus communication, allowing:
  – Programming of the frequency converters by the AUC3400. All relevant menus are covered, no need to program the drives manually. Approximately 40 parameters in two setups for automatic and manual control are set. Programming can be done even while the pump set is in operation.
  – Readout of motor currents (Amps)
  – Readout of motor power (kW)
  – Readout of motor frequency (Hz)
  – Calculation of kWh without the need for an external kWh meter and pulse input
  – Update of running hours, even in manual control
  – Reading of all status flags (standby, ready, trip, etc.), also by remote PC/Modem.
- ✓ HMI (display) featuring 4 lines of 20 characters, 8 keys, power and alarm led.
- ✓ Optional secondary HMI.
- ✓ Context sensitive menu system. WYSIWYN: what you see is what you need!
  Menus and information display are visible or hidden, depending on the selected hardware configuration. For example if you have selected *no* jockey pump, you will *not* be bothered by irrelevant menus, controls and status displays concerning jockey pumps.
- ✓ Head up displays for quick look up of status information.
- ✓ One customisable head up display for company name & service and call out telephone number. This display can be locked to prevent anyone entering the menu system.
- ✓ Hierarchical menus for easy access to settings and intuitive manoeuvring.
- ✓ Alarms
  – actual alarm list directly accessible by alarm function key on HMI front.
  – alarm history with time and date logging (max. 99 alarms).
  – alarm history can be downloaded to PC program AUC3400.exe (text / Ms Excel format).
  – SMS messages can be transmitted by a low cost GSM serial modem (Siemens MC55i).
  – A modem pool with up to 5 recipients can de setup. The AUC3400 expects to receive an reset or acknowledge SMS FROM one of the recipients after sending an alarm SMS. When no reset or

acknowledge is returned, the AUC3400 will relay the alarm SMS to the next recipient in the modem pool.
– General alarm relay and horn relay (comes up when new alarm rises).
✓ Event history logs pump starts, logging on and of, fire, remote starts, etc.
✓ Monthly test SMS to check the condition of the communications line.
✓ Real Time Clock with automatic summer time and winter time correction.
✓ Pump alternation through programmable and predictable (known) pump sequence scheme. Separate alternation schemes for main, jockey and pre-pressure pumps.
✓ Pump test run (programmable).
✓ Week program (programmable) for setpoints, test runs, pump changes and flow limitations.
✓ Fire setpoint
✓ Running hours (total and periodical for all pumps).
✓ Leak detection (counts the number of starts within a given span of time and optionally shuts down the pump set.
✓ Pressure tank test (an algorithm to determine the air pressure in the tank)
✓ Setpoint ramp timer (programmable) for smooth setpoint changes.
✓ Start up setpoint for filling pipe lines with one pump at a programmable maximum speed (prevents water hammer and cavitation of the lead pump).
✓ Restart setpoint for delayed restart after the pumps have shut down because of zero flow.
✓ Zero flow detection with programmable pressure boost and pump shut down.
✓ Optional low speed stop and low flow stop
✓ Suction pressure:
– optional analogue input with programmable range, live zero and wire break alarm.
– optional pressure switch.
– low pressure / water level shut down with automatic restart.
✓ Discharge pressure:
– analogue input with programmable range, live zero and wire break alarm.
– optional redundant 2ND discharge sensor.
– optional digital high pressure switch.
– high pressure shut down with automatic restart.
– low pressure shut down with adjustable start up override timer.
✓ Flow
– analogue input with programmable range, live zero and wire break alarm.
– high speed pulsed rate input for cheaper flow meters (up to 500 Hz) or pumped volume
– rate (m^3/h) and total volume (m^3).
– optional digital pulse input for volume. Otherwise, the volume can be calculated from the analogue flow rate input.
– total and periodical volume counters (can be reset).
– Flow threshold output, activated when flow passes adjustable flow rate.
– Support of bypass valve (opens and closes at preset flow rates)
– Flow limitation: above a set flow the setpoint will be lowered by a set ramp to limit the water usage by end users. Per setpoint a separate flow limitation curve can be defined.
✓ Virtual Flow calculation by polynomial calculation of pump curves.
- If no flow meter is present flow can be calculated at all speeds,
by either recording a pump curve, or by specifying a set of flow/pressure points, representing the pump curve.
✓ Friction loss compensation. Compensates pressure losses in the pipes by increasing the setpoint at higher flows.
✓ kWh pulse input with totalised and periodical counters (can be reset).
✓ Optional low cost modem for remote access (Siemens MC55i).

- ✓ Optional PC program for local or remote (trough modem) monitoring and controlling the AUC3400. The program features:
  – A virtual HMI identical to the local HMI
  – A graphical presentation of the pump set and all readings
  – A data logger with a real time trend window.
    No need to rent expensive data loggers anymore!
    Selectable trend pens for inlet, discharge pressure, flow, speed, number of pumps, kW, Amps, etc.
  – An alarm window showing all active alarms.
  – All readings and trend values are update at 0,5 second intervals!
  – A documentation option to download all menus and setting. Can be used for witness tests.
  – Password protection.
  – Direct connection to AUC3400.
  – Remote connection to AUC3400 over modem.
  – All this is still possible if the PC is a remote PC, communicating over a 9600 baud GSM modem!
- ✓ Password protection to prevent tampering by unauthorised personnel.
- ✓ Build in pump set simulator.
  Supplier: when you want to simulate the AUC3400 controller in the workshop with all input options enabled you can run the build in pump set simulator. The discharge pressure input can be used to connect a 4-20 mA flow valve simulator. The AUC will control and behave as if it was controlling the pumps and pressure in reality.
- ✓ Possibility for parallel speed control of some or all main pumps, effectively creating one big pump. This mode of operation can be used in cases where cavitation causes problems.
- ✓ Quick setup menu for commissioning (from the head up display press arrow up key).
- ✓ Service due reminder. If enabled, an alarm will be raised indicated that service is due. The commissioner can specify the date at which the alarm is raised. The end customer cannot delete this alarm, only service personnel are authorized to do so.
- ✓ Rugged design and software for high EMC immunity.

9 AUC3400 Fuzzy Wise control

The AUC3400 features ***Fuzzy Wise* control**.

Fuzzy Wise is our interpretation of the more common Fuzzy Logic (FL), and it is dedicated to pump control.

Fuzzy Logic is hot these days. Born in 1965 from the works of Professor Lofti Zadeh in the University of Berkeley, these theories have gained great acceptation nowadays, especially in Japan where they are applied in all sort of things from unmanned helicopters to video cameras. Probably you're not aware of it, but you use Fuzzy Logic technologies everyday while driving your car, watching TV or even shaving yourself in the morning!

So what does it do?

Without going too much into technical detail we can take an everyday problem as an example to explain how it works.

Suppose you take a shower in a hotel and, no luck, there is no thermostatic tap. Just a cold water and a warm water tap. Then, how do you control the temperature?
Well, you probably open the hot water tap first, waiting for warm water to come (dead lag).
You adjust the amount of water to your convenience and you start mixing cold water. But you really don't have a clue of how far to open the cold water to get the right temperature, or do you?
Well you may not be aware of it, but it seems that you apply a set of rules which you may not even be aware of:

- When the water is very cold, you close the cold water very fast
- When the water is cold, you close the cold water more slowly
- When the water is a bit cold, you close the cold water just a little bit
- When the water is a bit hot, you open the cold water just a little bit
- When the water is hot, you open the cold water more fast
- When the water is very hot, you open the cold water very fast

Just how fast fast is, or exactly how little little is, or how you select between those rules is a very personal question. Fact is, you apply those rules, and you make an adjustment to the 'control system' (the taps). You then wait to see the effect. And then you repeat the whole sequence all over until the temperature off the water is within an acceptable tolerance, lets say 1 degree. As long as the temperature stays within 1 degree of your 'setpoint' temperature you do not touch the taps.

Well: this is exactly what the AUC3400 ***Fuzzy Wise*** controller does!
Except that it can do a bit more… for it can calculate fairly well just how far to open or close the taps. In its own field of application, it can calculate the speed correction required to control to the setpoint pressure. And that is why we put the word ***Wise*** behind ***Fuzzy*** We can do more than just applying a set of Fuzzy rules, called "Linguistic Variables". We know the mathematical relation between pump speed and pressure and flow. Therefore, we can make a better 'wise' guess of how to adjust the speed to get where we want as fast as possible.
So is that all there is? No, not quite. Because pressure (or temperature) control is not a one dimensional thing. You also have to address changes in pressure (or temperature).
Back to the shower; the water is cold, you close the cold water tap and you want to wait 2 seconds before you expect to make another adjustment.

But guess what? Contrary to what you expected the water gets even colder while you are waiting. Then you don't wait for 2 seconds, you start to re-adjust again, because you know that the first correction was not sufficient.
This would also apply for the opposite system reaction. If you closed the cold water tap and you feel that the temperature increases must faster than you expected, you would start to re-adjust intermediately, for you know that the temperature would otherwise overshoot and you might burn your skin.

So what can we conclude? Well, that there are complementary sets of rules, not just the set of rules that we listed earlier in this chapter. We also apply rules how to handle, unexpected, sudden changes in pressure (or temperature). And when you start to think of it, there are many sets of rules which you apply while controlling the pressure (or temperature). For example: dead legs, you open the hot water but nothing happens. Or while you take a shower, the hotel runs out of hot water, so you now have to open the hot water tap more and more. But just how much?

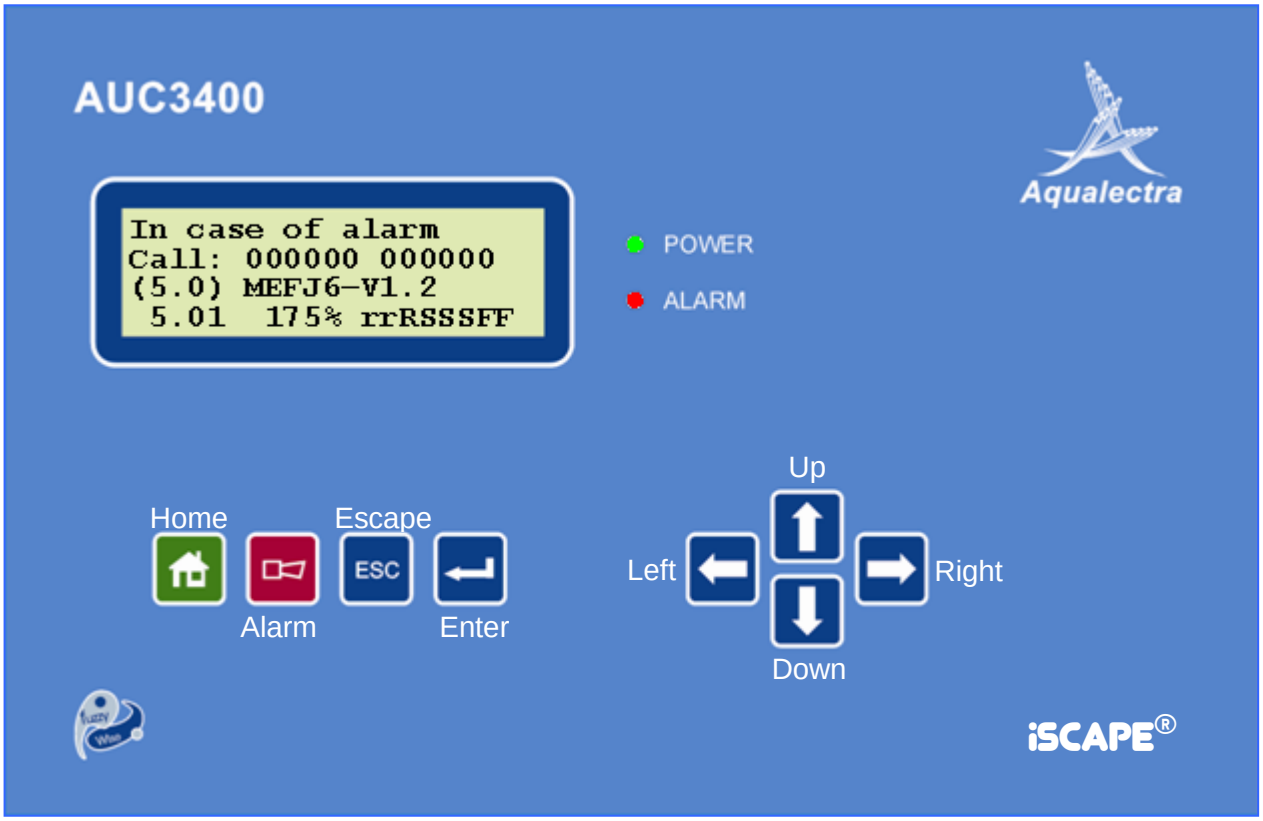
In a similar way the ***Fuzzy Wise*** controller addresses all kinds of real life problems to control the pressure (or other variables). In the AUC3400 it also addresses problems like minimum speed required, inlet pressure, zero flow, vibration in lines, etc.

What is the benefit compared to PID control?
With PID control you need to adjust Proportional, Integration and Derivative variables.
Therefore, you need to be an expert to be able to find correct and optimal setting for P, I and D.
And you cannot apply Ziegler-Nichols Closed Loop Tuning rules, because you cannot allow the pump set to oscillate for while! In practice nobody ever adjust D, because most people do not fully understand what is does and how to set it to a sensible value.
To the contrary, in our ***Fuzzy Wise*** controller you do not need to adjust anything. All we ask you to do is to specify the ramp timers programmed in the variable speed drives, for they determine the maximum allowable speed correction. And still the ***Fuzzy Wise*** controller acts in many ways like a properly tuned PI&D controller.

Other considerations:
- The relation between speed and pressure is not linear, it is square root.
  - Does PID compensate for that? No!
  - Does ***Fuzzy Wise*** control compensate for that? Yes!
- If the pressure deviation is 1% at 60% speed, does it take the same absolute speed correction as when we have a 1% deviation at, let say, 360% speed? That is, with four pumps running? No! Roughly, if the speed correction needed at 60% is 5%, then the correction required at 360% would be more like 360 / 60 * 5% = 30%.
  - Does PID compensate for that? No!
  - Does ***Fuzzy Wise*** control compensate for that? Yes!
- If the pressure is within, let say 0.5% of the setpoint, does it make sense to try and control the pressure back to the exact setpoint? No, even slight vibrations in the lines could cause small pressure fluctuations. Trying to compensate these would only result in high energy consumption, because of speeding up and down the pump motor constantly.
  - Does PID compensate for that? No, not without special measures being taken!
  - Does ***Fuzzy Wise*** control compensate for that? Yes! In fact, most of the time it is not controlling at all. It just sits and waits for something to happen. Action & reaction!

All that results in a fast, stable control, with minimum pressure over- & under shoot.

10 AUC3400 HMI (Human Machine Interface)



Indicates power healthy

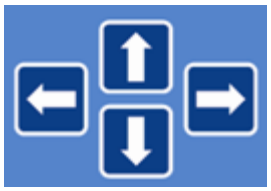
When on or blinking this indicates an alarm condition (flashing means new alarm which has not been accepted.

Pressing this key accesses the alarm list.

Enter key: To make a selection in the menu or to store an edited number.

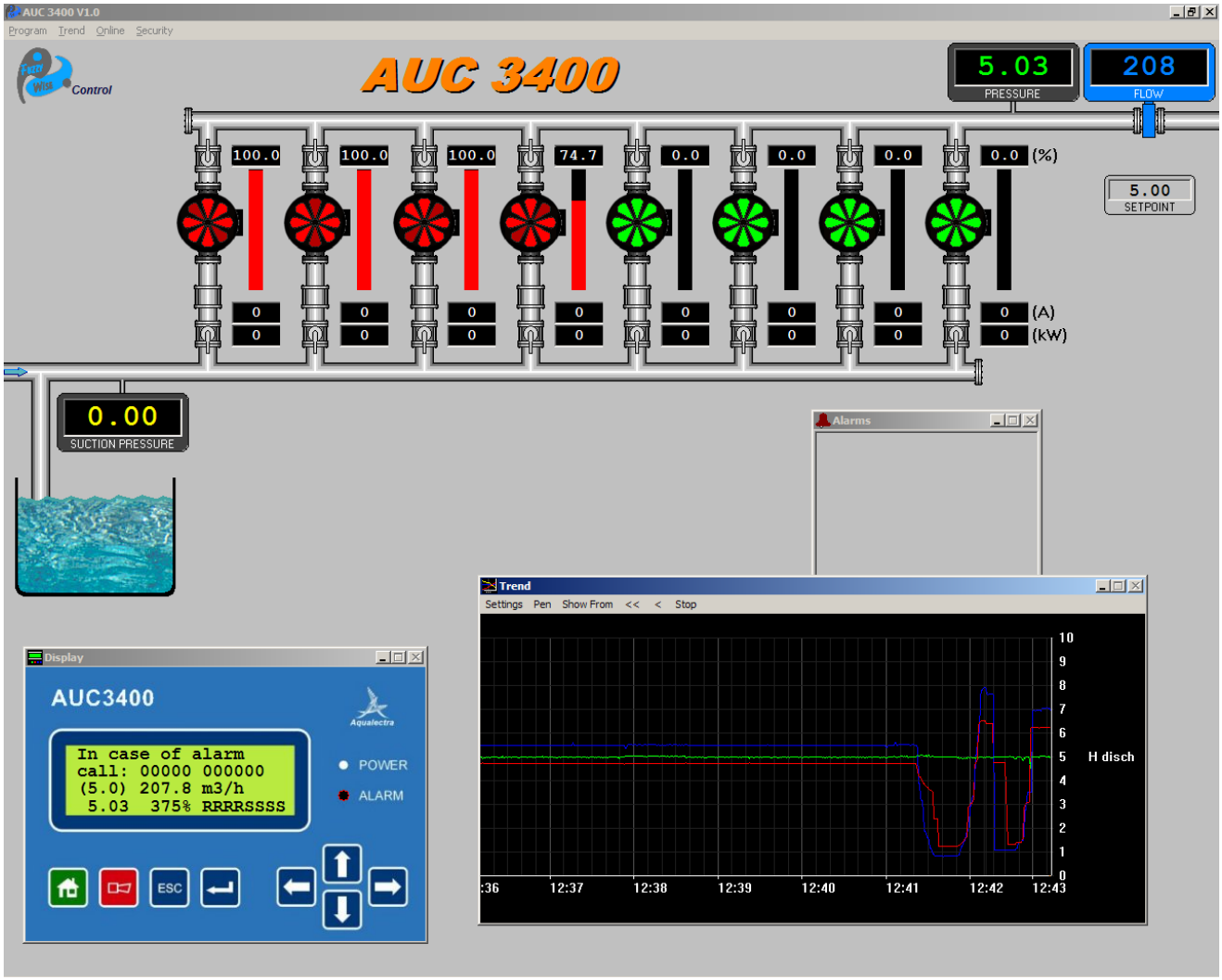
Home key: Leaves the menu and brings up the head up displays.

Escape key: Moves back one menu or abort editing a number.



Cursor keys: for manoeuvring the menu and editing numbers.

11 AUC3400 PC program

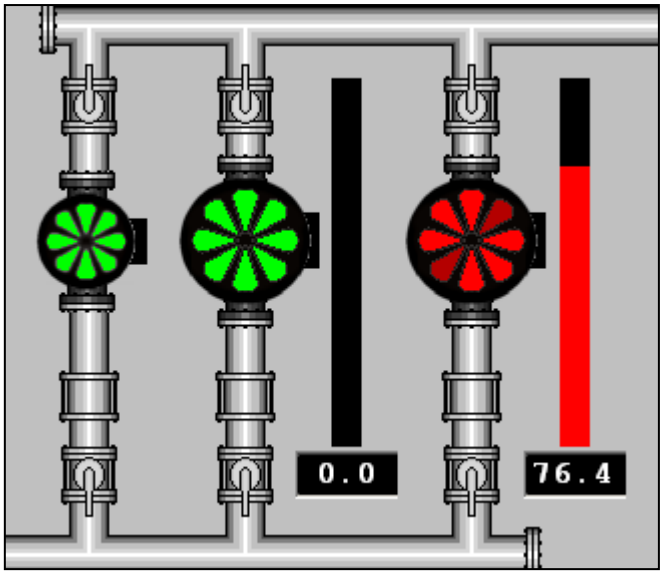


Connecting a PC running the AUC3400.exe Windows program on the serial port, either by a local direct connection or remotely through a modem dial up connection offers interesting benefits.

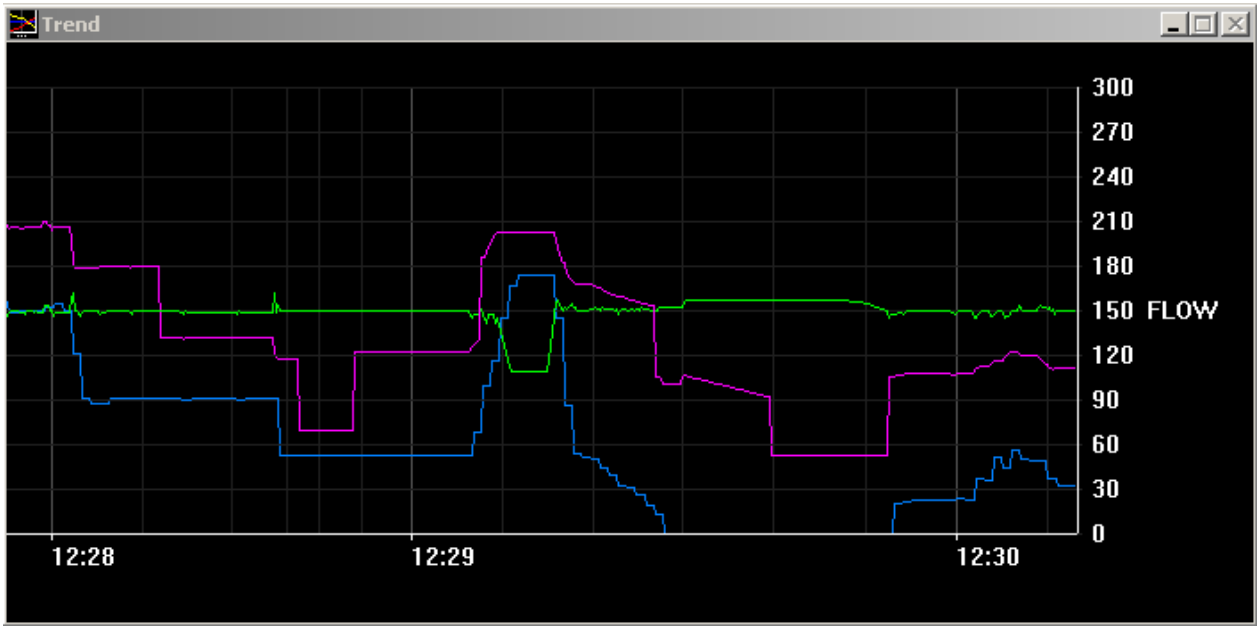
- A virtual HMI on the PC screen. The virtual HMI has identical “looks and feels” as the local HMI. So you don’t need to learn to operate a different program.
- A SCADA screen where the pumps and main readings are graphically animated on the PC screen (Supervisory Control And Data Acquisition).
- A data logger with a real time trend window.
  No need to rent expensive data loggers anymore!
  Selectable trend pens for inlet, discharge pressure, flow, speed, number of pumps, kW, Amps, etc.
- An alarm window showing all active alarms.
- All readings and trend values are update at 0.5 second intervals.
- Password protection.
- All this is still possible if the PC is a remote PC, communicating over a 9600 baud GSM modem!

You can use the AUC3400.exe PC program to:
- remotely view and access all readings and settings
- remotely commission a pump installation
- remotely “coach” a local operator through the process
- download and save the alarm history in a file
- create a complete documentation of all relevant settings and readings (refer to section 15.10.10.4)
- save (attach) the actual screen in a text file named SCREENS.txt

Note: like the local HMI and the virtual PC HMI, the SCADA screen will adjust automatically to the pump local pump configuration. If you connect to different pump sites, the pictures and HMI screen will adjust accordingly. So you don’t need different program versions for the HMI nor SCADA software. For example, in the below screenshot the graphical presentation is automatically adapted to a pump set with two main pumps and a jockey pump.

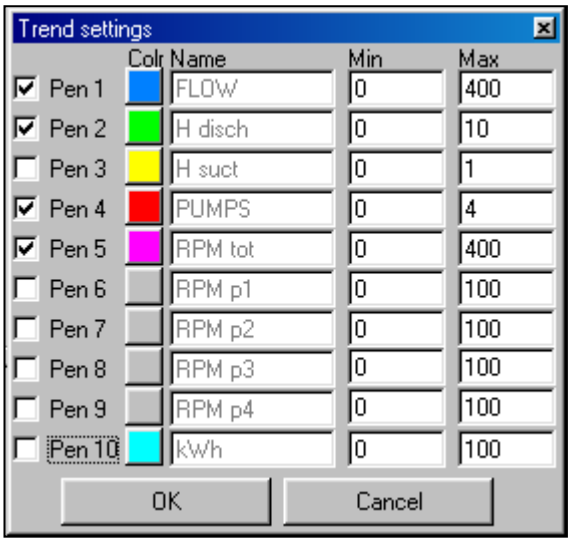


The trend window shows a “trend recorder” like presentation of measurements.



The pens are having the same colours as the numerical reading on the main screen. For example the green pen indicates the pressure.
At the right hand side the numerical value of the vertical axis is shown.
In the bottom the time scale is shown. The whole window is shifted to the left side by one pixel every time a new reading is received from the AUC3400. The refresh rate is about 2 to 3 times a second, depending on which menu of the AUC3400 is active. The fastest update rate is in the (main) menu and in the head up displays.

You can select the pens that you want to show in the PC menu Trend-> Settings. In the same menu you can select which scale should be shown at the right side of the trend window.

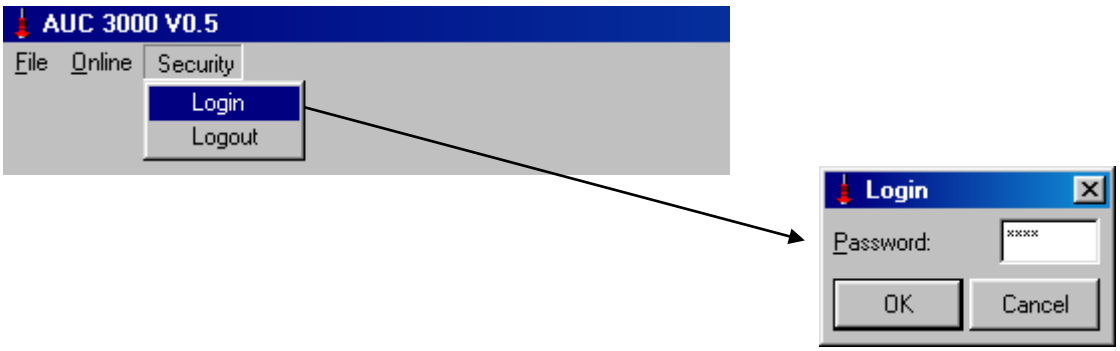


11.1 Security password

To prevent unauthorised access and tampering with an AUC3400 pump controller, a password is required for using the AUC3400.exe PC program. A correct password grants the operator access to the local AUC3400 controller menu system and its control parameters.

Important! The password required is the user password of the local AUC3400 controller.

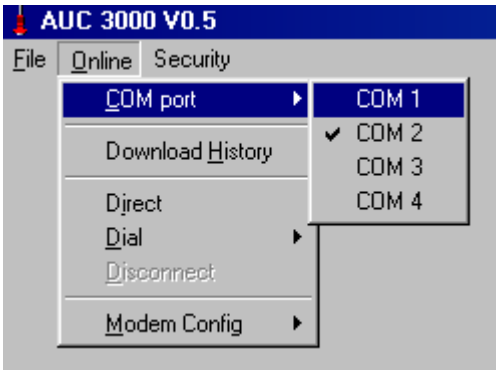
To login:



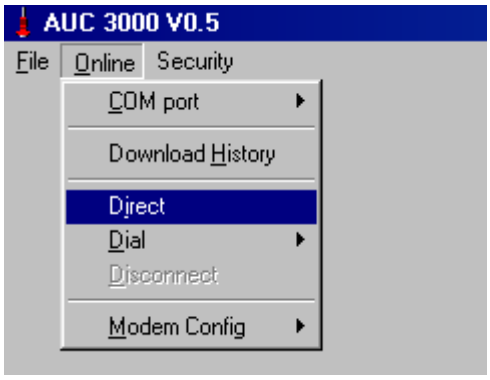
Note: - you do not need a password to monitor the SCADA and default head up display.
- if you only monitor it wise to logout, to avoid unauthorised access.

11.2 Setting up a connection to the local AUC3400

To go on line, first select a COM port on your PC:



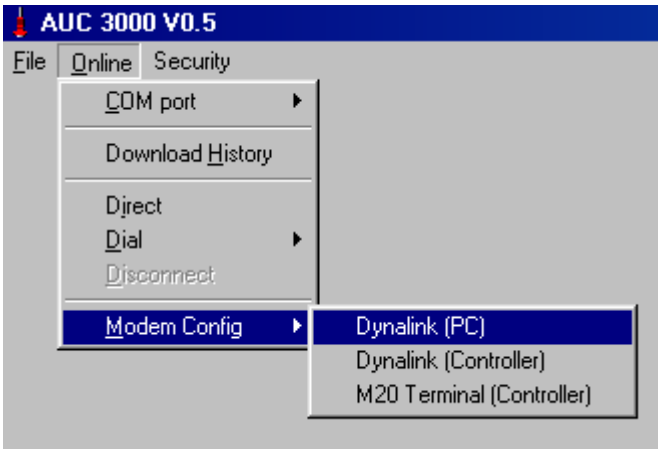
To set up a direct local connection select:



To set up a remote modem connection you need to initialise the modem first, therefore select:

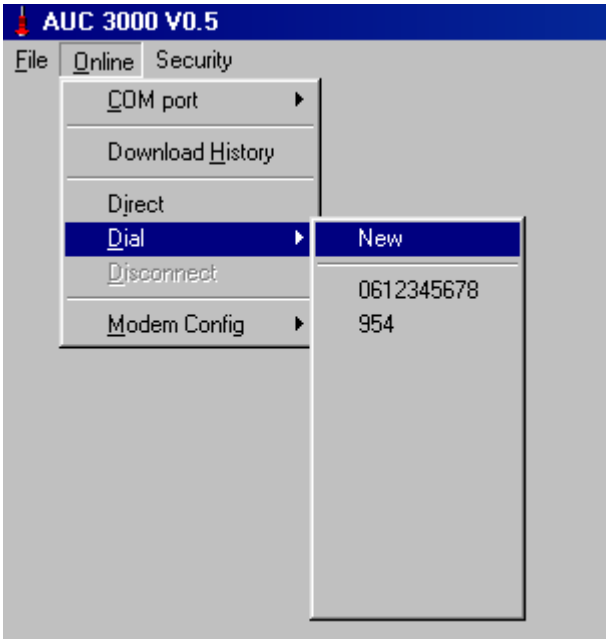
Currently only Dynalink and Siemens M20 (or Siemens MC55i) modems are supported.

Note that this menu is meant to send an initialisation string to the connected modem. As you see you can also initialise modems which are going to be connected locally to the AUC3400 controller.



To set up a remote modem connection dial the number to connect to:

If it is a new number select New, otherwise Select it from the list.



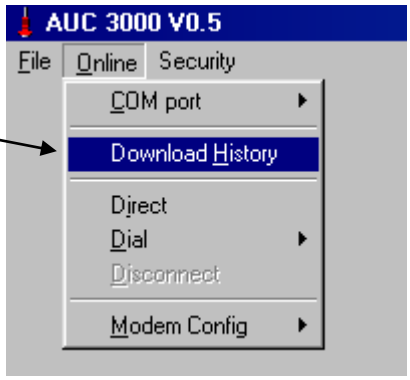
11.3 Downloading the alarm history

To download the alarm history from the local AUC3400:

- on the local HMI or on the virtual HMI on your PC screen, in the alarm history menu (section 15.2.5) select:

```
__DOWNLOAD_HISTORY_
Select the download
option in the PC
program or ESC...
```

- In the AUC3400.exe PC program select:

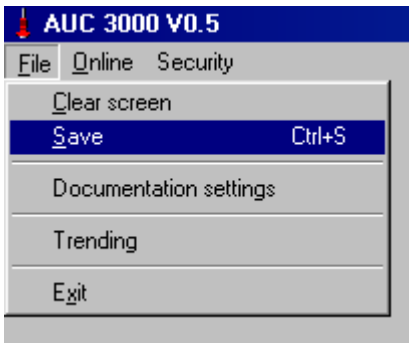


- A text file will appear on you PC Windows desktop.
  The file name is ALARM_YEAR-MONTH-DAY.csv (e.g. ALARM_2004-08-12.csv)
  The file is ready for importing in MS Excel, just double click the file.
  Refer to section 15.2.5 for more info. The lay out looks like this:

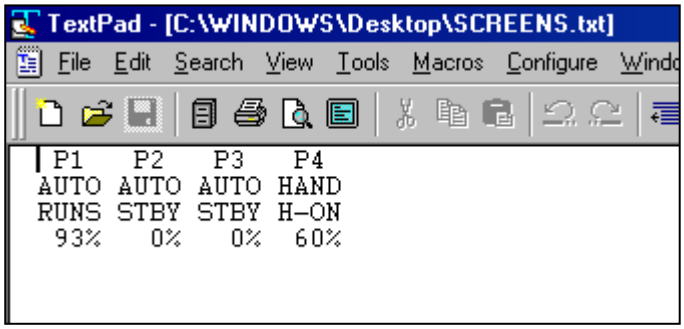
STATUS	ALARM	Time	Date
RESET	Power failure	11:20:56	07-1-04
SET	Power failure	11:20:15	07-1-04
RESET	Pump 4 failure	10:02:49	07-1-04
RESET	Pump 3 failure	10:02:49	07-1-04
RESET	Pump 2 failure	10:02:49	07-1-04
RESET	Pump 1 failure	10:02:49	07-1-04
SET	Pump 4 failure	10:02:47	07-1-04
SET	Pump 3 failure	10:02:46	07-1-04
SET	Pump 2 failure	10:02:46	07-1-04
SET	Pump 1 failure	10:02:45	07-1-04
SET	Phase failure	10:02:43	07-1-04
RESET	Power failure	10:01:42	07-1-04
SET	Power failure	10:00:38	07-1-04
RESET	Power failure	10:00:00	07-1-04
--End of history--			

11.4 Saving the current HMI display to file

- Select:



- A text file will appear on you PC Windows desktop, it is named SCREEN.TXT.
  When you double click the file your default text editor (e.g. NotePad or TextPad) is opened and the HMI display contents appear:



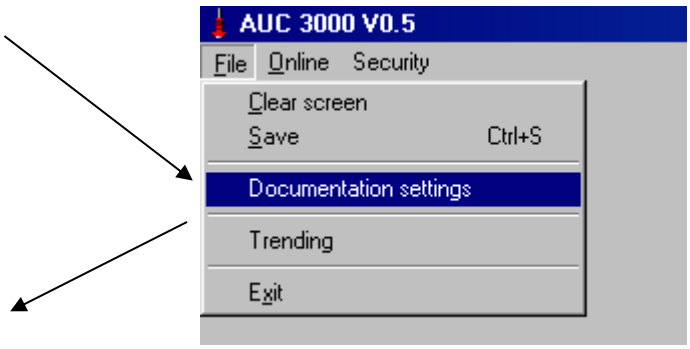
11.5 Documentation

When you have commissioned the AUC3400 you may want to have a complete documentation of all readings and settings in the local controller.
You can achieve this simply following the next steps:

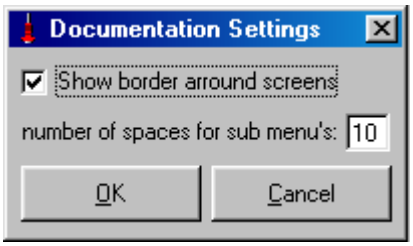
- on the local HMI or on the virtual HMI on your PC screen, in the configuration menu (section15.10.10.4) select:

```
___DOCUMENTATION___
Have PC program
connected. Are you
ready?  >NO
```

- In the AUC3400.exe PC program select:



A pop up window appears:



You can choose here if you want borders around the screen which are captured by the PC program from the local HMI for documentation purposes. See the following description for further explanation.

- on the local HMI or on the virtual HMI on your PC screen, select YES.

```
___DOCUMENTATION___
Have PC program
connected. Are you
ready?  >YES
```

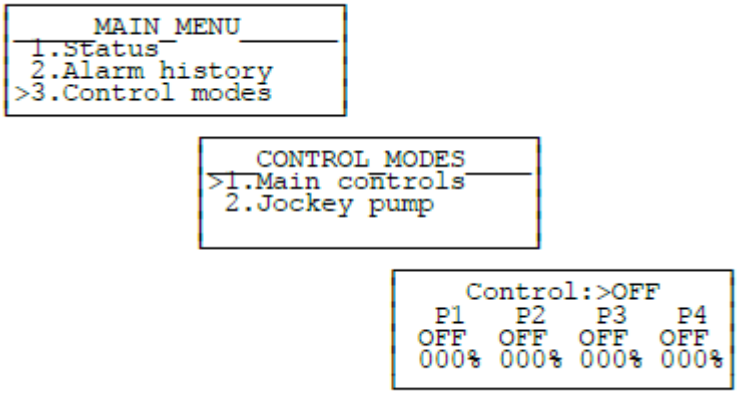
- What you will see now is a fast replay of all relevant submenus and status displays for documentation. The AUC3400.exe PC program captures the displays and writes all the documented displays into a text file.

- The name of the file is made up off the date and extension .txt. (ex. “AUC3400 Documentation 20041116.txt)

  - The contents of the documentation text file looks like this (listed is only an example part of the file with borders not shown):

```
____CONFIGURATION___
>1.Pumps
 2.Sensors
 3.Controller

    ________PUMPS_______
    >1.Main pump setup
     2.Main pump head
     3.Run on time pumps

        __MAIN_PUMP_SETUP___
        Installed: >2 pumps
        of which :  0 pump
        is standby.

    ________PUMPS_______
     1.Main pump setup
    >2.Main pump head
     3.Run on time pumps

        ___MAIN_PUMP_HEAD___

        Actual pump head at
        zero flow: >10.0 Bar
```

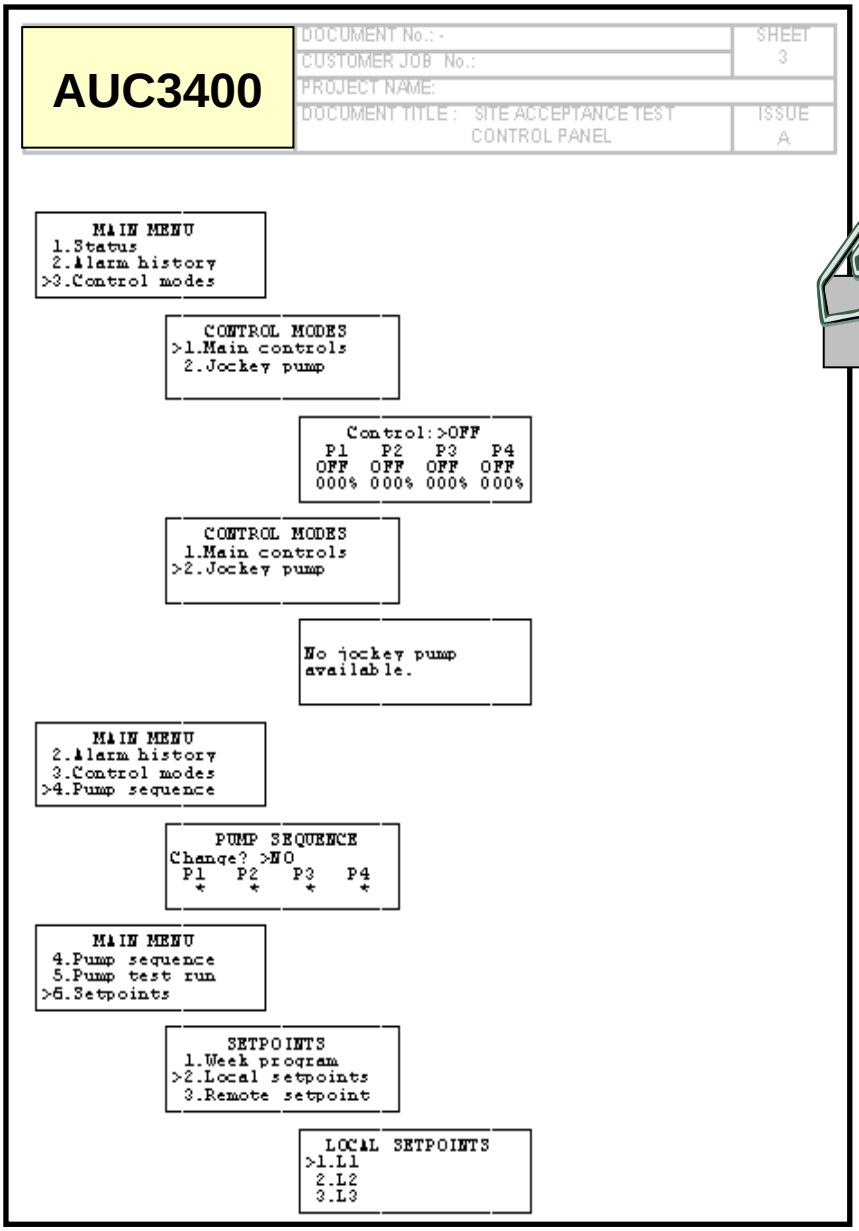
  - The contents of the documentation text file looks like this if you do select to show borders:

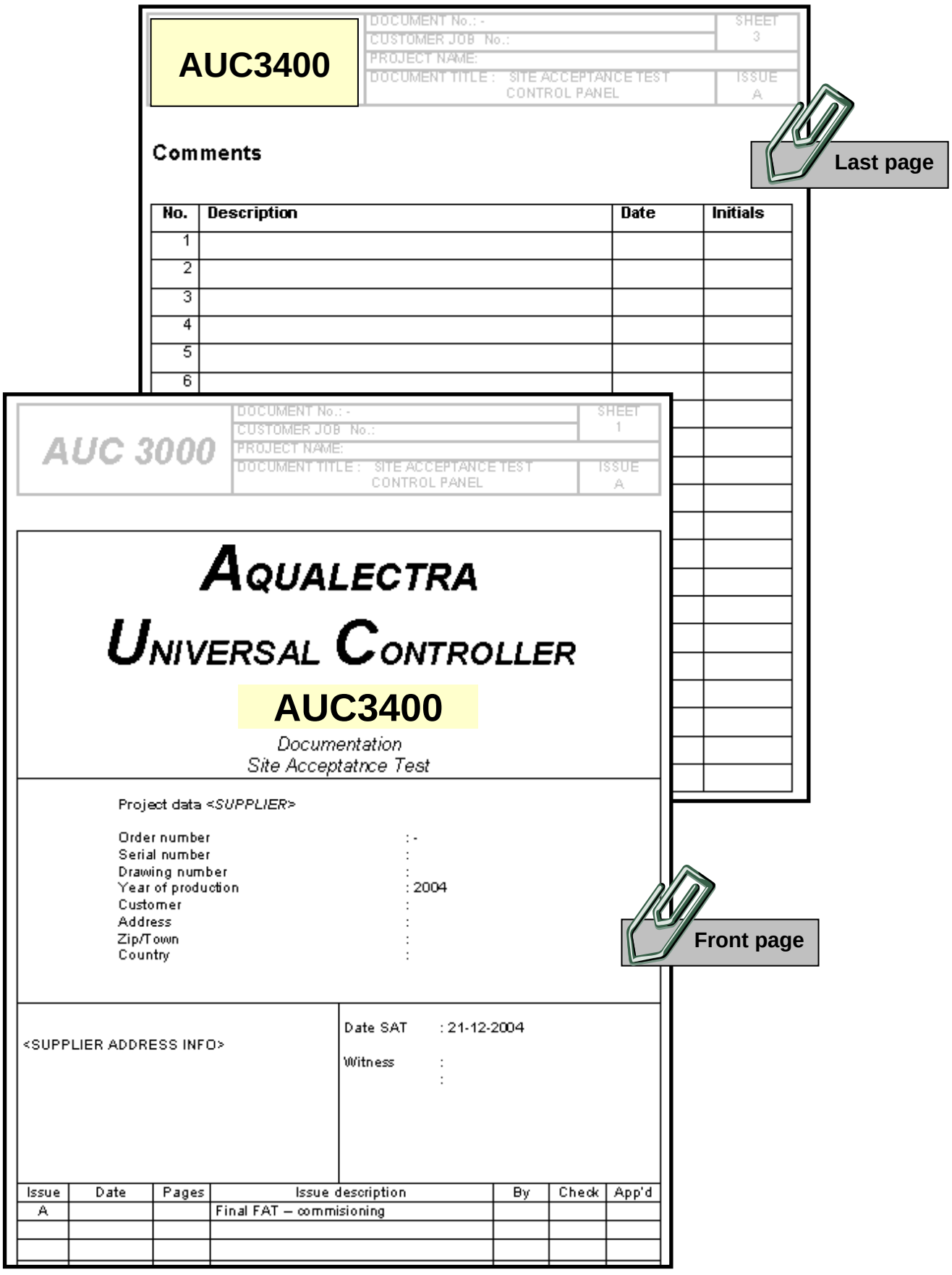


You can open the text file in any text editor, so that you can put your own headers, footers, logos, etc. in the file.

Note: you may need to install Windows font MsLineDraw, in order to correctly show the borders.

You can use this file as a FAT / SAT document (Factory Acceptance Test / Site Acceptance Test). For that purpose you can also use the MS WORD template document “AUC3400 Documentation template .doc”
In this template there is a header page which you can use for FAT/SAT purposes and a comments page.
In the template you can insert documentation text file contents.
The following pages show some examples of using the template in Ms Word.





AUC3400

DOCUMENT No.: -
CUSTOMER JOB No.:
PROJECT NAME:
DOCUMENT TITLE : SITE ACCEPTANCE TEST CONTROL PANEL
SHEET 3
ISSUE A

Comments

Last page

No.	Description	Date	Initials
1			
2			
3			
4			
5			
6			

AUC 3000

DOCUMENT No.: -
CUSTOMER JOB No.:
PROJECT NAME:
DOCUMENT TITLE : SITE ACCEPTANCE TEST CONTROL PANEL
SHEET 1
ISSUE A

AQUALECTRA
UNIVERSAL CONTROLLER
AUC3400
Documentation
Site Acceptatnce Test

Project data <*SUPPLIER*>

Order number : -
Serial number :
Drawing number :
Year of production : 2004
Customer :
Address :
Zip/Town :
Country :

Front page

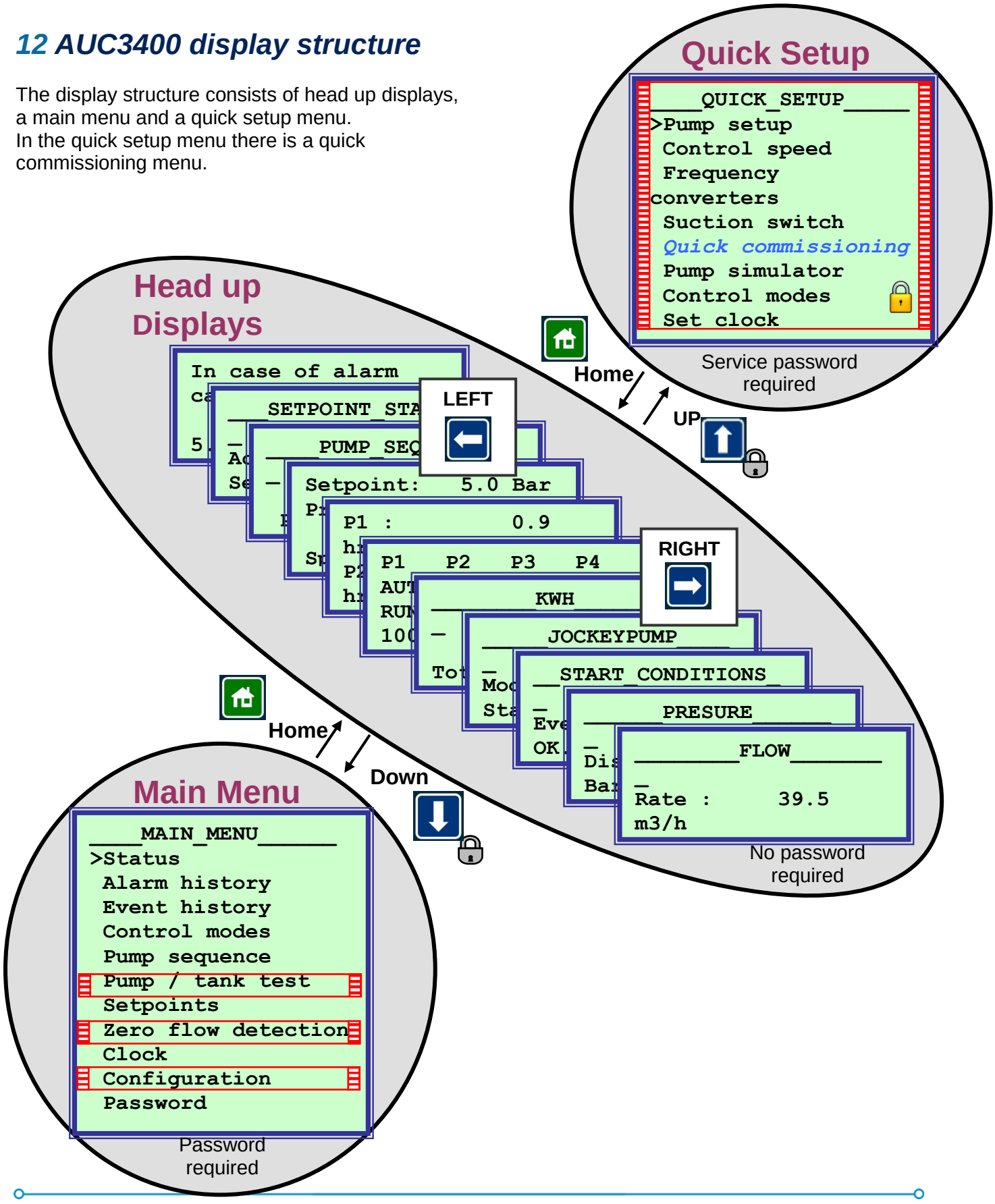
<SUPPLIER ADDRESS INFO>

Date SAT : 21-12-2004
Witness :

Issue	Date	Pages	Issue description	By	Check	App'd
A			Final FAT – commisioning			

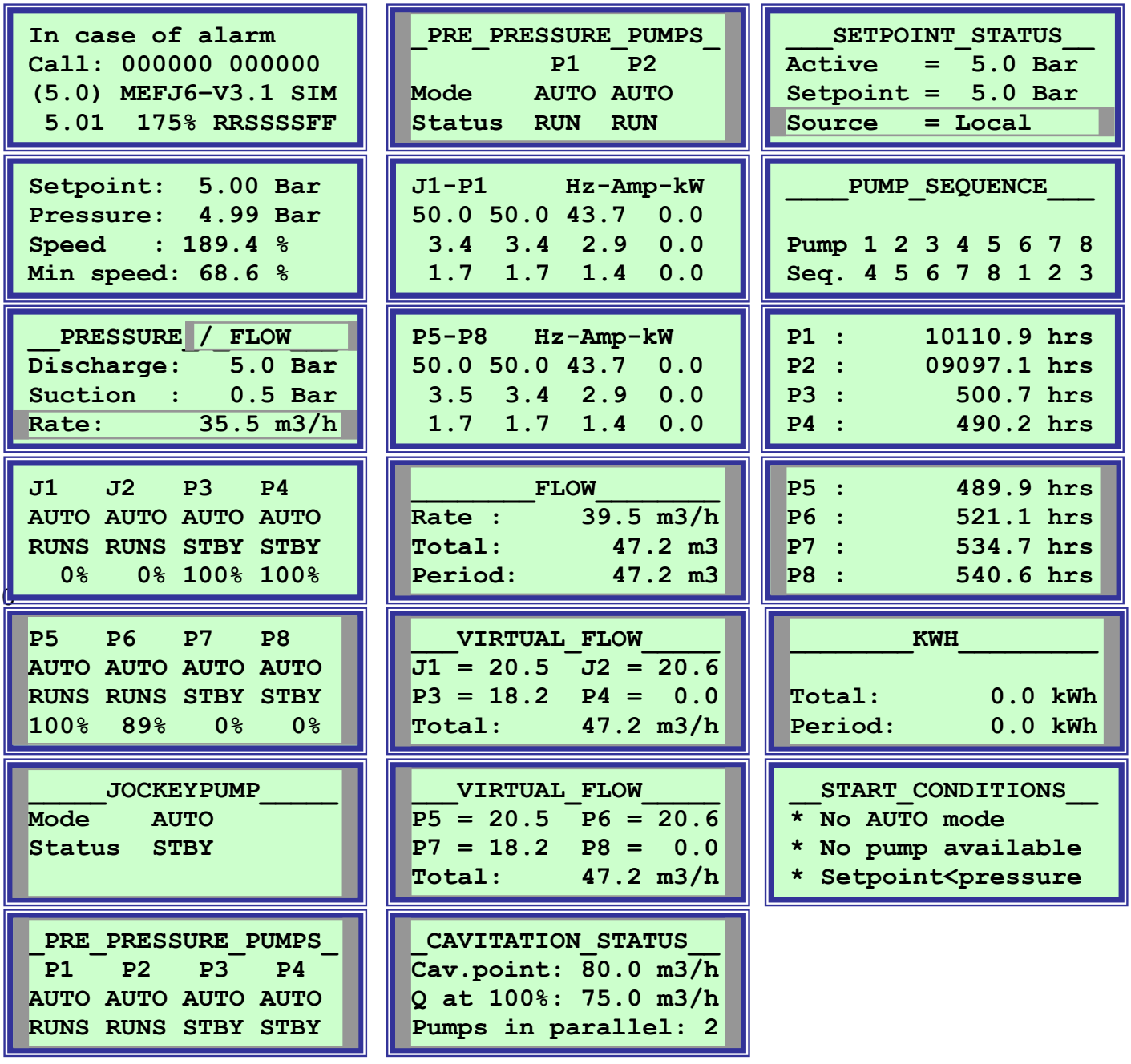
12 AUC3400 display structure

The display structure consists of head up displays, a main menu and a quick setup menu.
In the quick setup menu there is a quick commissioning menu.



13 AUC3400 Head up displays

Head up displays appear when the AUC3400 is powered up or when you press the home key. They list all relevant status information. The head up displays are accessible by everyone, no password is required. Use the arrow keys LEFT and RIGHT to manoeuvre through the displays.

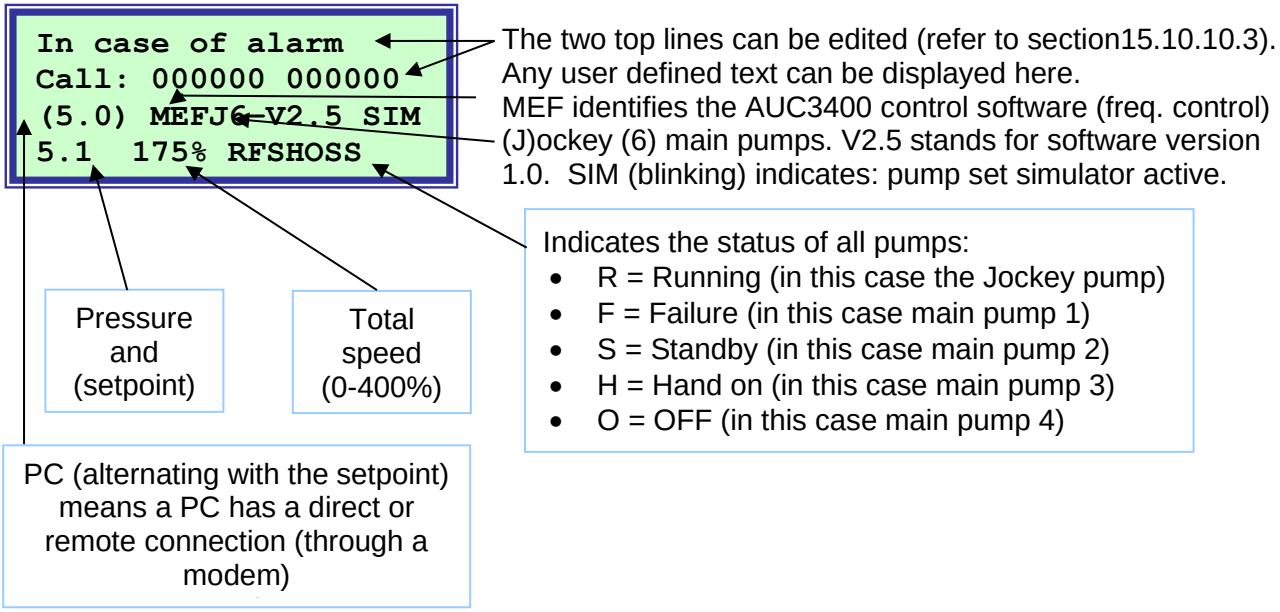


As each of these displays can be found in the menu, they will be discussed in further detail later in this manual.

Notes: the head up display you selected most recently will be the one reappearing after you pressed Home. Furthermore, if you don't touch any keys for 5 minutes the most recent head up display will also reappear automatically. Only relevant information is displayed. For example, if you have only two main pumps installed no information about other pumps will appear.

13.1 The default head up display

One display, the standard or default head up display, can only be found here and not in the status menu:



Notes:
- The text MEFX can be replaced by the actual flow rate (refer to section 0) how to select this option.
- If a remote stop is activated the text "REMOTE STOP" will blink and overlay the text MEFX.

As mentioned by the top display line you can alter the contents. In the configuration menu you will find a sub menu called Head up display where you can edit the contents of the top two lines. The default text is shown here. You may want to edit the telephone number, but you just as well put in any other desired text. Refer to section 15.10.10.3 for more details.
When you have commissioned the AUC3400 and specified what text you would like to see in the top two lines of the default head up display, you may want to lock the default head up display. There are two options:

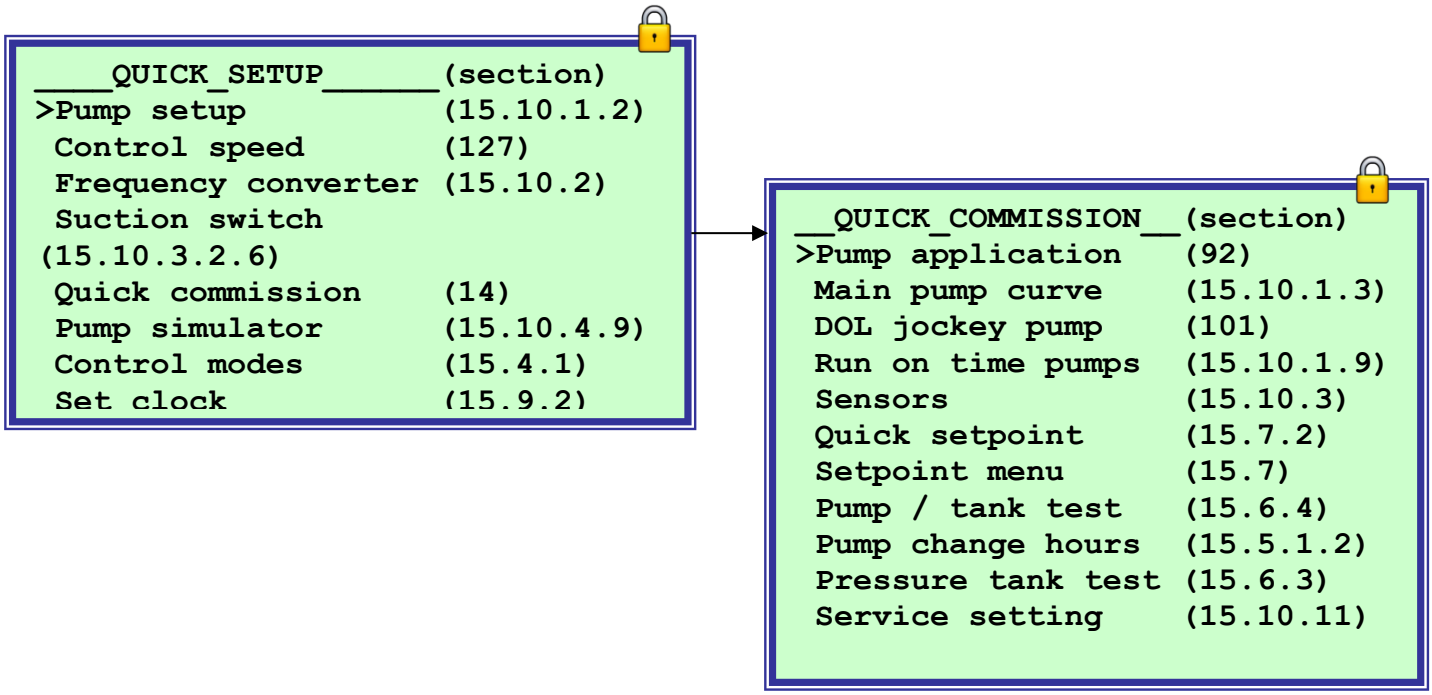
1. You select the default head up display to be the only visible head display. That means that no operator can select any other head up display. However the menu is still accessible.
2. You can lock the menu as well. Now no operator can selected any other head up display and not access the menu system either. The default head display (with your specified text) will remain the only visible display. To access the menu system, the operator will have to specify the service access code.

   For more information refer to section 15.10.10.1 in the configuration menu.

14 AUC3400 Quick Setup

The quick setup menu lists the most commonly used items and is intended for usage in the workshop of the supplier and for commissioning in the field.

For commissioning purposes a menu option <Quick commission> is available in the quick setup menu.
The quick setup can only be access by service personnel.
From the head up displays, press arrow UP to access the Quick setup menu.



Use the UP and DOWN arrow keys to scroll up or down and press enter or RIGHT arrow to select an option.
Note: the menu options listed here are described in detail in the section numbers as indicated behind each option.

15 AUC3400 menu

The menu is a hierarchical structure of related items, containing sub menus, status information and settings used for setting up, controlling and monitoring the pump application.

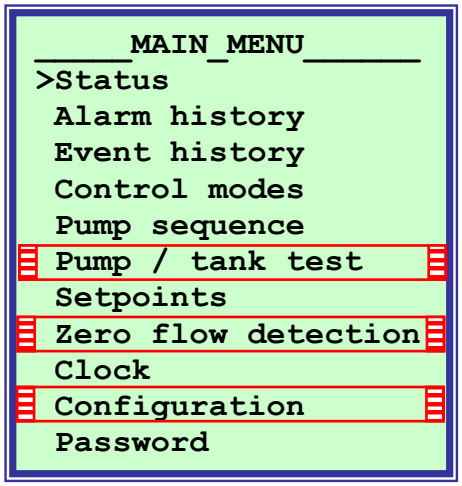
IMPORTANT

The menu is a dynamic system. The options that are described in the manual are all present in each AUC3400 but may not appear in your menu system because there are hidden.

Options are hidden when they are not relevant in your configuration. Your configuration is set up in the Quick setup and Quick commissioning menu.
Examples:

- if your configuration is set up to control 2 main pumps, you will find no information about the other possible 6 pumps that can be controlled.
- If a user logs in without the service code, only view options can be seen in the main menu.
- The first option in the Quick commissioning menu prompts for the pump application. You may choose between pressure boosting and irrigation. If you choose the latter you find additional options such as pre-pressure pumps suddenly available in the menu.

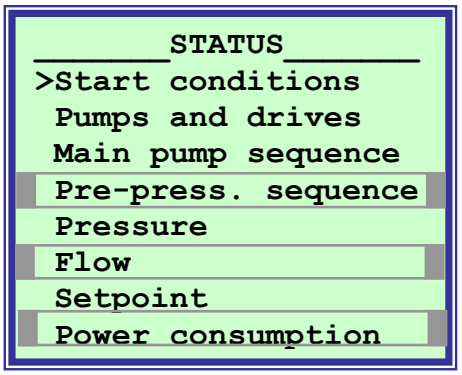
From the head up displays, press arrow DOWN or ENTER to access the Main menu.



Use the UP and DOWN arrow keys to scroll up or down and press enter or RIGHT arrow to select an option. The current option being considered below is indicated by the "**>**" sign.

15.1 Status

MAIN menu >



The status sub menu contains status information concerning the system. Most of this information can also be found in the head up displays.

15.1.1 Start conditions

MAIN menu > Status >

```
__START_CONDITIONS__
* failure: shut down
* no AUTO mode
* no pump available
```

If the system won't run, you may consult the start conditions. It will show you why pumps are not in operation.

The following hints may appear:

- Everything is OK (System should be up and running)
- Failure: shut down (There is a shut down failure, press the alarm key to see what it is)
- No AUTO mode (Go to Control modes and select AUTO mode)
- No pump available (All pumps have failed or their control mode is OFF)
- Remote stopped (Control was remotely stopped by a digital contact)
- No setpoint (0) (No setpoint was specified or zero, go to the setpoints menu)
- Setpoint < pressure (The actual setpoint is less than the actual pressure)

15.1.2 Pumps and drives

MAIN menu > Status >

```
___PUMP_AND_DRIVES__
>Main pumps (1-4)
 Main pumps (5-8)
 Prepress. pumps
 Jockey pump (DOL)
 Hz, Amp's & kW
 Running hours
 FC drive status
```

Note: depending on your configuration you may see other descriptions here.
For example if you have only two main pumps and nothing else this menu will appear as:

```
___PUMP_AND_DRIVES__
>Main pumps
 Hz, Amp's & kW
 Running hours
 FC drive status
```

15.1.2.1 *Main pumps*

MAIN menu > Status > Pump and drives

```
P1    P2    P3    P4
AUTO  AUTO  AUTO  AUTO
RUNS  RUNS  STBY  STBY
100%   89%    0%    0%
```

Line 1 shows the available pumps.
Line 2 shows the pump modes (AUTO – OFF – HAND)
Line 3 shows the status (RUNS – STANDBY – OFF – ERROR – H-ON '= Hand on')
Line 4 shows the speed of the pump (0 – 100 %)

Note: if you have configured the AUC3400 to control a different number of pumps, then the pump status display will look different as well. For example: if you have 2 pumps installed you would get the following display lay out:

```
          P1    P2
Mode      AUTO  AUTO
Status    RUNS  RUNS
Speed     100%   89%
```

Note: if you have external selector switches on the door of the panel, AUTO - HAND and OFF modes will indicates the position of those switches. If you do not have external switches, then AUTO - HAND and OFF will follow the selections made in the control mode menu.
The AUC3400 obtains the presence and status of external mode selector switches through the frequency converter and the communications bus.

15.1.2.2 *Pre-pressure pumps*

MAIN menu > Status > Pump and drives >

```
_PRE_PRESSURE_PUMPS_
          P1    P2
Mode      AUTO  AUTO
Status    RUNS  RUNS
```

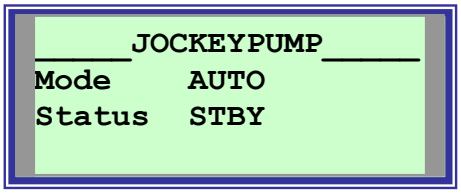
Line 2 shows the available pre-pressure pumps.
Line 3 shows the pump modes (AUTO – OFF – HAND)
Line 4 shows the status (RUNS – STANDBY – OFF – ERROR – H-ON

'= Hand on')

Note: if you have configured the AUC3400 to control a different number of pumps, then the pump status display will look different as well.
Note: if you have external selector switches on the door of the panel, AUTO - HAND and OFF modes will indicates the position of those switches. If you do not have external switches, then AUTO - HAND and OFF will follow the selections made in the control mode menu.

15.1.2.3 *Jockey pump*

MAIN menu > Status > Pump and drives



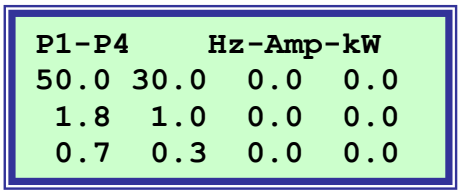
Line 2 shows the pump modes (AUTO – OFF – HAND)
Line 3 shows the status (RUNS – STANDBY – OFF – ERROR)

Note: refer to section 15.7.13 for a description about jockey pump control.

15.1.2.4 *Hz, Amp's and kW's*

MAIN menu > Status > Pump and drives

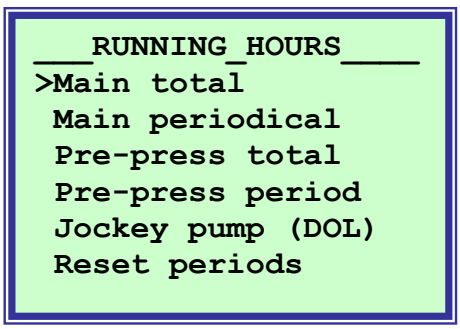
This readout window shows the measured values of each pump as received over the serial bus line from the frequency converters.



2nd line shows the frequency of each pump
3rd line show the amp readings of each pump
4th line shows the kilowatts of each pump

15.1.2.5 *Running hours*

MAIN menu > Status > Pump and drives >



The controller continuously updates total hours and periodical hours. The total hours counter always continues and cannot be reset. Periodical hours can be reset as often as necessary.

15.1.2.5.1.1 Main total hours

MAIN menu > Status > Pump and drives > Running hours >

```
P1 :          100.2 hrs
P2 :           90.1 hrs
P3 :           88.9 hrs
P4 :          103.4 hrs
```

15.1.2.5.2 Main periodical hours

MAIN menu > Status > Pump and drives > Running hours >

```
P1 :            1.3 hrs
P2 :            1.6 hrs
P3 :            0.7 hrs
P4 :            0.2 hrs
```

15.1.2.5.3 Pre-press total hours

MAIN menu > Status > Pump and drives > Running hours >

```
P1 :          100.2 hrs
P2 :           90.1 hrs
P3 :           88.9 hrs
P4 :          103.4 hrs
```

15.1.2.5.4 Pre-press periodical hours

MAIN menu > Status > Pump and drives > Running hours >

```
P1 :            1.3 hrs
P2 :            1.6 hrs
P3 :            0.7 hrs
P4 :            0.2 hrs
```

15.1.2.5.5 Jockey pump (DOL)

MAIN menu > Status > Pump and drives > Running hours >

```
__JOCKEY_PUMP_(DOL)_
Running hours.
Total:            0.0
Period:           0.0
```

15.1.2.5.6 Reset period

MAIN menu > Status > Pump and drives > Running hours >

```
The periodical
Run hours are reset.
```

As soon as this option is selected, the periodical hours are reset.

15.1.2.6 FC drives status

MAIN menu > Status > Pump and drives >

```
___FC_DRIVE_STATUS__
>FC drive pump 1
 FC drive pump 2
 FC drive pump 3
 FC drive pump 4
 FC drive pump 5
 FC drive pump 6
 FC drive pump 7
 FC drive pump 8
```

The AUC3400 controller receives the status of each frequency converter (FC drive) over the bus line. That status is displayed for each pump, for example the first pump will display something similar to the following information:

```
COM1 OK: 2334 ER:  5
RUNS: SPEED = REF
CRDY DRDY STBY TRIP
WARN VH/L ILIM TH-W
```

Indication	Meaning
COM1	communication with FC drive 1 for pump motor 1
2334 / 5	communication protocols were OK, but 5 had an error. Those numbers indicate whether the communication is working good or not. Normally an error rate of 1 to 5 per thousand is normal.
RUNS	the pump motor is running
SPEED = REF	that the motor runs at exactly the speed requested by the AUC3400. SPEED <> REF means that the motor is ramping up or down to the requested speed. You may see this appears very briefly as the speed is adjusted.
CRDY	Control Ready, the drive is healthy and ready for operation
DRDY	Drive ready, waiting for a start signal
TRIP	Drive has an error or failure and needs to be reset. Read the FC display to see what error caused the drive to trip. In case of a Danfoss VLT 2800 you need to look up the error number being displayed in the Danfoss manual. In case of a Danfoss VLT 6000 the cause of the error is displayed in plain text. In case of a Danfoss FC200, look below or at the FC200 display for an alarm message or at FC200 menus 1690 and 1691 for detailed alarms.
WARN	There is a warning situation. Like a trip you can read at the FC display what caused the warning.
VH/L	Voltage high / low (DC link voltage, FC200 only) See also section 15.10.2.3.
ILIM	Current limit. (FC200 only) See also section 15.10.2.3.
TH-W	Thermistor failure warning (FC200 only). See also section 15.10.2.3.

15.1.3 Main pump sequence

MAIN menu > Status >

The status display show one of two versions, depending on if the hourly pump change was enabled (section15.5).

If it is enabled you will see:

```
____PUMP_SEQUENCE___
Change:     39.51 hrs
 P1    P2    P3    P4
  2     3     4     1
```

or

```
____PUMP_SEQUENCE___
Change:     42 min.
 P1    P2    P3    P4
  2     3     4     1
```

If the hourly pump change was disabled:

```
____PUMP_SEQUENCE___

 P1    P2    P3    P4
  2     3     4     1
```

Note: if you have a pump configuration with frequency controlled jockey pumps the jockeys are indicated by a capital J. They also have their own pump sequence, prior to the main pumps.

For example, suppose the pump sequence with 2 with frequency controlled jockey pumps is:

```
____PUMP_SEQUENCE___

 J1   J2   P3   P4
  1    2    3    4
```

Then after a pump change the sequence will become:

```
____PUMP_SEQUENCE___

 J1   J2   P3   P4
  2    1    4    3
```

15.1.4 Pre-pressure pump sequence

MAIN menu > Status >

The status display show one of two versions, depending on if the hourly pump change was enabled (section 15.1.3).

If it is enabled you will see:

```
____PUMP_SEQUENCE___
Change:     39.51 hrs
 P1   P2   P3   P4
  2    3    4    1
```

or

```
____PUMP_SEQUENCE___
Change:     42 min.
 P1   P2   P3   P4
  2    3    4    1
```

If the hourly pump change was disabled:

```
____PUMP_SEQUENCE___

 P1   P2   P3   P4
  2    3    4    1
```

15.1.5 Pressure

MAIN menu > Status >

```
___PRESURE_/_FLOW___
Discharge:  5.00 Bar
Suction   :  0.48 Bar
Rate:       17.3 m3/h
```

Discharge pressure, suction pressure and flow are updated and displayed. If no suction pressure sensor is installed, the fixed suction pressure specified in the configuration menu is shown (refer to section 15.10.3.2.1).
The flow rate can be a value derived either from an analogue input from flow meter, a pulsed digital input from a totalising flow meter, or a calculated virtual flow value. Refer to section 15.10.3.4 for details on how to configure the flow measurements.

15.1.6 Flow

MAIN menu > Status >

```
_________FLOW_________
>Readings
 Reset period
 Virtual flow
```

The controller continuously updates the flow rate (m^3/h), the total pumped volume (m^3) and the periodically pumped volume (m^3).
The total counter always continues and cannot be reset. The periodic counter can be reset as often as required.

15.1.6.1 Flow readings

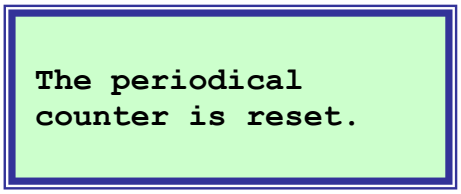
MAIN menu > Status > Flow >

```
_________FLOW_________
Rate :      39.5 m3/h
Total:        65.8 m3
Period:       65.8 m3
```

The flow rate can be a value derived from either an analogue input from flow meter, a pulsed digital input from a totalising flow meter, or a calculated virtual flow value. Refer to section 15.10.3.4 for details on how to configure the flow measurements.

15.1.6.2 *Reset period*

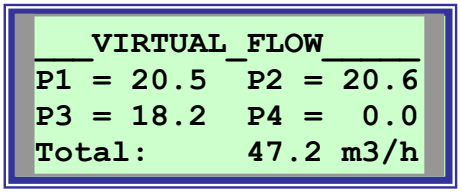
MAIN menu > Status > Flow >



As soon as this option is selected, the periodical flow counter is reset.

15.1.7 Virtual flow

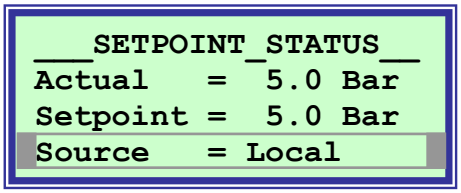
MAIN menu > Status > Flow >



Shows the virtual flow calculated by the AUC3400 based on the pressure and the pump curve of the pump. Refer to section 15.10.3.4.3 for more information.
Note: if virtual flow is not enabled, you will not find this option in the menu.

15.1.8 Setpoint

MAIN menu > Status >



Actual Shows what the current value for the selected setpoint is.

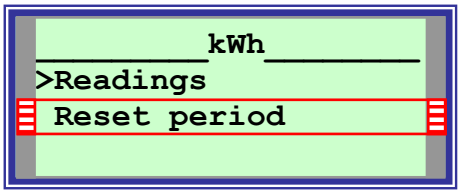
It may differ from the “Setpoint”, because of the programmed setpoint ramp. This ramp slows down the changes in setpoint levels. Refer to the setpoint ramp in the setpoint menu section 15.7.11.

Setpoint Shows the currently selected setpoint.

Source Indicates Local or Remote setpoint.
A local setpoint is obtained from the week program. A remote setpoint can be externally activated by a digital input. The reference for an external setpoint is an analogue input signal coming from an external source.
Note: if you have not enabled the external setpoint, source will not be relevant and thus not appear.

15.1.9 Power consumption

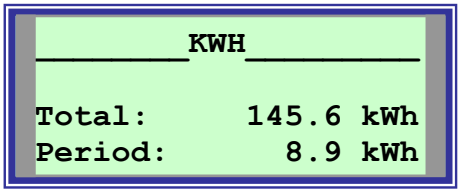
MAIN menu > Status >



The power consumption is calculated from a digital input. For configuration of the kWh refer to section 15.10.3.5
The controller updates a total kWh and a periodical kWh counter. The total counter always continues and cannot be reset. The periodical counter can be reset as often as required.

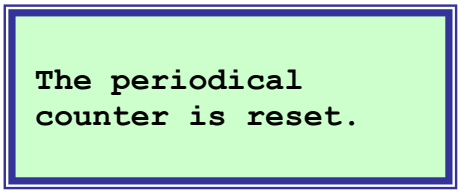
15.1.9.1 Readings

MAIN menu > Status > Power consumption >



15.1.9.2 *Reset period*

MAIN menu > Status > Power consumption >



As soon as this option is selected the periodical kWh counter is reset.

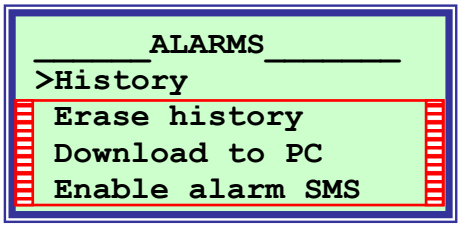
15.2 Alarms

MAIN menu > alarm history >

Alarms in the AUC3400 are handled by the following procedures:

1. The alarm led on the fronts starts blinking each time a new alarm is triggered.
2. The general alarm contact on the terminals breaks (fail save, potential free, relay contact).
3. The alarm possible causes the AUC3400 to stop one or more pumps.
   (depending on the nature and consequences of the concerned alarm)
4. The alarm will show up in the alarm list (press the alarm button)
5. The alarm is recorded in the alarm history (to be found in the menu).
6. The alarm is possible send by SMS to a registered recipient.
7. If the AUC3400 PC program is on line, the alarm will be shown on the PC.
8. If a modem SMS pool is configured the alarm may be relayed to several recipients.
9. If the PC program is connected you can download the alarm history to the PC and store the alarms in a .csv file (comma separated file) which may be imported to MS Excell.

This section continues describing the alarm history menu. The menu present a history of alarms and the opportunity to generate alarm SMS messages and download the history to a PC.



The above options will be discussed later; first a description is given for the actual alarms.

15.2.1 Actual alarms

Direct access by alarm button

The actual alarms can be accessed by means of the red alarm button. 
If you view the actual alarms list you will get the following display when no alarm is active:

```
No alarm active.
```

If there is an alarm you get something similar to this example:

```
* Phase failure
* Pump 1 failure

Enter = reset
```

In this case there is a pump failure and a phase failure.
Note: each time a new failure appears, the red alarm L.E.D. starts blinking.

Press the enter key to reset failures. If a failure cannot be reset, because the fault condition has not been cleared, the alarm L.E.D. stops blinking and is continuously illuminated. This indicates you have seen the alarm and acknowledged it. If the fault condition has been cleared, press the reset again and the alarms will disappear from the display and the alarm L.E.D. will go off.
Remember that resetting alarms will also restart your pumps, if no further alarms are present.
Notes:

- pump alarms will automatically reset, you do not need to specifically reset manually on the AUC3400. Inlet alarms and high discharge alarms will automatically reset after a specified time (refer to sections 15.10.3.2.4 and 15.10.3.1.4)

15.2.2 Alarm overview

Nr	Alarm	Description
1	Pump 1 failure	Pump failure. A pump failure is caused by: • a tripped circuit breaker (check motor rating) • a tripped frequency converter (section 15.1.2.6) • a communication failure (see next error)
2	Pump 2 failure	
3	Pump 3 failure	
4	Pump 4 failure	
5	Pump 5 failure	
6	Pump 6 failure	
7	Pump 7 failure	
8	Pump 8 failure	
9	Drive 1 COM error	FC drive communications error. The AUC3400 controls the frequency converters over the RS485 serial bus. The communication is no longer possible when this error appears. Check the cable connection and if the frequency converter is online (power on and no errors in the display of the drive).
10	Drive 2 COM error	
11	Drive 3 COM error	
12	Drive 4 COM error	
13	Drive 5 COM error	
14	Drive 6 COM error	
15	Drive 7 COM error	
16	Drive 8 COM error	
17	Failure flow meter	Broken sensor cable of the flow meter, check cable.
18	Phase failure (SD)	One or more of the incoming power phases failed.
19	Inlet wire break (SD)	Broken sensor cable of the inlet sensor, check cable.
20	R.setp.wire break	Broken sensor cable of the remote setpoint, check cable.
21	Disch.wire break (**SD)	Broken sensor cable of the discharge sensor, check cable. See also Nr 70 for second discharge sensor alarm.
22	Dry running (SD)	Inlet pressure is too low (section 15.10.3.2.3 / 15.10.3.2.6).
23	High disch.press.	Discharge pressure is too high (section 15.10.3.1.3 / 15.10.3.1.8).
24	Low disch.press. (SD)	Discharge pressure is too low (section15.10.3.2.3).
25	Power failure (SD)	Incoming power on the main failed.
26	Jockey pump fail.	The direct on line operated jockey circuit breaker tripped.
27	Service due	Service visit is to be scheduled (see section 15.10.11).
28	Flow > threshold	Flow was higher than the set threshold (see section **Fout! Verwijzingsbron niet gevonden.**).
29	Pres.tank air low	Low air pressure in the diaphragm tank (section 15.6.3).
30	Pres.tank air high	High air pressure in the diaphragm tank (section 15.6.3).
31	COM err. IO mod.1	The pre-pressure pumps are controlled by remote I/O modules. The AUC3400 communicates with the remote I/O modules over the RS485 bus. The connection was lost. Check the communication cable and the power on the remote modules.
32	COM err. IO mod.2	
33	COM err. IO mod.3	
34	COM err. IO mod.4	
35	Write er.remoteIO	A command of the AUC3400 was not accepted.
36	Preprespump1fail. (*SD)	Pre-pressure pump failure. A pre-pressure pump failure is caused by: • a tripped circuit breaker (check motor rating) • a tripped converter (section 15.1.2.6) • a communication failure (see previous errors)
37	Preprespump2fail. (*SD)	
38	Preprespump3fail. (*SD)	
39	Preprespump4fail. (*SD)	
40	Preprespump5fail. (*SD)	
41	Preprespump6fail. (*SD)	
42	Preprespump7fail. (*SD)	
43	Preprespump8fail. (*SD)	
44	Leakage detected. (SD)	Pump(s) started more often than allowed (section 15.6.4)

Nr	Alarm	Description
45	P1 thermistor hot	Pump thermistor error Note: this alarm applies only to Danfoss FC200 drives. Thermistors are thermally sensitive resistors and have a positive (PTC) resistance/temperature coefficient. Build into the pump motor they signal high, possibly dangerous motor temperatures. The thermistor is connected to the frequency converter drive. The AUC3400 read the error and stops the concerned pumps to protect from damage. Thermistors must selected in the menu (See section 15.10.2.3.
46	P2 thermistor hot	
47	P3 thermistor hot	
48	P4 thermistor hot	
49	P5 thermistor hot	
50	P6 thermistor hot	
51	P7 thermistor hot	
52	P8 thermistor hot	
53	P1 currentlimited	Note: this alarm applies only to Danfoss FC200 drives. The frequency converter drive may limit the current drawn by a pump when overloaded due to heavy load. If you want to detect this, you can enable menu option in the frequency converter menu.
54	P2 currentlimited	
55	P3 currentlimited	
56	P4 currentlimited	
57	P5 currentlimited	
58	P6 currentlimited	
59	P7 currentlimited	
60	P8 currentlimited	
61	P1 DC link V-H/L	The frequency converter drive may suffer a low DC link voltage when problems with the supply voltage occur. If you want to detect this, you can enable menu option in the frequency converter menu
61	P2 DC link V-H/L	
62	P3 DC link V-H/L	
63	P4 DC link V-H/L	
64	P5 DC link V-H/L	
65	P6 DC link V-H/L	
66	P7 DC link V-H/L	
67	P8 DC link V-H/L	
68	High water level	High water detected. This alarm comes from an optional external level controller. It signals a high water level in the well or possibly in the control room.
69	Forced (FC) stop (SD)	You can select to connect an optional contact to the AUC3400 inputs, indication an emergency stop. (section 15.10.8). If selected the AUC3400 will raise an alarm and stop the pumps using DC braking. Normally the pumps will have a coasted stop. Note: the AUC3400 must reprogram the drives for this option.
70	Disch.wire break2 (**SD)	Broken sensor cable of the discharge sensor, check cable.

Notes:

(SD) indicates Shut Down alarm. All the pumps are stopped when such alarm is raised.
(*SD) indicates a possible shut down caused by pre-pressure pumps. If depends on the number of available pre-pressure pumps if the system is completely shut down.
(*SD) indicates a possible shut down. When a single discharge sensor is used the controller will shut down. If a redundant sensor is used the controller will not shut down when the alternate sensor is still available.

15.2.3 History

MAIN menu > Alarm history >

In the history you will find on each display:

- The alarm description
- Coming (*) or going (-) of fault
- Time of coming (*) or going (-) of fault
- Date of coming (*) or going (-) of fault
- The alarm index, for example 1/50 means alarm record 1 out of 50 alarms in total.

Examples:

```
- Phase failure

Time: 12:38:36
Date: 01-07-12  1/50
```

This alarm is going "-".
In this case it means the alarm was reset by the operator at the stated time and date.

```
* Power failure

Time: 10:00:00
Date: 01-07-12 50/50
```

Note: That power failure appears only in the alarm history and not in the actual alarm list. This is because the alarm cannot be viewed during the power failure and is automatically reset when the power is restored. However, the alarm L.E.D. will be illuminated.

```
* Pump 1 failure

Time: 10:02:45
Date: 01-07-12 45/50
```

Note: The history records a maximum of 99 alarms. After that, the oldest alarm is removed from the history to allow the entry of a new alarm.

15.2.4 Erase history

MAIN menu > Alarm history >

After selecting this option the alarm history is reset (service password required).

```
The alarm
history is erased.
```

15.2.5 Download history PC

MAIN menu > Alarm history >

```
__DOWNLOAD_HISTORY_
Select the download
option in the PC
program or ESC...
```

With the AUC3400.exe PC program you can operate the controller from a remote site, for example your office. In the AUC3400 PC program is a download option. You can use this to download the complete alarm history to a PC. Refer to chapter 11.3 for further information.

15.2.6 Enable alarm SMS

MAIN menu > Alarm history >

I you want you can order an optional Siemens C35i modem and receive SMS alarm messages on your mobile phone. Refer to section 15.10.5 for selecting the type of modem you use. Before you can have the modem operating, you need to order a data SIM card from your local provider and insert this into the modem slot.

The Siemens modem has no digital input. SMS messages are controlled and sent by the AUC3400 through command string over the serial connection between AUC and MC55i.
SMS messages are sent when you set the following option to YES:

```
_____ALARM_SMS______
0 alarms waiting
Next SMS in: 0 sec.
Enable SMS: >NO
```

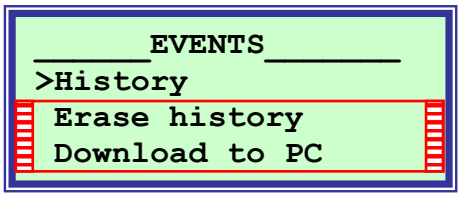
On the second line the AUC3400 indicates the number of alarms waiting to be send by SMS. However, if you disable SMS (by selecting NO) the send buffer will remain empty and no alarms will be transmitted. Therefore, when you do a commissioning or servicing you can disable the transmittal of SMS messages. When you are done commissioning or servicing, enable the SMS messages again.

If you have enabled SMS and failures occur, they are placed in an internal transmission buffer of the AUC3400. The alarms in the buffer will be send one at the time with an interval of 20 seconds. This delay is necessary for the modem, because it needs time for each SMS transmittal.
The time delay is visible on the third line.
When you power up the panel there will be a one minute delay before the first possible SMS will be transmitted. This delay is required for the start up sequence of the modem (connecting to the GSM network and provider).

15.3 Events

MAIN menu > event history >

This event menu presents a history of events and a way to download the history to a PC.



The above options will be discussed later; first all available events are listed:

Pump 1 started	Main pump 1 was started
Pump 2 started	Main pump 2 was started
Pump 3 started	Main pump 3 was started
Pump 4 started	Main pump 4 was started
Pump 5 started	Main pump 5 was started
Pump 6 started	Main pump 6 was started
Pump 7 started	Main pump 7 was started
Pump 8 started	Main pump 8 was started
Pump 1 stopped	Main pump 1 was stopped
Pump 2 stopped	Main pump 2 was stopped
Pump 3 stopped	Main pump 3 was stopped
Pump 4 stopped	Main pump 4 was stopped
Pump 5 stopped	Main pump 5 was stopped
Pump 6 stopped	Main pump 6 was stopped
Pump 7 stopped	Main pump 7 was stopped
Pump 8 stopped	Main pump 8 was stopped
PrePump 1 started	Pre-pressure pumps 1 was started
PrePump 2 started	Pre-pressure pumps 2 was started
PrePump 3 started	Pre-pressure pumps 3 was started
PrePump 4 started	Pre-pressure pumps 4 was started
PrePump 5 started	Pre-pressure pumps 5 was started
PrePump 6 started	Pre-pressure pumps 6 was started
PrePump 7 started	Pre-pressure pumps 7 was started
PrePump 8 started	Pre-pressure pumps 8 was started
PrePump 1 stopped	Pre-pressure pumps 1 was stopped
PrePump 2 stopped	Pre-pressure pumps 2 was stopped
PrePump 3 stopped	Pre-pressure pumps 3 was stopped
PrePump 4 stopped	Pre-pressure pumps 4 was stopped
PrePump 5 stopped	Pre-pressure pumps 5 was stopped
PrePump 6 stopped	Pre-pressure pumps 6 was stopped
PrePump 7 stopped	Pre-pressure pumps 7 was stopped
PrePump 8 stopped	Pre-pressure pumps 8 was stopped

Jockey started	Jockey pump was started
Jockey stopped	Jockey pump was stopped
User logged in	Operator with user level logged in
User logged out	Operator with user level logged out
Server logged in	Operator with service level logged in
Server logged out	Operator with service level logged out
Fire mode started	Fire mode was started
Fire mode stopped	Fire mode was stopped
Pump blocking on	Pump blocking mode was started
Pump blocking off	Pump blocking mode was stopped
Remote start	AUC3400 received remote start (over digital inputs)
Remote stop	AUC3400 received remote stop (over digital inputs)

15.3.1 Event History

MAIN menu > Alarm history >

In the history you will find on each display:

- The event description
- Time of event
- Date of event
- The event index, for example 1/50 means event record 1 out of 50 events in total.

Examples:

```
Server logged in

Time: 12:38:36
Date: 01-07-04  1/50
```

In this case it means that a service man logged into the AUC3400.

```
Pump 4 started

Time: 10:00:00
Date: 01-07-04 50/50
```

Pump 4 started

.

Note: The history records a maximum of 99 events. After that, the oldest event is removed from the history to allow the entry of a new event (FIFO principle, first in first out).

15.3.2 Erase history

MAIN menu > Event history >

After selecting this option the alarm history is reset (service password required).

```
The Event
history is erased.
```

15.3.3 Download history PC

MAIN menu > Alarm history >

```
__DOWNLOAD_HISTORY_
Select the download
option in the PC
program or ESC...
```

With the AUC3400.exe PC program you can operate the controller from a remote site, for example your office. In the AUC3400 PC program is a download option. You can use this to download the complete event history to a PC. Refer to chapter 11.3 for further information.

15.4 Control modes

MAIN menu >

In the control modes section, the pumps can be selected for automatic operation (AUTO mode), manual control operation (HAND mode) or disabled operation (OFF mode).

```
___CONTROL_MODES____
>Main pumps
 Pre-pressure pumps
 Jockey pump (DOL)
```

Note: if your setup does not included pre-pressure pumps nor jockey pumps you will be forwarded directly to the following menu:

15.4.1 Main pumps

MAIN menu > Control modes >

```
Control: AUTO
  P1    P2    P3    P4
 AUTO  AUTO  AUTO  AUTO
 100%  089%  000%  000%
```

Line 1 shows the overall system mode selected (AUTO – OFF – HAND - ALL)
Line 2 shows the available pumps.
Line 3 shows the individual pump modes (AUTO – OFF – HAND)
Line 4 shows the speed of the pump (0 – 100 %)

All the following fields are adjustable:

```
Control:>AUTO
  P1    P2    P3    P4
 AUTO  AUTO  AUTO  AUTO
 100%  089%  000%  000%
```

If you do not have external selector switches for each pump, the following rules apply:

Control mode = OFF:

- All pumps are automatically switched to OFF mode. You cannot put any pump in AUTO or HAND.

Control mode = HAND:

- If control mode was AUTO before you selected control mode HAND then all pumps automatically switch over to OFF mode, except for the pumps already running in HAND (In AUTO mode you can still select a pump in manual = HAND)
- You can put a pump in HAND or OFF mode, but not in AUTO mode.
- After you have selected HAND mode for a pump you can control the speed of that pump. Move the cursor “>” to the required speed field, press enter and type in a value, press enter again. The pump will immediately start operating at the selected speed.
- **Important note:** In HAND mode, alarms like low / high pressure will stop the pump, just like in AUTO mode. After a shut down failure is reset the pumps automatically start again in HAND mode, running at the speed where you left then before the shut down failure occurred.

Control mode = AUTO:

- If control mode was HAND before you selected control mode AUTO then all pumps in HAND remain in HAND.
- You can put a pump in AUTO, OFF mode and in HAND mode (so you can have pumps in mixed modes).
- In AUTO mode all applicable protections apply (shut down in case of certain failures)

Control mode = ALL:
- Puts the control mode in AUTO and also puts all the pumps in AUTO. After you selected this, the display will indicated all modes as AUTO. This also affects possible pre-pressure and jockey pumps.

If you do have external selector switches for each pump, the following rules apply:

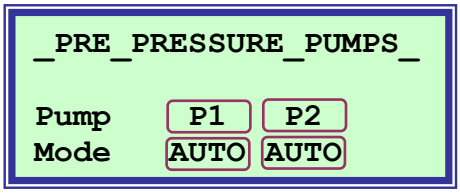
Control mode = OFF:
- All pumps are automatically switched to OFF mode. You cannot put any pump in AUTO or HAND.

Control mode = HAND or AUTO:
- Pumps stay in their individual control modes, but the speed is reset to zero.
  HAND (In AUTO mode you can still select a pump in manual = HAND)

Control mode = ALL:
- Puts the control mode in AUTO and also puts all the pumps in AUTO. After you selected this, the display will indicated all modes as AUTO. This also affects possible pre-pressure and jockey pumps.

15.4.2 Pre-pressure pumps

MAIN menu > Control modes >



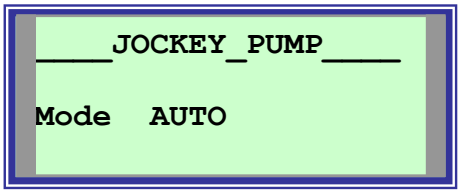
The above example shows only two pre-pressure pumps. Off course the display will change when you have a different number of pre-pressure pumps.

Line 3 shows the available pumps.
Line 4 shows the individual pump modes (AUTO – OFF – HAND)

For the rest the same rules apply as for the main pumps.
Note: in the display for the main pumps you can also find the overall control mode. If the overall control mode is set to ALL, then also the individual control modes of each pre-pressure pump will be set to AUTO.

15.4.3 Jockey pump (DOL)

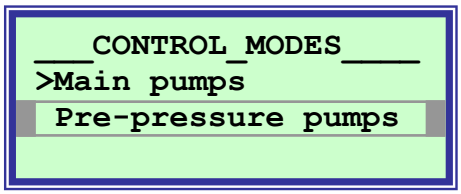
MAIN menu > Control modes



If you have jockey pump installed you can operate it just like the main and pre-pressure pumps.

15.5 Pump sequence

MAIN menu >

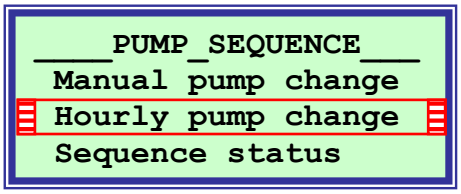


In the pump sequence menus, you control the way pumps are changed over.

Note: an alternative way to change over (lead) pumps is discussed in the week program (see 15.7.1). In the week program you can specify the day of the week and the exact time on which a pump change over must be executed.

15.5.1 Main pumps

MAIN menu > Pump sequence >

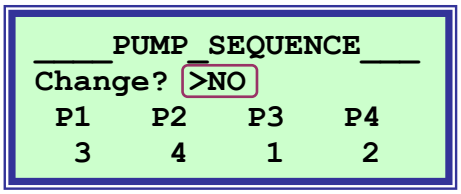


In the following section two alternatives are discussed:

1. manual pump change
2. hourly pump change over based on real time hours run

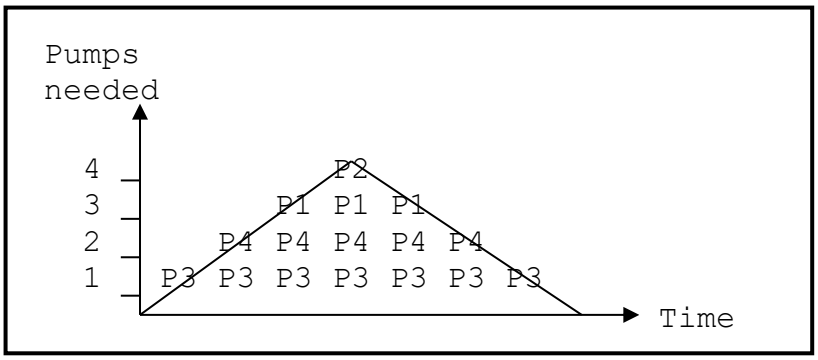
15.5.1.1 Manual pump change

MAIN menu > Pump sequence > Main pumps >

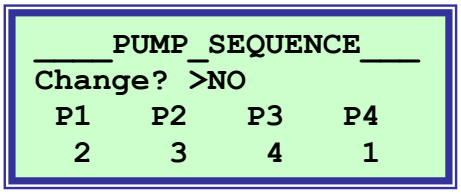


The pump sequence is the order in which pumps are started and stopped.

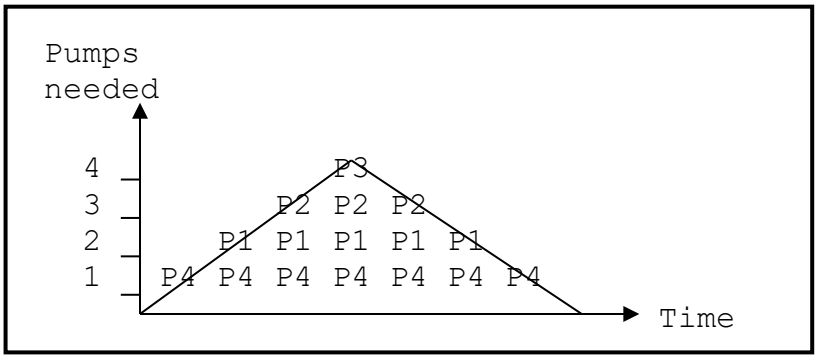
In the above example the order is



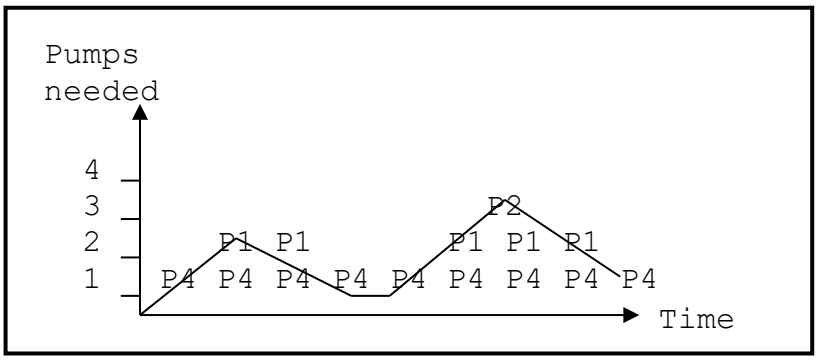
If you change the order, by selecting and changing “>NO” to “>YES”, the above order will change into:



Now the order becomes:



When the demand for pumps fluctuates you get this:



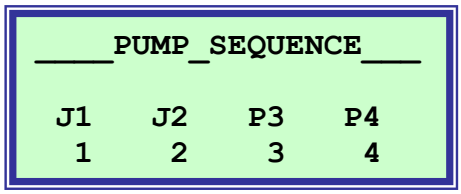
So the pump sequence does not alternate by the starting and stopping of the pumps. It remains fixed until a pump change is instigated either manually by means of the above display or automatically by the week program. In the week program you can program a pump change at any time of the week (even on a daily basis, refer to section 15.7.1).

This algorithm results in the following benefits:

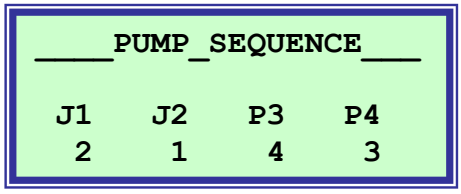
- You can, at all times see what the start / stop order of the pumps is and will be, so you won't have to guess which pump is next in line to be started or stopped.
- If a pump is not available, failed or is in the OFF mode, it is taken out of the sequence. It is then indicated by a star [*] instead of a sequence number.
- Each Pump gets more evenly distributed running hours. If you program a daily pump change over, in the week program, the leading pump will run that day all of the time. In other algorithms a pump may run for a short period of time and then become last in sequence.
- If a pump was out of service and put back into service you can get it to run as the leading pump for as long as you like so it can compensate for its "lost" hours.
- If you don't want evenly distributed running hours: don't program a pump change over and keep the pumps running in fixed sequence. Then you can be sure which pump you need to service first.

Note: if you have a pump configuration with frequency controlled jockey pumps the jockeys are indicated by a capital J. They also have their own pump sequence, prior to the main pumps.

For example, suppose the pump sequence with 2 with frequency controlled jockey pumps is:



Then after a pump change the sequence will become:



15.5.1.2 *Hourly pump change*

MAIN menu > Pump sequence > Main pumps >

```
__PUMP_CHANGE_OVER__
Change lead pump
After: 0040.00 hrs.
Or use week program.
```

Starting with the bottom line: an alternative way to change over (lead) pumps is discussed in the week program (see 15.7.1). In the week program you can specify the day of the week and the exact time on which a pump change over must be executed.

Here however, you can specify that the lead pump should be changed after having run 40 hours (in the above example). The time and date is not known!
Note, that if you enter 0 hours (default factory setting) this pump change is disabled.

15.5.1.3 *Sequence status*

MAIN menu > Pump sequence > Main pumps >

The status display show one of two versions, depending on if the hourly pump change was enabled (previous section).

If it is enabled you will see:

```
____PUMP_SEQUENCE___
Change:     39.51 hrs
 P1   P2   P3   P4
  2    3    4    1
```

or

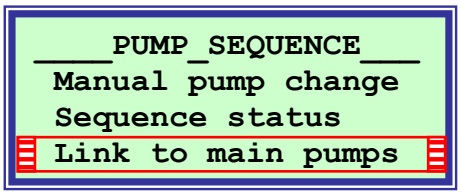
```
____PUMP_SEQUENCE___
Change:     42 min.
 P1   P2   P3   P4
  2    3    4    1
```

If the hourly pump change was disabled:

```
____PUMP_SEQUENCE___

 P1   P2   P3   P4
  2    3    4    1
```

15.5.2 Pre-pressure pumps

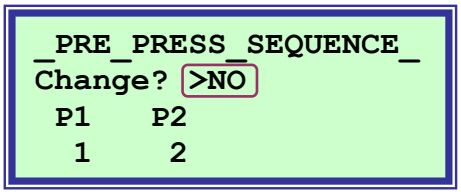
MAIN menu > Pump sequence >



The pre-pressure pump sequence is similar to that of the main pumps, except that a pump change based on real time hours run is not possible.
However, if you program a pump change in the week program (see 15.7.1). that will affect both main pumps and pre-pressure pumps.

15.5.2.1 Manual pump change

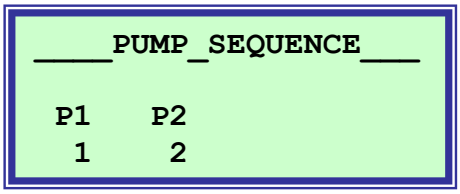
MAIN menu > Pump sequence > Pre-pressure pumps >



The pump sequence is the order in which pumps are started and stopped as described in the previous section for the main pumps.

15.5.2.2 Sequence status

MAIN menu > Pump sequence > Pre-pressure pumps >



The pump sequence is the order in which pumps are started and stopped as described in the previous section for the main pumps.

15.5.2.3 *Link to main pumps*

MAIN menu > Pump sequence > Pre-pressure pumps >

```
_PRE_PRESS_SEQUENCE_
Link the sequence of
the pre-press. pumps
to main pumps: >NO
```

If you have a pump installation where each individual main pump has its own pre-pressure pump, then you can link the sequence of the pre-pressure pumps to the main pumps.
In that case, when you start a main pump, its related pre-pressure pump also starts.
It is only possible to link the pump sequences when the number of pre-pressure pumps equals the number of main pumps.

15.6 Pump / tank test

MAIN menu >

```
__PUMP_/_TANK_TEST__
>Pump test run
 Expansion tank
 Pressure tank test
 Leak detection
```

The PUMP / TANK test menu cover topics related to pump test run, the use of an expansion or diaphragm tanks and the detection of system leakages.

15.6.1 Pump test run

MAIN menu > Pump / tank test >

```
____PUMP_TEST_RUN___

Execute pump test
run:>NO
```

A test run avoids pumps from getting seized, by operating them on a regular basis.
A test run can be executed manually, as described here or automatically through the week program (refer to section 15.7.1).
Test run means: start each pump, that has not been in operation since the last time a test run was executed, one by one for 2 seconds a **safe low speed**.
This **safe low speed** is actually the minimum (calculated) speed. This speed will not interfere with the control strategy, as it has no effect on the pressure.
Note that the minimum speed is being constantly calculated, and depends on the setpoint and suction pressure.

All tested pumps will start, operate for 2 seconds, and stop. Then a delay of 2 seconds and the next pump to be tested is operated.

15.6.2 Expansion tank

MAIN menu > Pump / tank test >

```
__EXPANSION_TANK___
Do you have an alarm
Contact connected to
the AUC3400? >NO
```

If you have a contact available from an external device to indicate the status of the bladder in the diaphragm or expansion tank, you can use this menu option to raise the alarm and register an alarm message.

15.6.3 Pressure tank test

MAIN menu > Pump / tank test >

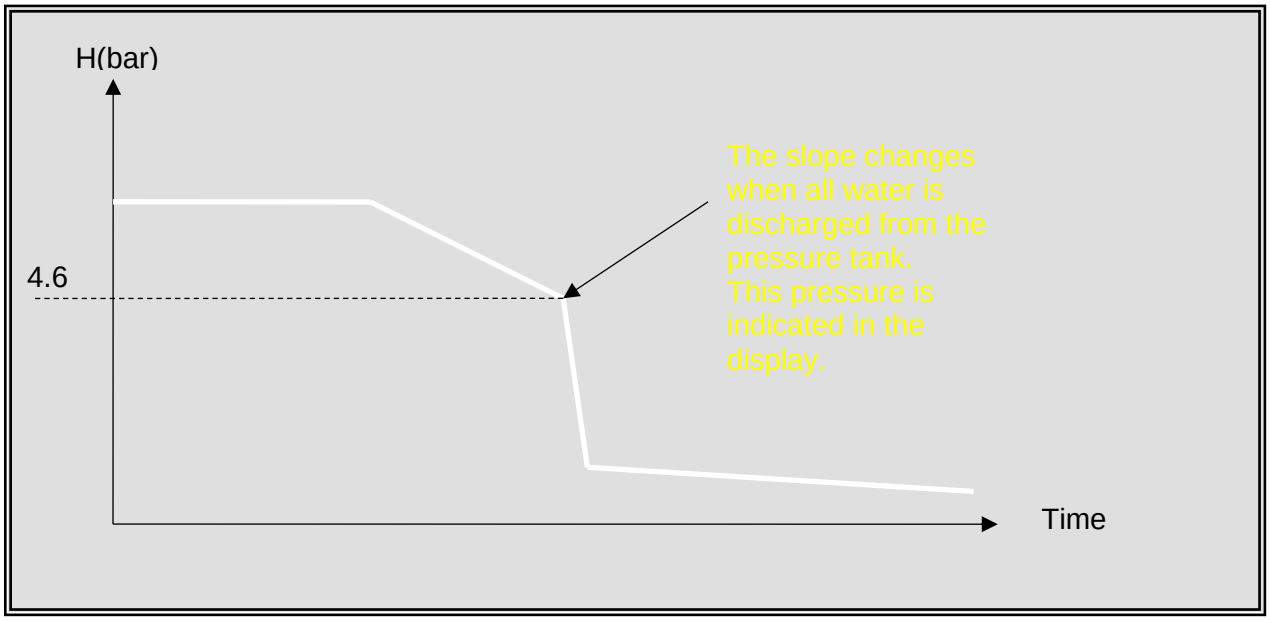
```
Pressure:    4.6 bar
Execute test? >NO
Air pres: 0.7 to 0.8
Of setpoint values.
```

The purpose of a pressure tank (diaphragm tank) test is to check the air pressure in the tank in relation to the used setpoint(s).
The optimum pressure for the air in the pressure tank is generally considered to be 0.7 to 0.8 times the setpoint value. For example: if the setpoint is 10 bar the air pressure should be 7 to 8 bar. As indicated you can change these settings of 0.7 and 0.8 to suit your application.

The algorithm of the pressure tank test is a follows:

- Run the pump set at the setpoint pressure and let the pumps stop at zero flow.
  You may need to close a shut off valve in the discharge to make sure you isolate the pressure tank and the pumps from the pipe work in the discharge.
- Enable the pressure tanks test by selecting YES in the above window
- Create a constant small flow
- Wait and watch the display until YES has been changed into NO and the pressure at the first line shows the air pressure in the tank.

What happens is that the AUC3400 monitors the slope of the pressure drop. As the slope tumbles down, the AUC3400 records the pressure as the air pressure in the diaphragm tank.
This is visualised in the following figure.



Once the air pressure in the diaphragm tank is determined by the AUC3400, you may get an alarm, now or in the future, that the air pressure in the tank is too low or too high in relation to any of the setpoint values that have been specified.
For example, if the air pressure is 4.6 bar and the actual setpoint is 5 Bar then an alarm is raised, saying "Pres.tank airhigh", since the maximum optimum pressure is set at 0.8 x 5 Bar = 4 Bar.

15.6.4 Leak detection

MAIN menu > Pump / tank test >

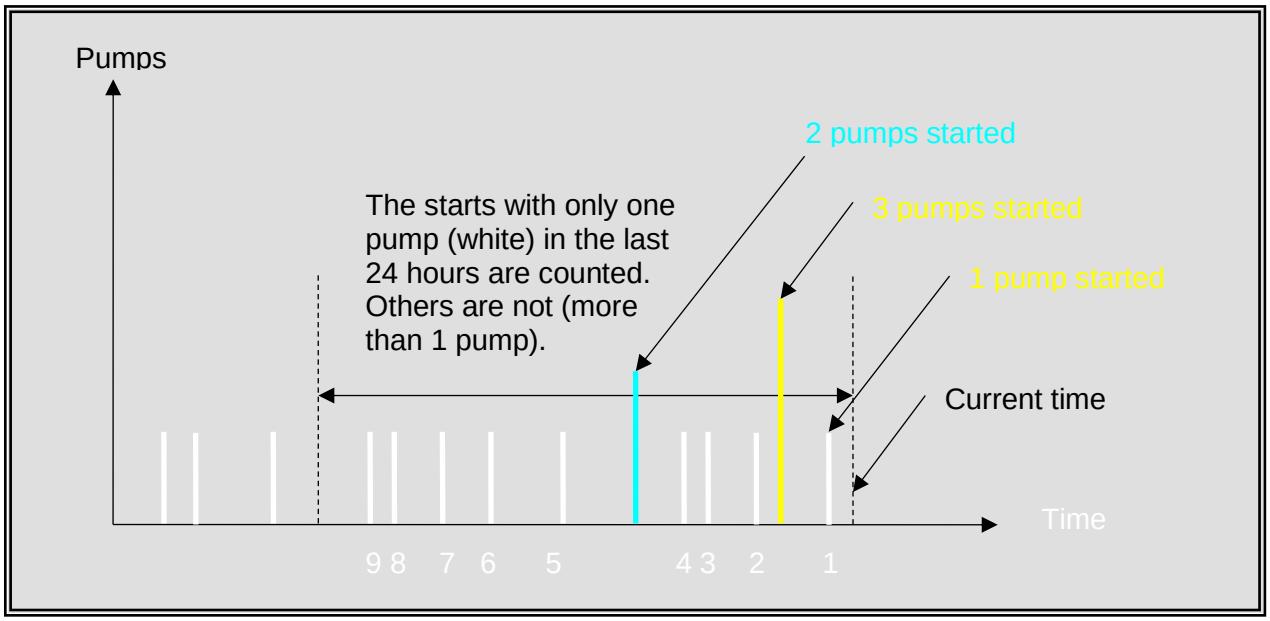
Leak detection is a feature that will allow you to detect leakages in your system. Most likely, it ill be useful in irrigation applications.

Leak detection counts the number of starts in a given period of time. If more start than allowed are required to maintain the pressure, an alarm will be raised, saying "leak detected".

```
Counted starts:  2
Max:>10 in 24.0 hrs.
By maximum  1 pumps.
Enable: YES
```

2 is the number of starts counted so far in the last 24 hours.
10 starts are allowed in 24 hours.
If 1 pump starts, the counter is increased, otherwise not.
YES enables the leak counter, NO resets and disables the counter.

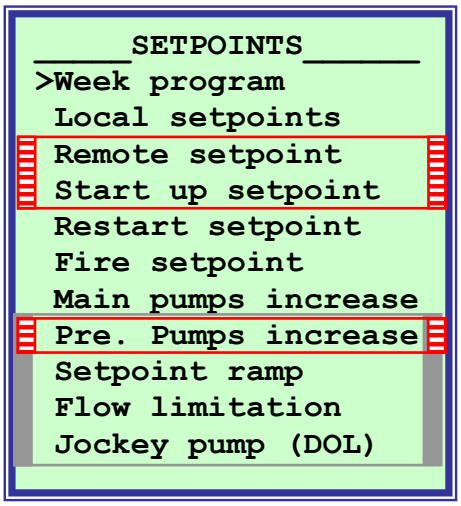
The period specified is relative to the current time as shown in the below figure.


Pumps
2 pumps started
The starts with only one pump (white) in the last 24 hours are counted. Others are not (more than 1 pump).
3 pumps started
1 pump started
Current time
Time
9 8 7 6 5 4 3 2 1

15.7 Setpoints

MAIN menu >

The AUC3400 comes with a number of setpoint options to allow you to run the pumps at different pressure rates in various situations.
The options are listed in the SETPOINTS menu:



The core of the setpoint program is a week program. This is a sophisticated time clock that you can program to run all kinds of jobs, including different setpoints, test runs and pump changes.

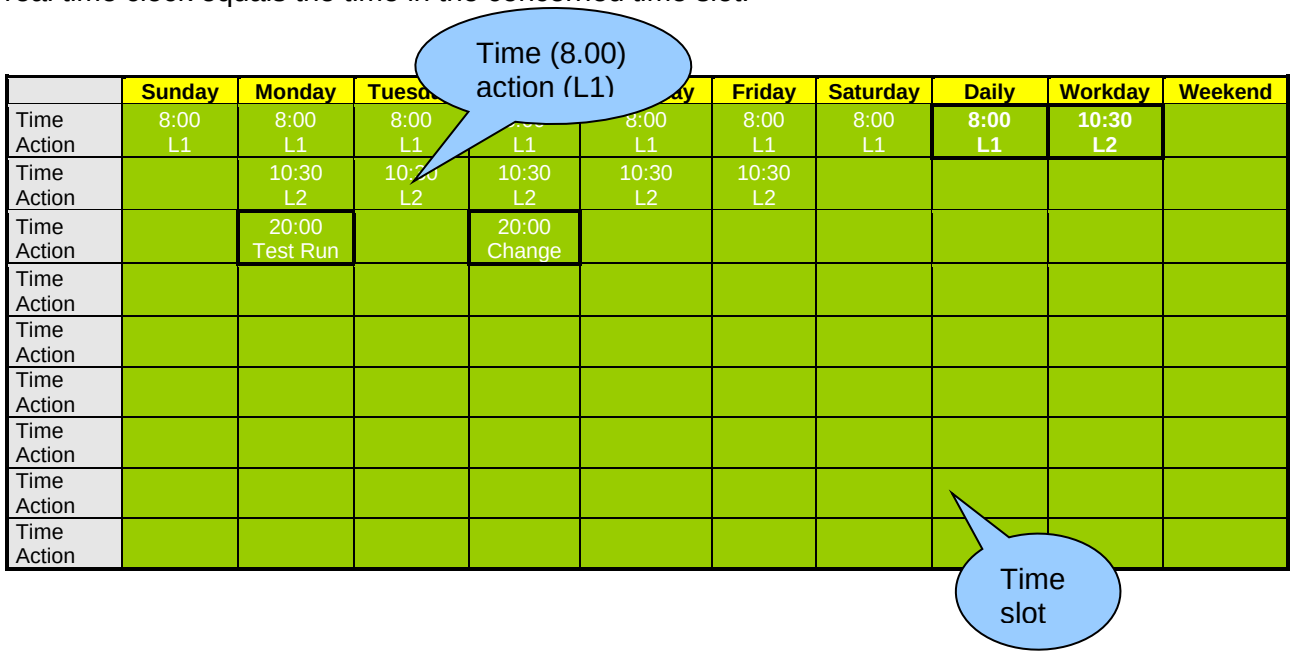
First of all you need to program one local setpoint and program this setpoint in the week program. But do not worry, if you don't want to go into that week program: the AUC3400 comes with one setpoint already programmed in the week program. All you need to do is change local setpoint number one (designated L1). To make life even easier, you can also find this default setpoint in the Quick commissioning menu (refer to section 14).

In the next sections you can read how to use the week program and all the other available setpoint options.

15.7.1 Week program

MAIN menu > Setpoints >

The week program consists of a table with weekly days in the columns and time slots in the rows. Per column or day there is a maximum of 10 time slots.
In a time slot you are free to program a real time ex. 8.30 am and the actions to be executed when the real time clock equals the time in the concerned time slot.



	Sunday	Monday	Tuesday		Friday	Saturday	Daily	Workday	Weekend
Time Action	8:00 L1	8:00 L1	8:00 L1	8:00 L1	8:00 L1	8:00 L1	**8:00 L1**	**10:30 L2**	
Time Action		10:30 L2	10:30 L2	10:30 L2	10:30 L2	10:30 L2			
Time Action		20:00 Test Run		20:00 Change					
Time Action									
Time Action									
Time Action									
Time Action									
Time Action									
Time Action									

Note that in the table above only the shaded or greyed areas were entered into the week program. As shown in the table there are three general columns: daily, workdays and weekend. Programs in these days will affect all the related weekdays.
The following actions can be programmed:

- Local setpoint (L1 to L5)
- Test runs
- Pump changes
- Pressure tank test
- Clear counters for automatic reset of low discharge pressure alarms

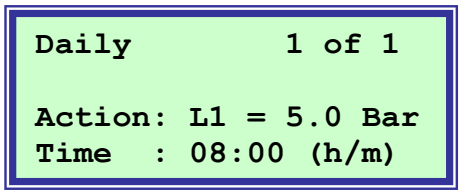
When you select the week program from the menu it automatically shows Sunday.

```
Sunday          1 of 1

Action: L1 = 5.0 Bar
Time   : 08:00 (h/m)
```

- This line indicates the day being accessed in the week program and the number of actions specified (1 of 1)
- The action is Local setpoint L1, which is 5.0 Bar.
- The action is executed at 8:00 hours on Sunday.

```
Monday          1 of 3

Action: L1 = 5.0 Bar
Time   : 08:00 (h/m)
```

Go the next day by using the arrow keys. I.e. Monday, etc.

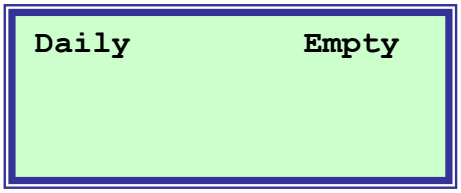


Pressing the right arrow a couple of times brings you to Daily, where the common setpoint for Sunday, Monday and the rest of the week are entered into the program.

15.7.1.1 *Adding entry*

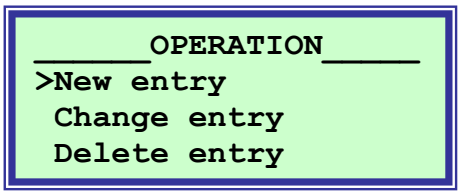
MAIN menu > Setpoints > Week program >

This is how setpoint L1 on Daily was entered into the week program:

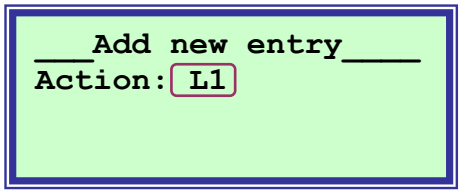


First there was nothing.

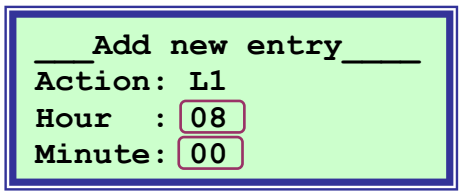
Press enter.



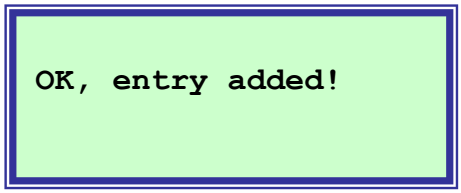
You can now select what you want to do in Daily.
We want a new setpoint, so press enter again.



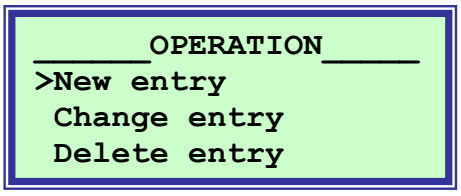
A new entry can be selected by pressing the up or down arrows.
You can choose between L1 / L2 / L3 / L4 / L5 / Test run and Pump change.



We want L1 so press enter.
Next, you can type in the hours and then the minutes.



Press enter again and you get:

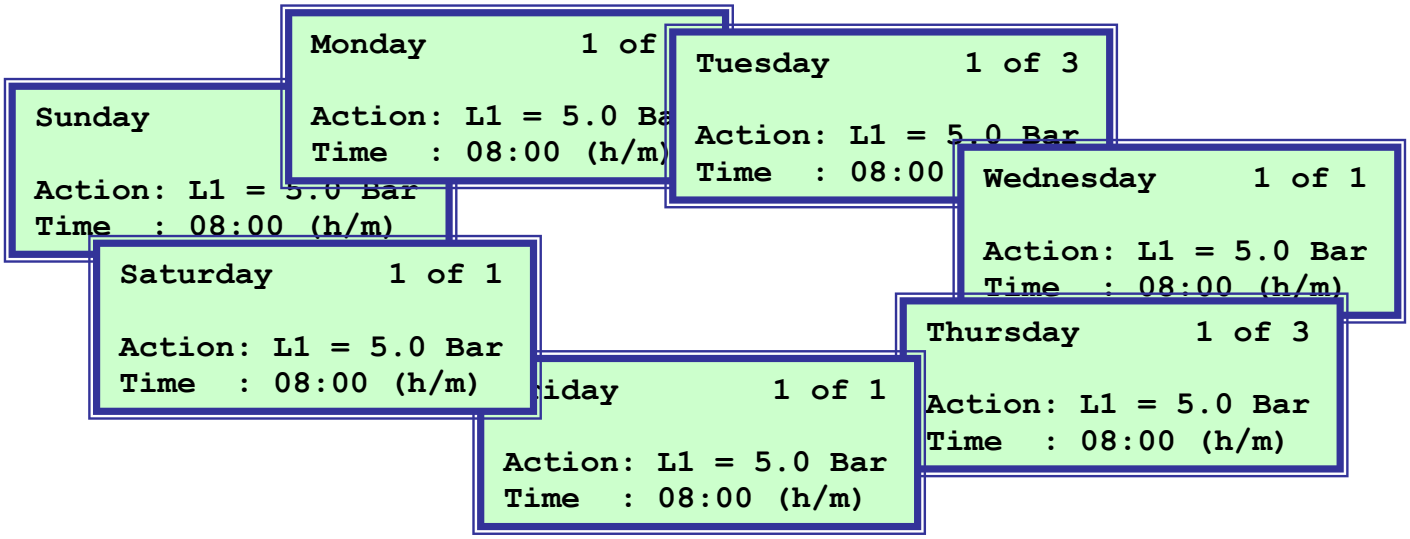


Automatically, the operation menu reappears.

Press **ESC**ape and you are back in the viewing area of the week program.

```
Daily          1 of 1

Action: L1 = 5.0 Bar
Time   : 08:00 (h/m)
```

Now all days have local setpoint L1 = 5.0 bar as a setpoint at 8:00 hours!



15.7.1.2 *Changing entry*

MAIN menu > Setpoints > Week program >

In the operation menu you can also change an entry:

```
______OPERATION_____
 New entry
>Change entry
 Delete entry
```

```
____Change entry____
Action: L1
Hour   : 20
Minute: 50
```

```
OK, entry changed!
```

15.7.1.3 *Deleting entry*

MAIN menu > Setpoints > Week program >

```
Daily          1 of 1

Action: L1 = 5.0 Bar
Time   : 20:50 (h/m)
```

```
______OPERATION_____
 New entry
 Change entry
>Delete entry
```

```
OK, entry deleted!
```

```
Daily          Empty
```

15.7.2 Local setpoints

MAIN menu > Setpoints >

As shown in the previous section, 7.6.1.1, you can enter a local setpoint L1 / L2 / L3 / L4 / L5 in the week program. Here is where you specify the related pressure values:

```
__LOCAL_SETPOINTS___
>L1 (quick setpoint)
 L2
 L3
 L4
 L5
```

15.7.2.1 Local setpoint 1(default factory setpoint) **

MAIN menu > Setpoints > Local setpoints

Default layout of the local setpoint display.

```
___LOCAL SETPOINT___

L1:>05.0 Bar
```

L1 (Local setpoint nr 1) is the default quick setpoint which comes pre-programmed from the factory. This setpoint can be set from the quick commissioning menu directly (refer to section 14). In the week programmed it is assigned to Sunday at 10:00 am.

Alternative layout of the local setpoint display when Flow limitation is enabled (refer to par.15.7.12).

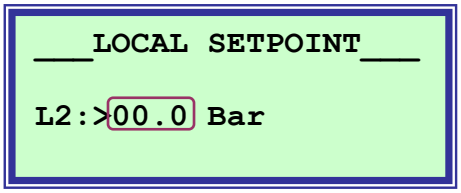
```
___LOCAL SETPOINT___
L1:>05.0 Bar
Limit at: 100.0 m3/h
By 0.02 bar per m3/h
```

If flow limitation is enabled, you can also define how the setpoint ramps down as the flow increases above a set value.
In this example the setpoint of 5 bar wil ramp down by 0,02 bar per m^3/h when the flow passes 100 m^3/h.1
At 150 m^3/h the setpoint will be limited to:
5 bar – ((150-100 m^3/h) x 0.02) = 4 bar.

15.7.2.2 *Local setpoint 2* **

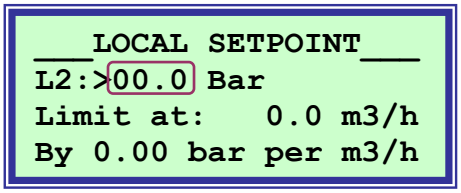
MAIN menu > Setpoints > Local setpoints

Default layout of the local setpoint display.



L2 (Local setpoint nr 2) is extra available setpoint for the user to create an alternative pressure at time intervals which can be inserted in te week program.

Alternative layout of the local setpoint display when Flow limitation is enabled (refer to par.15.7.12).

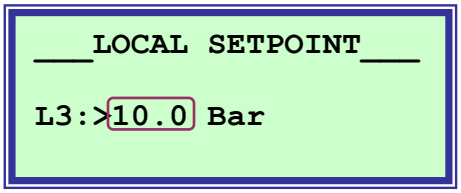


In this case we show the default factory settings, which are for setpoints L2-L5 all zerod.
In the following parapgraphs examples of given for different settings.

15.7.2.3 *Local setpoint 3* **

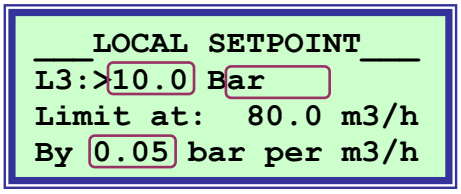
MAIN menu > Setpoints > Local setpoints

Default layout of the local setpoint display.



L3 (Local setpoint nr 3) is extra available setpoint for the user to create an alternative pressure at time intervals which can be inserted in te week program.

Alternative layout of the local setpoint display when Flow limitation is enabled (refer to par.15.7.12).

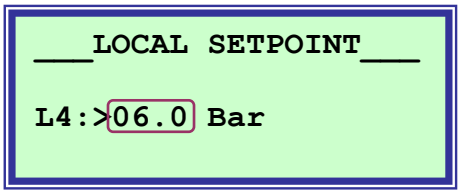


If flow limitation is enabled, you can also define how the setpoint ramps down as the flow increases above a set value.
In this example the setpoint of 10 bar wil ramp down by 0,05 bar per m^3/h when the flow passes 80 m^3/h.1
At 120 m3/h the setpoint will be limited to:
10 bar – ((120-80 m^3/h) x 0.05) = 8 bar.

15.7.2.4 *Local setpoint 4* **

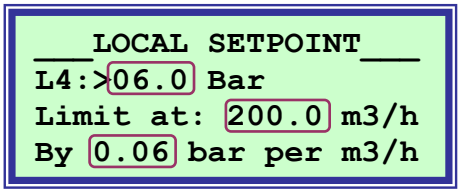
MAIN menu > Setpoints > Local setpoints

Default layout of the local setpoint display.



L4 (Local setpoint nr 4) is extra available setpoint for the user to create an alternative pressure at time intervals which can be inserted in te week program.

Alternative layout of the local setpoint display when Flow limitation is enabled (refer to par.15.7.12).

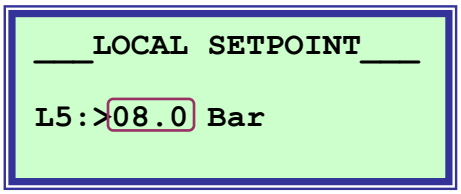


If flow limitation is enabled, you can also define how the setpoint ramps down as the flow increases above a set value.
In this example the setpoint of 6 bar wil ramp down by 0,06 bar per m^3/h when the flow passes 200 m3/h.1
At 300 m3/h the setpoint will be limited to:
6 bar – ((300-200 m^3/h) x 0.06) = 0 bar.

15.7.2.5 *Local setpoint 5* **

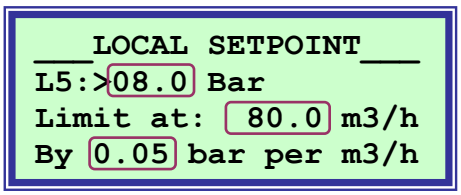
MAIN menu > Setpoints > Local setpoints

Default layout of the local setpoint display.



L5 (Local setpoint nr 5) is extra available setpoint for the user to create an alternative pressure at time intervals which can be inserted in te week program.

Alternative layout of the local setpoint display when Flow limitation is enabled (refer to par.15.7.12).



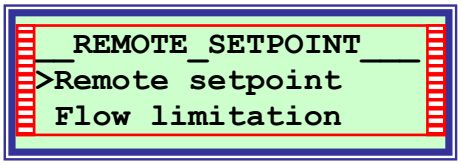
If flow limitation is enabled, you can also define how the setpoint ramps down as the flow increases above a set value.
In this example the setpoint of 8 bar wil ramp down by 0,05 bar per m^3/h when the flow passes 80 m3/h.1
At 120 m^3/h the setpoint will be limited to:
8 bar – ((120-80 m^3/h) x 0.05) = 6 bar.

15.7.3 Remote setpoint **

MAIN menu > Setpoints >

A remote setpoint can be externally activated by a digital input. The reference for an external setpoint is an analogue input signal coming from an external source.
An activated remote setpoint has a higher priority than a local setpoint activated through the week program.

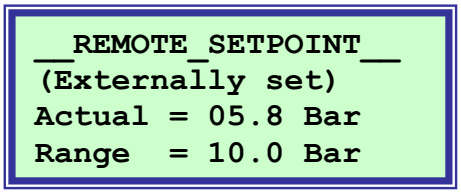
Notes:
- if you have not enabled the external setpoint in the configuration menu (refer to par. 15.10.3.3.1), the menu in this section does not appear.
- If you have not activated flow limitation in the setpoints menu (refer to par. 15.7.12) or in the configuration menu (refer to par. **Fout! Verwijzingsbron niet gevonden.**) you will not see a remote setpoint menu, but only the display as shown in the next section.



15.7.4 Remote setpoint

MAIN menu > Setpoints > Remote setpoint >

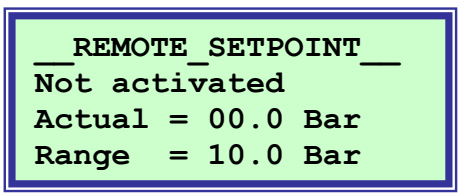
This option, Remote setpoint show the actual reference of the external setpoint.



Externally set is the reference signal coming from the analogue input.
Range is the maximum reference, as specified in the configuration menu.

Refer to section 15.10.3.3 Remote setpoint, for the analogue signal used for the external setpoint and the required digital switch to enable the external setpoint.

If the remote setpoint is not activated by the digital input the display indicates:



15.7.5 Remote setpoint - flow limitation *

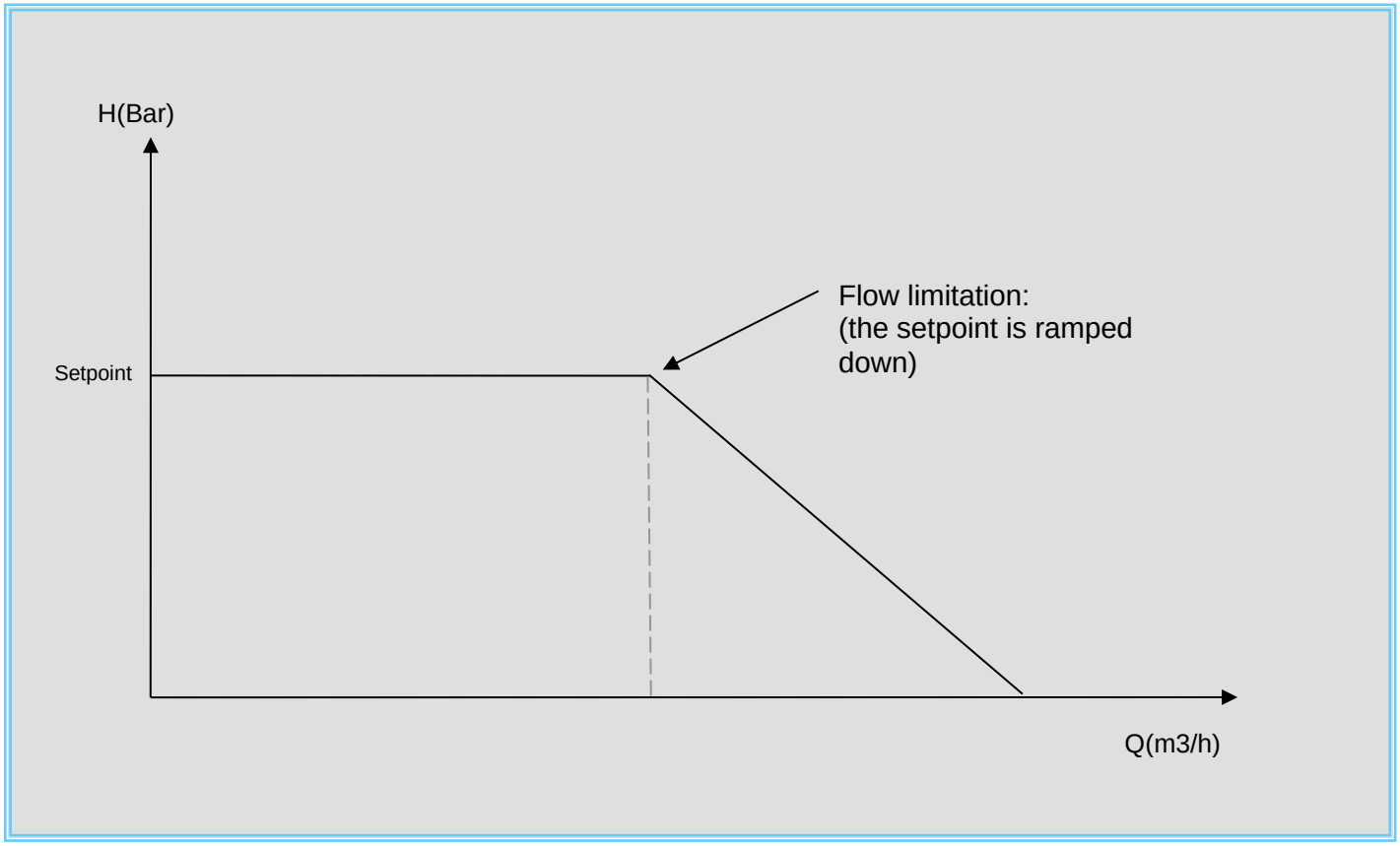
MAIN menu > Setpoints > Remote setpoint >

With flow limitation it is possible to limit the flow when it passes a set value.
When the flow grows too high, the AUC3400 will ramp down the setpoint towards 0 bar.
Applications for this feature can be found were cleaning is done with high pressure lances.
Flow limitation must be enabled for this menu to become available and visible. You can enable it in the setpoints menu (refer to par. 15.7.12) or in the configuration menu (refer to par. **Fout! Verwijzingsbron niet gevonden.**)

```
___FLOW_LIMITATION__
Enable flow limita-
tions for all the
setpoints? [NO]
```

```
___REMOTE_SETPOINT__

Limit at: [80.0] m3/h
by [0.05] bar per m3/h
```

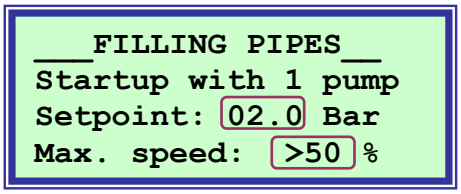
In this example the setpoint will be ramped down by 0.05 Bar per m^3 when the flow passes 80.0 m^3/h.



15.7.6 Start up setpoint

(MAIN menu > Setpoints >)

The start up setpoint is always used as the initial setpoint when the system is first started up. This is either after a power failure, a shut down failure or when you enter AUTO control mode.



This setpoint is used for filling the lines up with water and only applies to the lead pump on system start up. It is normally used as a low level setpoint to reduce hydraulic shock when filling a system. When the pressure has built up and the setpoint reached, a 3 seconds delay timer is started. When the 3 seconds have elapsed, the normal setpoint (Local or remote) is activated.
To avoid that the lead pump runs flat out, causing cavitation at the impeller, the maximum speed can be limited as required.
Note that setpoint changes are ramped to avoid sudden setpoint jumps that may result in hydraulic shocks. Refer to section 15.7.11 for the setpoint ramp.

15.7.7 Restart setpoint

MAIN menu > Setpoints >

The restart setpoint is always used when there is no pump running due to zero flow. The purpose of this restart setpoint is to delay a restart of the lead pump after is has stopped due to zero flow. The delay is created by activating a lower setpoint.

```
__RESTART_SETPOINT__
Lower the setpoint
for restarting lead
pump by: -01.0 Bar
```

In this example the setpoint lowering for a restart will be 1 bar. So if the setpoint is 8 bar the setpoint will be 7 bar when all pumps have stopped. When the pressure drops below 7 bar the lead pump starts and the original setpoint of 8 bar is activated again.
For a diagram on this topic refer to section 15.8.2.

15.7.8 Fire setpoint

MAIN menu > Setpoints >

Fire operation. When this mode is enabled and input X10 is off, then at least one pump will (continue) to run
and no alarm will stop the pumps.

```
___FIRE_OPERATION__
Enable mode: > NO
Setpoint:   6.5 Bar
```

15.7.9 Main pumps increase

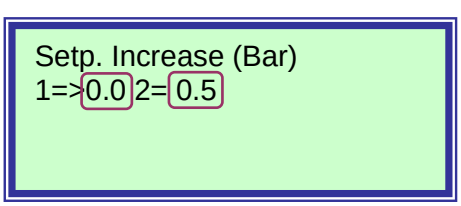
MAIN menu > Setpoints >

```
Setp. Increase (Bar)
1=>0.0  2= 0.5  3= 1.0
3= 1.5  2= 2.0  3= 2.5
```

In this example the setpoint will be increase by 0.5 Bar by each successive main pump started.
The purpose is to allow for friction loss compensation in an irrigation application where the flow demand is increased by known steps.
For true step less friction loss compensation there is a more sophisticated feature described in section 15.10.4.8.

15.7.10 Pre-pressure pumps increase

MAIN menu > Setpoints >



In this example the setpoint will be increase by 0.5 Bar by each successive pre-pressure pump started.
Pre-pressure pumps are used in irrigation application for supplying a contact positive suction pressure to the main pumps.
The purpose is to avoid hunting of the pumps when an extra pre-pressure pump is brought into operation. What could happen without a setpoint increase is that the additional pre-pressure pump is capable alone to supply that bit of extra water required to boost the pressure above the setpoint again. And of course the initial reason for starting that very pre-pressure pump was because the pressure was dropping below the setpoint. So without the setpoint increase the pre-pressure pump might start and stop continuously at intervals defined by the run on time of the pumps, because the pressure goes over and under the setpoint each time that pre-pressure pump is started and stopped.

Note: in principle it is needless to specify a pressure increase for the first pre-pressure pump, as it is normally started before any of the main pumps is started. Only when one or more main pumps are allowed to run without any pre-pressure pump it makes sense to increase the setpoint for the first pre-pressure pump.

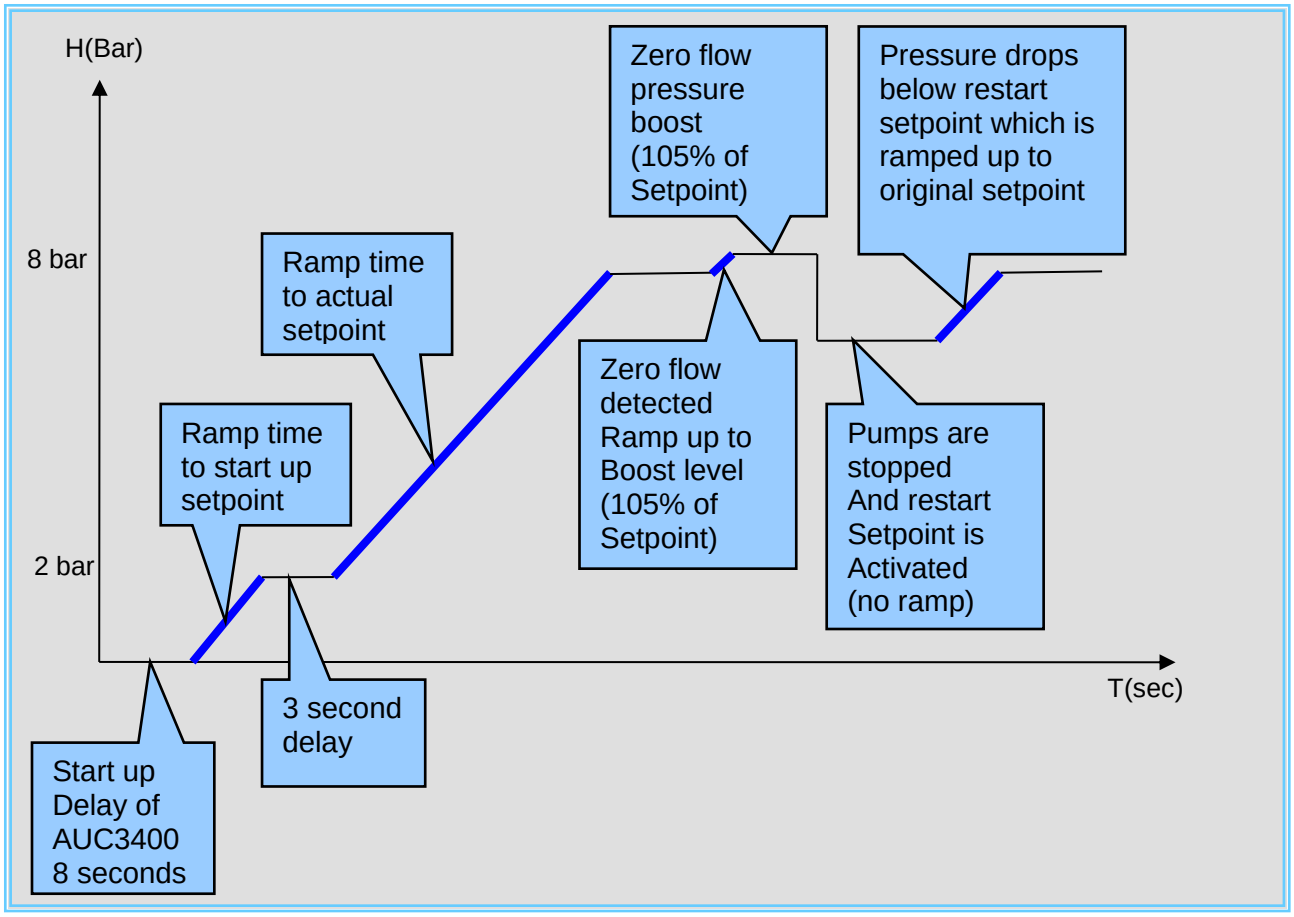
15.7.11 Setpoint ramp

MAIN menu > Setpoints >

```
____SETPOINT_RAMP___
Ramp: >0020 sec
Note: time from 0 to
Sensor range press.
```

To avoid pressure shock in your system the setpoint must be ramped up and down.
The slope of the ramp is controlled by this timer.
It defines the time it takes to ramp a setpoint from 0 to the discharge sensor range pressure.
For example: if you have a sensor of 10 bar it will take 20 seconds in the above example to ramp the setpoint from zero to 10 Bar.
The time required fro 0 to 2 bar (the default start-up setpoint) is 2/10 * 20 = 4 seconds.

The following diagram shows all the timing involved from start-up.



15.7.12 Flow limitation

MAIN menu > Setpoints >

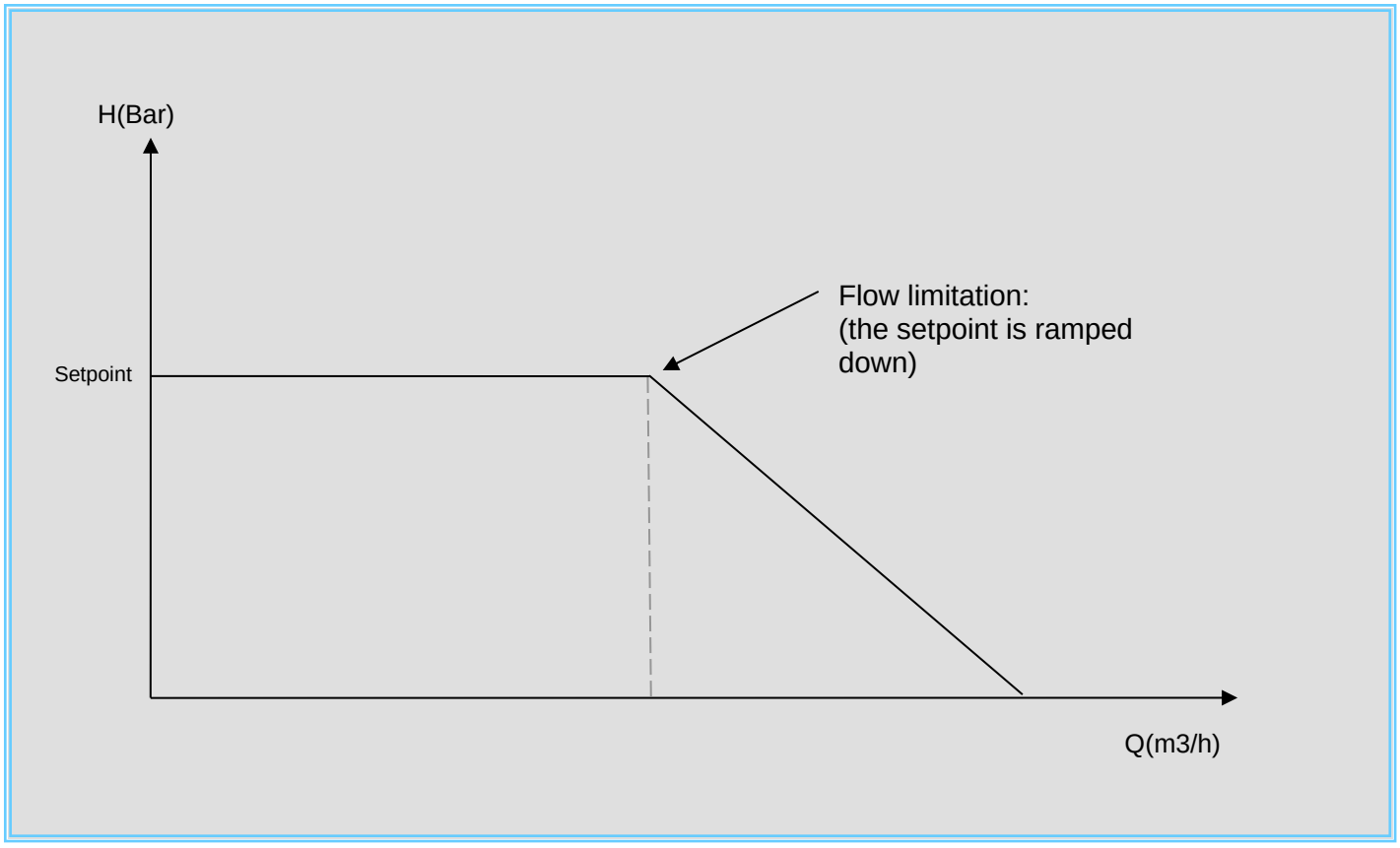
With flow limitation it is possible to limit the flow when it passes a set value.
When the flow grows too high, the AUC3400 will ramp down the setpoint towards 0 bar.
Applications for this feature can be found were cleaning is done with high pressure lances.

```
___FLOW_LIMITATION__
Enable flow limita-
tions for all the
setpoints?  NO
```

```
___LOCAL SETPOINT___
L1:>05.0 Bar
Limit at: 80.0 m3/h
by 0.05 bar per m3/h
```

When you enable this option you will find that an extra line appears with all the local setpoints:

In this example the setpoint will be ramped down by 0.05 Bar per m^3 when the flow passes 80.0 m^3/h.

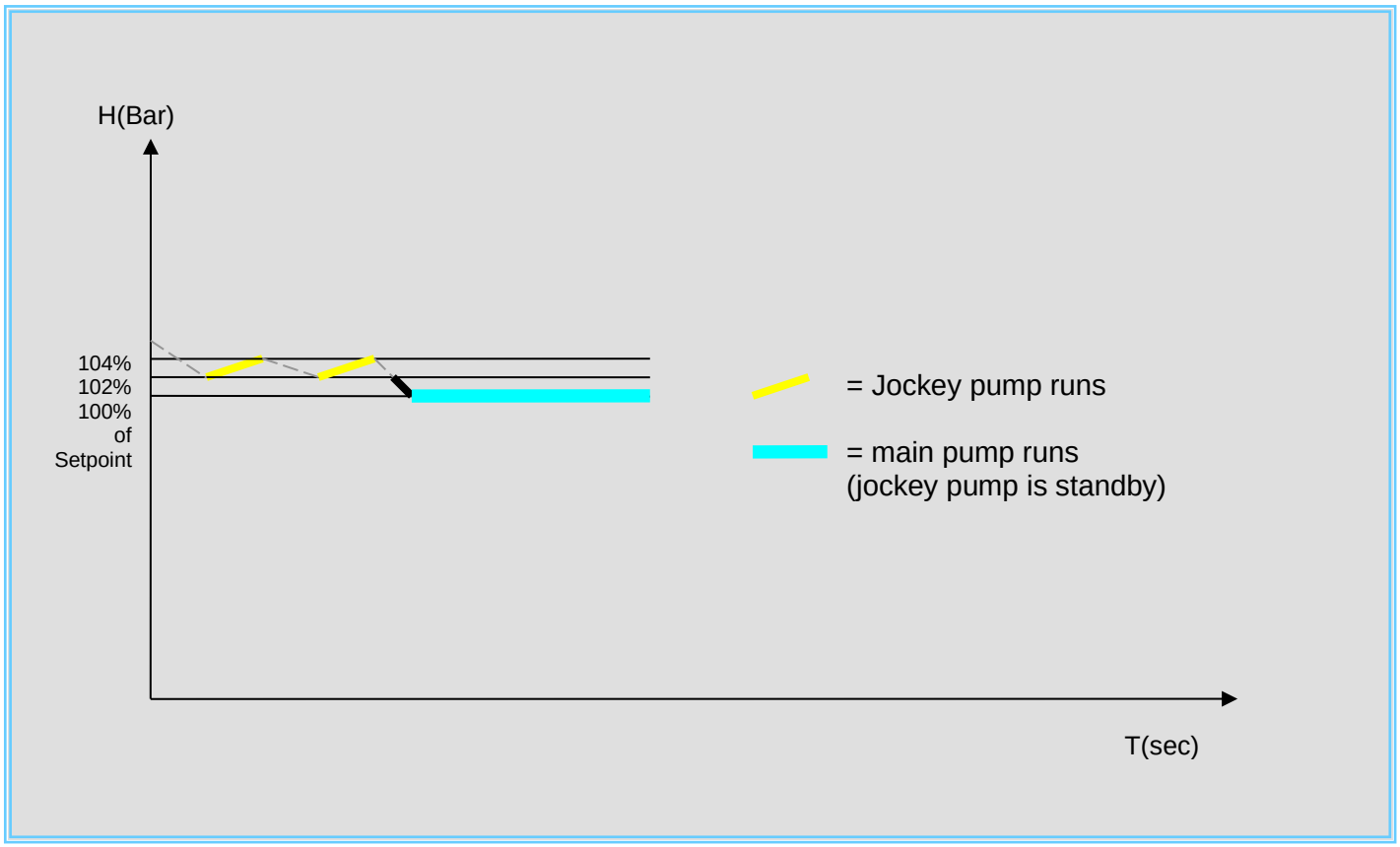


15.7.13 Jockey pump (DOL)

MAIN menu > Setpoints >

```
____JOCKEY LEVELS___
On below: 102 %
Off above: 104 %
Of actual setpoint.
```

When the main pumps are stopped, the jockey pump will start when the pressure drops below 102% of the active setpoint level until the pressure reaches 104% of the setpoint level (this figure is adjustable).



15.8 Zero flow detection

MAIN menu >

The AUC3400 features the following algorithms to stop the pumps when there is no flow demand:

1. Zero flow detection
2. Low flow stop (only if you have a flow meter connected)
3. Low speed stop

By default, only the first algorithm is enabled.
In the zero flow detection menus, you can change the zero flow detection behaviour.

```
__ZERO_FLOW_DETECT__
>Enable
 Boost level
 Detection speed
 Timers
 Low flow stop
 Low speed stop
```

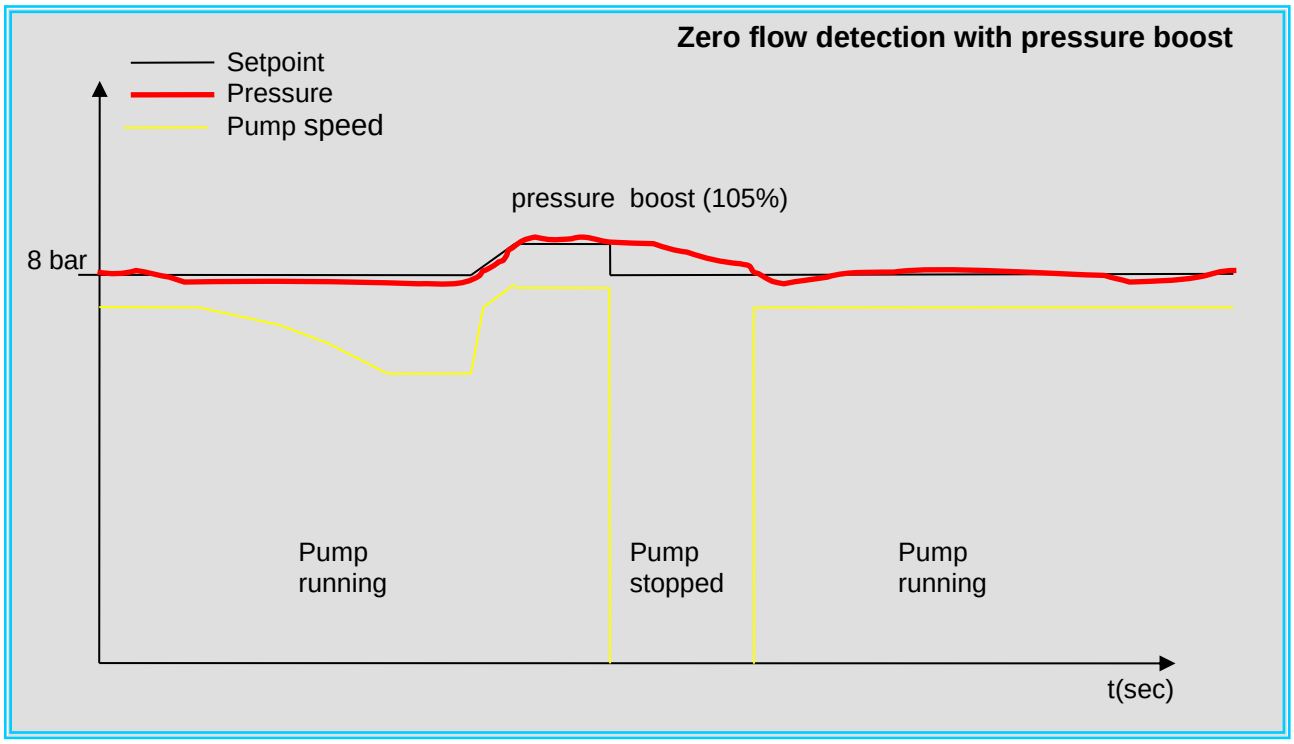
15.8.1 Enable

MAIN menu > Zero flow detect

```
__ZERO_FLOW_DETECT__
Enable the algorithm
for zero flow detec-
tion ?    YES
```

When zero flow detection is enabled the AUC3400 will attempt to detect zero flow and stop the lead pump accordingly. If you do not want the lead pump to stop then you should disable this option.

The following diagram explains the how the zero flow detection algorithm works.

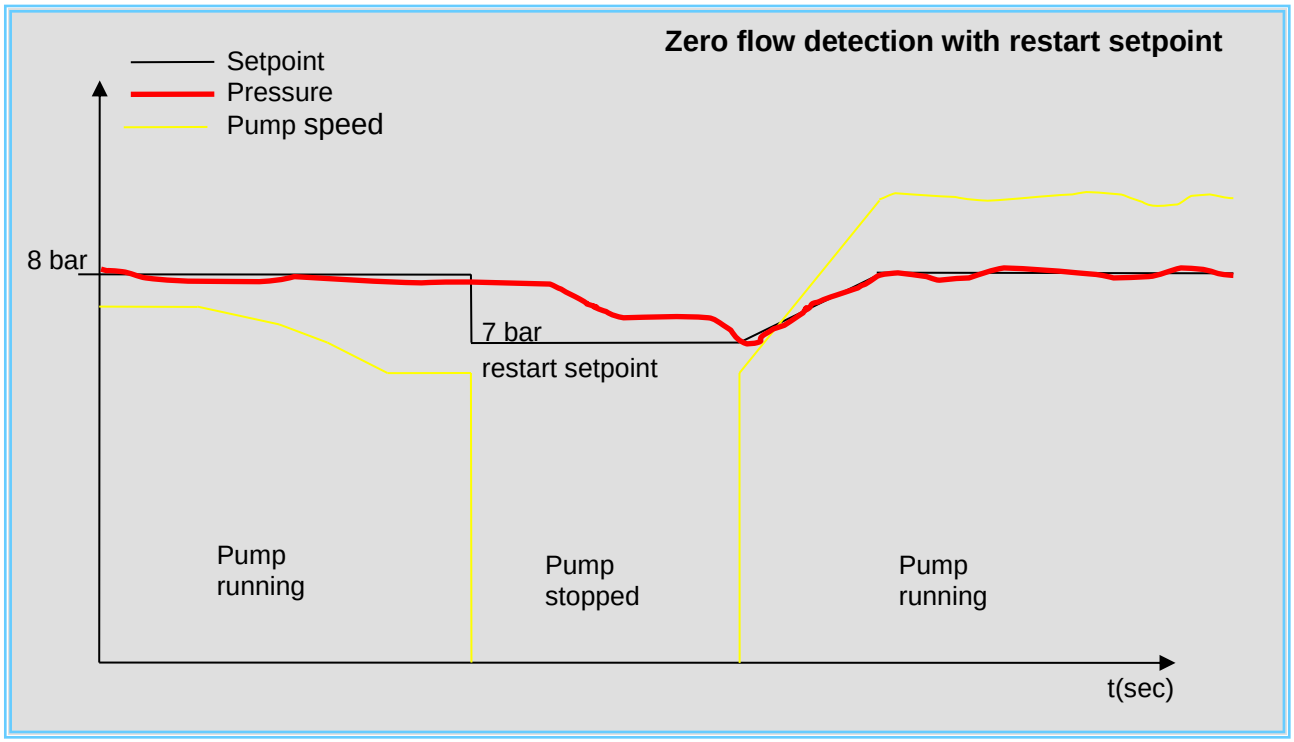


The pump set is running at 8 bar with one pump running. The AUC3400 lowers the speed of the lead pump gradually while the discharge pressure remains at 8 bar. After a time delay the AUC3400 concludes that there is no flow (otherwise the pressure would have dropped) and the setpoint is increased by the value specified by the boost level in the next section.
In this example the pressure is increased to 105% of the setpoint (8.4 bar). This pressure boost is continued for a number of seconds (10 by default) as specified in the zero flow timers menu (refer to section 15.8.4). Then the lead pump is stopped and the original setpoint is restored.
When the pressure drops below 8 bar after a period of time, the lead pump is restarted again, running at the calculated minimum speed.

Notes:

- The zero flow detection algorithm is activated only when a single pump is running at a speed lower than the calculated minimum speed plus an offset. The offset is set in the menu detection speed (refer to section 15.8.3).
- If, by mistake, the AUC3400 detects zero flow and the speed goes to a 100% to reach the pressure boost, than the algorithm will abort after a number of seconds as set in the zero flow detection timers menu (refer to section 15.8.4). By default this timer is set to 100%. So, when the AUC3400 tries to reach the pressure boost pressure of 8.4 bar in the above example and it reaches a 100% speed of the lead pump then after 4 seconds the algorithm aborts and the original setpoint of 8 bar is restored.
- if you want to enable the zero flow detection but do not want to have a pressure boost, you can still enable the zero flow detection function. However, you will have to specify a restart setpoint (refer to section 15.7.7).

The combination of using zero flow detection with a restart setpoint is explained in the below figure.



The pump set is running at 8 bar with one pump running. The AUC3400 lowers the speed of the pump gradually while the discharge pressure remains at 8 bar. After a time delay (this is the run on time, see section 15.10.1.9) the AUC3400 concludes that there is no flow and the setpoint is set at the value specified by de restart setpoint. In this example the restart setpoint is set at an offset of -1 bar. So the setpoint goes down to 8-1 = 7 bar and the pump is stopped. When the pressure drops below 7 bar after a period of time, the original 8 bar setpoint is restored. The setpoint will be ramped up from 7 to 8 bar (refer to section 15.7.11 for the setpoint ramp time) and the lead pump is restarted, beginning at the calculated minimum speed.

15.8.2 Boost level

MAIN menu > Zero flow detect >

```
___PRESSURE BOOST___
At zero flow the
pressure will be
boosted to: >105 %
```

When zero flow is detected by the AUC3400, the pressure can be boosted up to an adjustable percentage of the setpoint, so that a hydraulic buffer is created in the diaphragm tank or in the discharge pipe, in case there is a large discharge network.
The remaining lead pump in operation is then stopped and the hydraulic buffer prevents the discharge pressure to drop too rapidly due to water leakages in the network and hence it also delays a quick restart of the lead pump.
The pressure boost is specified as a percentage of the actual setpoint, so if your setpoint is 8 bar it will be boosted to 8.4 bar when the boost level is set to the default value of 105%.
Note that when you do not want the pressure to be boosted, but instead a low restart setpoint should be used, then you should set the boost level a 100% as described in the previous section.

15.8.3 Detection speed

MAIN menu > Zero flow detect >

```
__ZERO_FLOW_DETECT__
Controller checks
zero flow>10 % above
minimum speed level.
```

The zero flow detection algorithm is enabled when the speed of the lead pump is below calculated minimum speed plus an adjustable offset (10% in the above default example). Suppose that the calculated minimum speed is 65% and the detection speed offset is 10%, then zero flow detection will be active below 75% speed of the lead pump.
The reason for this offset is that zero flow detection will have a small, but noticeable, effect on the pressure which can cause some oscillation in irrigation applications.

15.8.4 Zero flow timers

MAIN menu > Zero flow detect >

```
__ZERO_FLOW_TIMERS__
Boost:        010 sec
Interval:    0015 sec
Abort (100%): 04 sec
```

The zero flow timers specify the following:

- Boost: the time that the increased setpoint should be maintained before the lead pump is to be stopped. If you have no boost (level set to 100%), then you should set this number at the same setting as the run on time of the pumps.
- Interval: the time between two successive zero detection attempts.
- Abort: if the AUC3400 tries to reach the boost level while the speed is increased up to a 100%, then the algorithm will abort after the time set here.

15.8.5 Low flow stop

MAIN menu > Zero flow detect >

```
____LOW_FLOW_STOP___
Use flow stop: NO
If flow < 00.0 m3/h.
Delay by 060 seconds
```

As an alternative or supplement to the zero flow detection algorithm you may enable the low flow stop. However, you must connect a flow meter that is accurate at low flows!

The algorithm for this function is plain and simple: when the flow remains below the set value for a time specified by the delay, then the lead pump will stop.

Important! You must specify a restart setpoint, for otherwise the lead pump is very likely to restart immediately when the pressure drops blow the setpoint. For the restart setpoint refer to section 15.7.7.

15.8.6 Low speed stop

MAIN menu > Zero flow detect

```
___LOW_SPEED_STOP___
Use speed stop: NO
if speed < 00.0 %
Delay by 060 seconds
```

As an alternative or supplement to the zero flow detection and / or low flow stop algorithms you may enable the low speed stop.

The algorithm for this function is plain and simple: when the speed of the lead pump remains below the set value for a time specified by the delay, then the lead pump will stop.

Important! You must specify a restart setpoint, for otherwise the lead pump is very likely to restart immediately when the pressure drops blow the setpoint. For the restart setpoint refer to section 15.7.7.

15.9 Clock menu

MAIN menu >

```
_______CLOCK________
>Read clock
 Set clock
```

Make sure the clock is correctly set as it is used for the alarms history and for the week program.

15.9.1 Read clock

MAIN menu > Clock >

```
_______CLOCK________
    WINTERTIME
Time  : 14:20:40
Date  : 01:11:2004
```

Note: the clock automatically switches over to summer time (last Sunday in march at 02.00 hrs the clock is set to 03.00 hrs) and winter time (last Sunday in October at 03.00 hrs the clock is set to 02.00 hrs).

15.9.2 Set clock

MAIN menu > Clock >

```
     SUMMERTIME
Time:>13 19 44 h/m/s
Date: 01 07 12 d/m/y
Set clock: NO
```

Hint: If you set the clock, set the seconds a bit in advance of the current time.
Then go to “Set Clock: NO” and change NO to YES. Wait with pressing enter until the set seconds coincide with the current time on your watch.
Note: when you set the clock you also need to select winter/summer time.

15.10 Configuration

MAIN menu >

```
____CONFIGURATION___
>Pumps
 Frequency converter
 Sensors
 Controller
 Modem
 UPS
 Pump / tank test
 Remote start/stop
 Pump blocking
 Head up displays
 Reset program
 Service setting
 Test timing
```

The configuration menu is normally accessed only during commissioning. It contains setup information required for the AUC3400 to control pumps. Settings in these menus are not alterable by end users, unless they have service codes.

15.10.1 Pumps

MAIN menu > Configuration > Pumps >

```
________PUMPS_______
>Pump application
 Main pumps
 Main pumps curve
 Jockey curve (VLT)
 Pre-pressure pumps
 Pre-pressure setup
 DOL Jockey pump
 Delay for lead pump
 Run on time pumps
```

Here you find everything related to the installed pumps.

15.10.1.1 *Pump application*

MAIN menu > Configuration > Pumps >

```
To limit the number
of visible sub menus
select application:
>IRRIGATION
```

To limit the number of visible sub menus select your application, irrigation or pressure boosting.

By selecting irrigation the following menus will become accessible:

- Pre-pressure pumps
- Leak detection
- Low flow stop algorithm (part of the zero flow detection)
- Low speed stop algorithm (part of the zero flow detection)
- Restart setpoint
- Setpoint increase by main pumps
- Setpoint increase by pre-pressure pumps
- Anti cavitation
- Friction losses

15.10.1.2 *Main pumps*

MAIN menu > Configuration > Pumps >

```
__MAIN_PUMP_SETUP___
Installed  : 4 pumps
Standby    : 0 pumps
FC jockeys: 0 pumps
```

Installed means the total sum of main pumps, standby and frequency controlled jockey pumps. You can have up to 8 installed pumps.

Standby pumps are backup pumps. They will come into operation only when other pump(s) fails. For example: if you have 5 installed pumps of which 2 are standby pumps, then you can have only 3 pumps in operation at any given time.

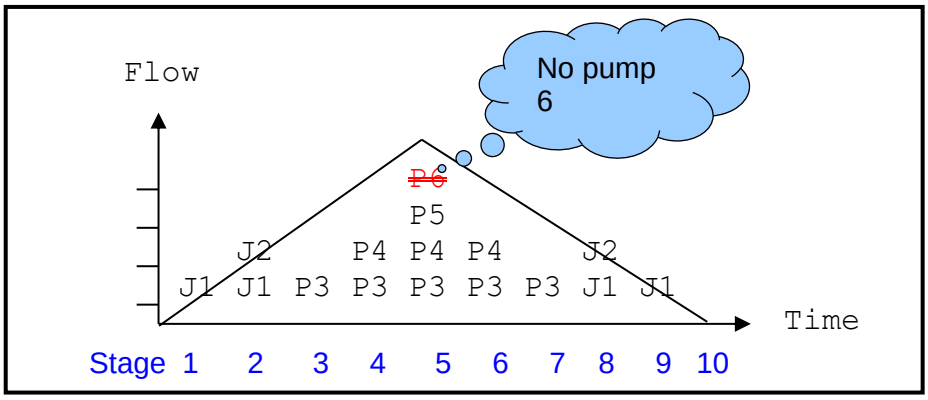
FC jockey pumps are frequency controlled jockey pumps that will supply small amounts of water (and leakages). They are the first pumps to come into operation and will be stopped as soon as one or more main pumps are started.
Note that the installed number of pumps also includes the frequency controlled (FC) jockey pump(s).

Consider the following pump setup…and let's assume the pump sequence is straightforward:

```
__MAIN_PUMP_SETUP___
Installed   : 6 pumps
Standby     : 1 pumps
VLT jockeys: 2 pumps
```

```
____PUMP_SEQUENCE___

J1 J2 P3 P4 P5 P6
 1  2  3  4  5  6
```

There are 6 pumps installed, of which 1 is standby and two are jockey pumps. So, in effect, there are 6 – 1 – 2 = 3 main pumps available for control, as indicated in the following diagram.



As the flow increases upward from zero the following happens in each stage:

1. Frequency controlled jockey pump J1 is ramped up from minimum speed to 100%
2. Frequency controlled jockey pump J2 is ramped up from minimum speed to 100%
3. Main pump P3 is ramped up from minimum speed to 100% and the jockeys are ramped down slowly and come to a stop
4. Main pump P4 is ramped up from minimum speed to 100%
5. Main pump P5 is ramped up from minimum speed to 100%. Note that P6 is standby so there is no way it will come into operation, unless one of the other main pumps P3 to P5 fails.

   As the flow reduces we come through the following stages.

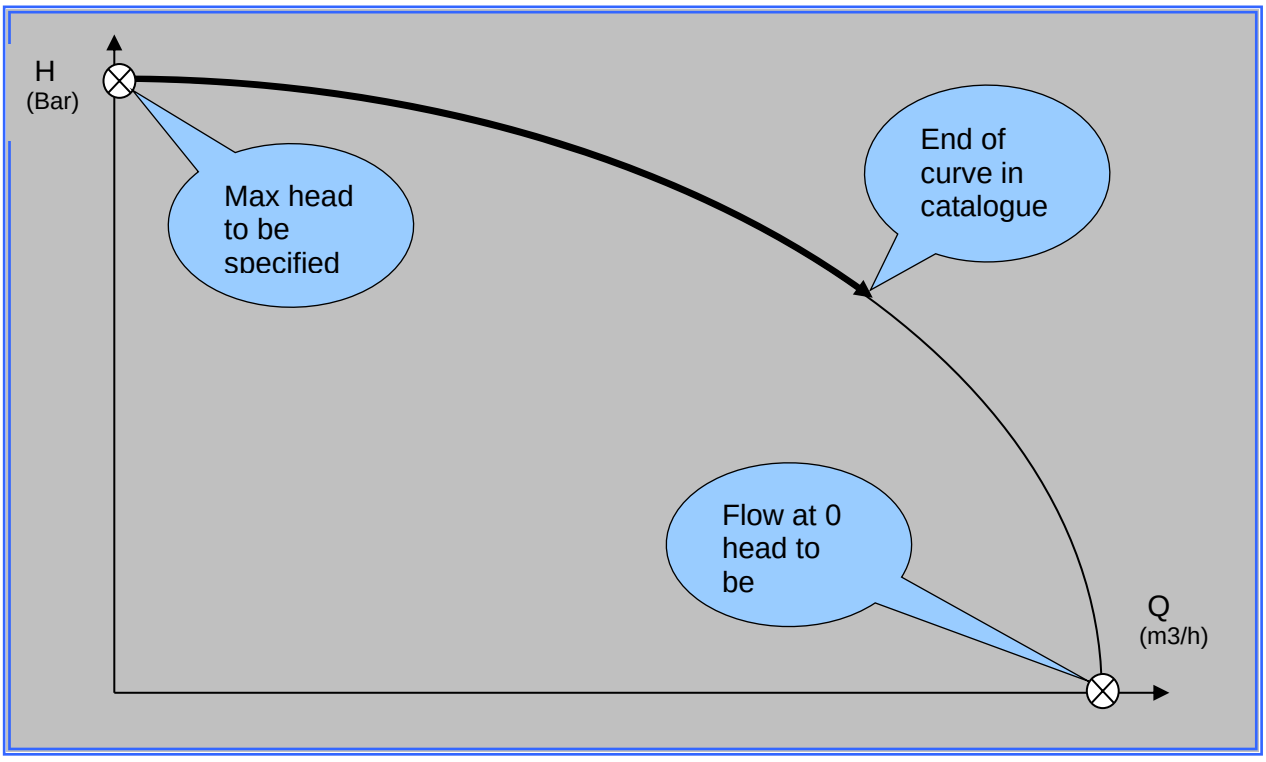
6. Main pump P5 is ramped down from 100% to minimum speed and stops.
7. Main pump P4 is ramped down from 100% to minimum speed and stops.
8. Frequency controlled jockey pumps J1 and J2 are ramped up from minimum speed to 100% and take over P3 which is stopped.
9. Frequency controlled jockey pump J2is ramped down from 100% to minimum speed and stops.
10. Frequency controlled jockey pump J2is ramped down from 100% to minimum speed and stops.

15.10.1.3 *Main pumps curve*

MAIN menu > Configuration > Pumps > Main pump setup >

```
___MAIN_PUMP_CURVE__
Max head:  >10.0 Bar
If VLT jockey, flow
at 0 head:  100.0 m3
```

The actual pump head at zero flow is needed for minimum speed calculations.
Note that actual pump head at zero flow is sometimes referred to as “the closed valve head pressure”.
This figure must **NOT** take into account any positive or negative suction pressure.
It is the value that you would normally retrieve from a pump curve in a catalogue.
If you have frequency controlled jockey pumps, you need to specify also the flow at zero head. Since this number is not specified in any regular pump curve, you will have to extrapolate the pump curve and estimate the number like in the following example:



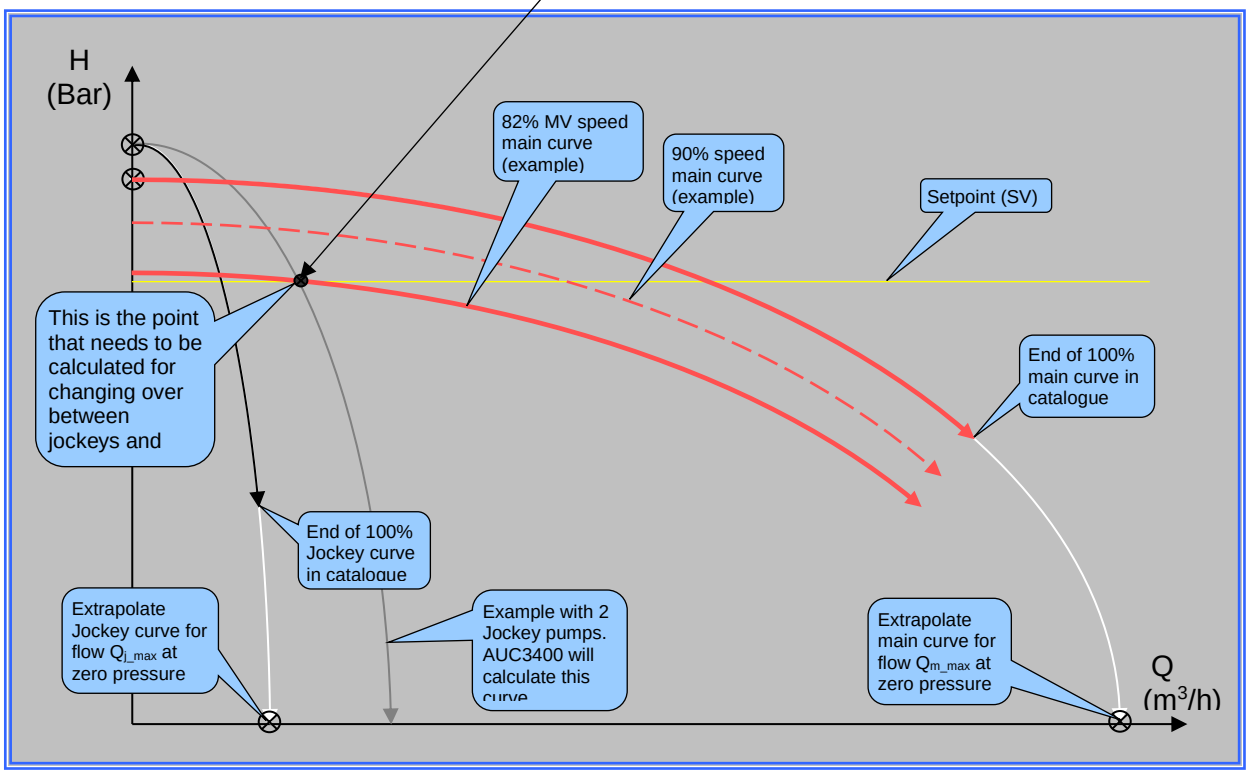
15.10.1.4 *Jockey curve (FC)*

MAIN menu > Configuration > Pumps > Main pump setup >

```
__VLT_JOCKEY_CURVE__
Max head:  >12.0 Bar
Extrapolated flow
at 0 head:  022.0 m3
```

.
See previous section for an explanation of the required points.

The jockey curve is required to calculate the switching point between jockey pump(s) and main lead pump.



To calculate this point the AUC3400 applies the infamous Hazen – Williams' mathematical parabolic equation:

$$H = H_{max} \times \left[1 - \left(\frac{Q}{Q_{max}} \right)^2 \right]$$

And from this equation we can derive the following equations.

For the main speed controlled pump:

$$Q = \frac{MV}{1000} \times Q_{m\_max} \times \sqrt{1 - \frac{H_{SV} - H_{inlet}}{\left(\frac{MV}{1000}\right)^2 \times H_{m\_max}}}$$

For the jockey pumps at full speed:

$$Q = n_{jockeys} \times Q_{j\_max} \times \sqrt{1 - \frac{H_{SV} - H_{inlet}}{H_{j\_max}}}$$

And finally, from all this the AUC3400 can calculate the switching over point: the Manipulated Value MV of the main lead pump, where it can stop the main pumps and continue to operate with just the jockey pump(s).

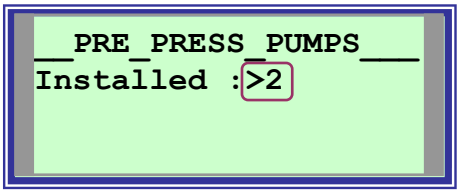
So, all you need to do is specify 4 points:

1. Where the main pump curve starts
2. Where the main pump curve stops
3. Where the jockey pump curve starts
4. Where the main pump curve stops

Note:
The Hazen – Williams' equations is after all just an approximated pump curve. It will not be a 100% match and therefore the calculated MV switching point will also be an approximation. But, it will function nonetheless and you may even change the end points of the pumps curves at zero head to make a shift of the calculated MV switching point.

15.10.1.5 *Pre-pressure pumps*

MAIN menu > Configuration > Pumps >



Pre-pressure pumps are used in irrigation application for supplying a constant positive suction pressure to the main pumps. Pre-pressure pumps, also referred to as pond pumps, serve to boost the inlet pressure of the main pumps within acceptable working conditions in certain applications. Without them the inlet pressure would fail to meet NPSH demands of the main pumps, with cavitation as a result.

In most situations the pre-pressure pumps will be mounted in the suction pipe in parallel.
The number of pre-pressure pump to be controlled can be specified in the above menu.
Up to 8 pre-pressure pumps can be controlled by the AUC3400.

Note: pre-pressure pumps will not be *speed* controlled by the AUC3400. Your only start options are direct on line or soft-start (which of course can still be done by means of frequency converters).
The AUC3400 will operate the pre-pressure pumps through remote I/O modules such as the ADAM modules.
These modules contain digital inputs for connection of run- and fail contacts and selector switches. There are transistor available for starting / be stopping pre-pressure pumps.

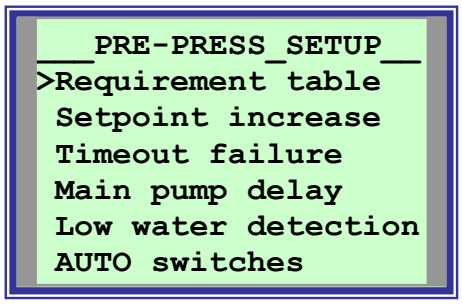
The ADAM modules are controlled over over the RS485 communication line.

Up to two pumps can be connected per ADAM module.

Up to four ADAM modules (8 pumps) can outputs controlled by the AUC3400.

15.10.1.6 *Pre-pressure setup*

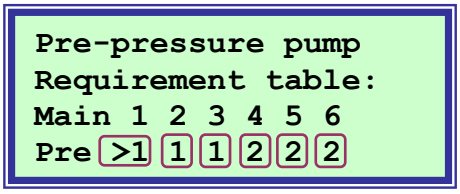
MAIN menu > Configuration > Pumps >



If you have selected any pre-pressure pumps in the previous section, then this menu will become visible. In this menu you will find all options to control the operation of the pre-pressure pumps.

15.10.1.6.1 Requirement table

MAIN menu > Configuration > Pumps > Pre-pressure setup >



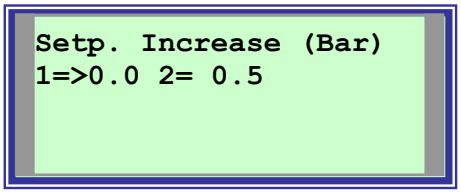
The pre-pressure pump requirement table tells the AUC3400 what number of pre-pressure pumps to use in relation to the number of main pumps in operation.

In the example above, there are six main pumps and two pre-pressure pumps available.
To run the first three main pumps, we need a single pre-pressure pump. For main pump 4 to 6 we need two pre-pressure pumps.

Note: in the above example a pre-pressure pump will be started before the first main pump. However, you can also start a main pump without a pre-pressure pump. The first “>1” in the above example would then be set to zero.

15.10.1.6.2 Setpoint increase

MAIN menu > Configuration > Pumps > Pre-pressure setup >

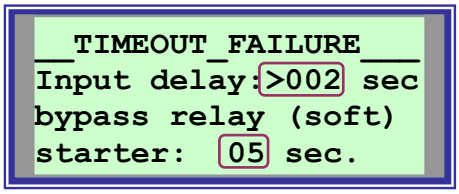


In this example the setpoint will be increased by 0.5 Bar by each successive pre-pressure pump started. The purpose of this setpoint increase is to avoid hunting of the main pumps when an extra pre-pressure pump is brought into operation. What could happen without a setpoint increase is that the additional pre-pressure pump is capable by itself alone to supply that bit of extra water required to boost the pressure above the setpoint again. And of course the initial reason for starting that pre-pressure pump was because the pressure was dropping below the setpoint. So, without the setpoint increase the pre-pressure pump might start and stop continuously at intervals defined by the run on time of the pumps, because the pressure goes over and under the setpoint each time that pre-pressure pump is started and stopped.

Note: in principle it is needless to specify a pressure increase for the first pre-pressure pump, as it is normally started before any of the main pumps is started. Only when one or more main pumps are allowed to run without any pre-pressure pump it makes sense to increase the setpoint for the first pre-pressure pump.

15.10.1.6.3 Timeout failure

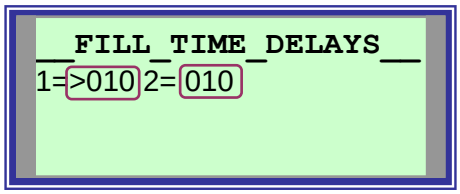
MAIN menu > Configuration > Pumps > Pre-pressure setup >



The pre-pressure pumps can be started in various ways. But if you have a soft starter, you will need to be able to adjust the error timing of the starter.
The input delay is the time that the run and thermal inputs should disappear before an alarm is raised.
The bypass time is the time needed by a soft starter to start a motor and ramp it up to full speed. This is the time you also adjust at the soft starter front.

15.10.1.6.4 Main pump delay

MAIN menu > Configuration > Pumps > Pre-pressure setup >

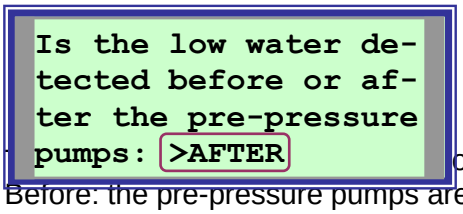


The pre-pressure pumps are often mounted in a separate leg in the suction pipe of the main pumps. Possibly this pipe leg has a separate air release valve and it may have to be filled by the pre-pressure pump prior to starting the main pump(s).
The time it takes to fill the pipe should be specified in this menu.

Note that when you have specified a time of ten seconds, like in the above example, it will take at least that time before a main pump is started and therefore the pressure might drop below the setpoint during that period.

15.10.1.6.5 Low water detection

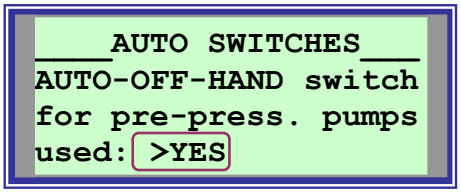
MAIN menu > Configuration > Pumps > Pre-pressure setup >



ogue signal) can be mounted before or after the pre-pressure pumps.
Before: the pre-pressure pumps are protected against dry running.
After: the main pumps are protected against dry running. However, the alarm will be released only after the filling times (previous section) are fulfilled.

15.10.1.6.6 AUTO switches

MAIN menu > Configuration > Pumps > Pre-pressure setup >



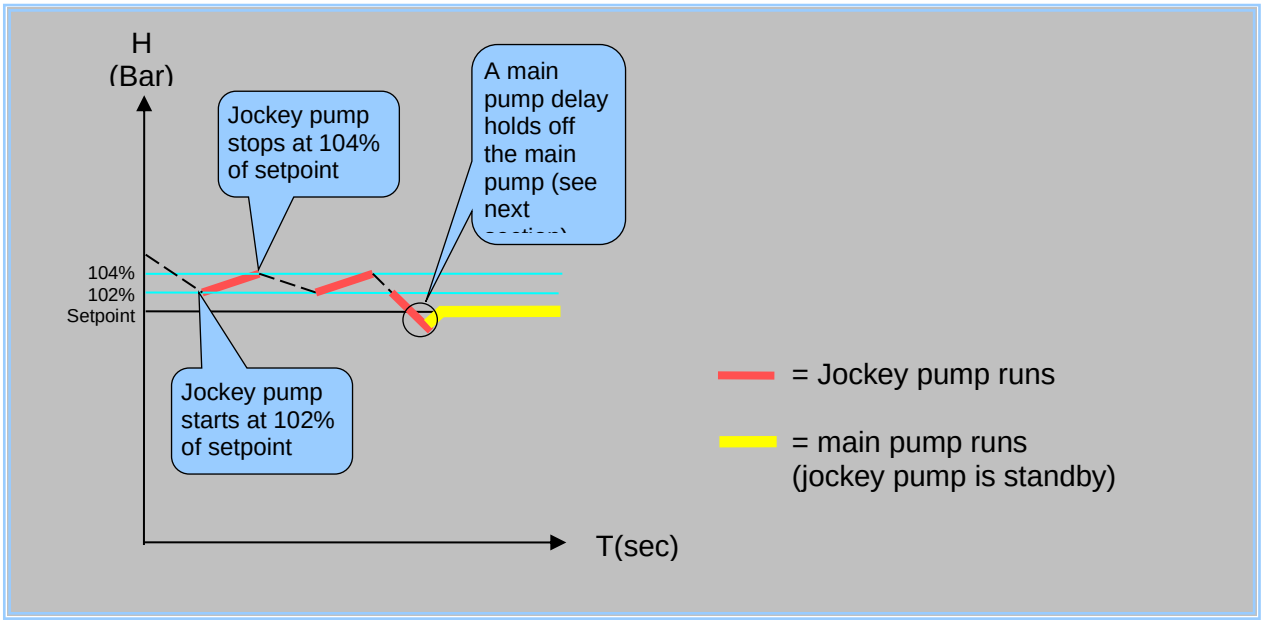
In the control menu you can put pumps into AUTO – OFF and HAND mode. However, if you have ordered a panel equipped with selector switches on the door for into AUTO – OFF and HAND outside the AUC3400, the controller needs to know the position of the external selector switches. In that case, select YES in this menu.
Note: you will not be able to fully control the pumps in the control menu any more. The external selector switches prelate the control menu.

15.10.1.7 *DOL Jockey pump*

MAIN menu > Configuration > Pumps >

```
____JOCKEY_SETUP____
Jockey pump: YES
On  below: 102 %
Off above: 104 %
```

If a DOL (Direct On Line) jockey pump is installed enter YES in this menu.
When the main pumps are stopped the jockey pump will start when the pressure drops below 102% of the active setpoint level until the pressure reaches 104% of the setpoint.



15.10.1.8 *Delay for lead pump*

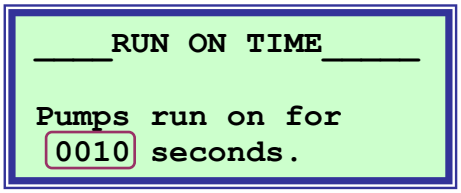
MAIN menu > Configuration > Pumps >

```
__DELAY_LEAD_PUMP___
Start up delay for
lead pump when
pressure<set:> 2 sec
```

If a DOL jockey pump is to be commissioned successfully, it may be required to hold of the main lead pump. Otherwise the main lead pump could start when, due to water of valve hammering, the pressure surges below the setpoint momentarily.

15.10.1.9 *Run on pump timers*


MAIN menu > Configuration > Pumps >



If the controller commands a pump to stop, this timer will allow it to “run on” for the time specified above. The advantage of this run time is that a pump will continue to run at minimum speed and that it can be picked up by the AUC3400 speed controller very quickly as it becomes needed again, shortly after it had become obsolete.

15.10.2 Frequency converters **

Quick setup > or
MAIN menu > Configuration >

```
_____VLT_MENU_____
>Setup motor data
 Program VLT's
 Enable drive alarms
```

The AUC3400 can control and program the Danfoss VLT series 2800 and 6000.
For each connected pump you must select the FC model.
The AUC3400 programs approx. 40 parameters in the FC in two setups. One setup is for the automatic control over the RS485 bus. The second setup is purely for manual control without the AUC3400. That means that as a customer, you can benefit from a high grade of redundancy.
If you order selector switches, potentiometers and lamp indicators on the panel door, you are able to run the pumps in manual HAND operation, even if the AUC3400 completely fails.

15.10.2.1 Setup motor data

Quick setup > Frequency converters or
MAIN menu > Configuration > Frequency converters > setup motor data

```
__SETUP_MOTOR_DATA__
>Motor 1
 Copy 1 to others
 Motor 2
 Motor 3
 Motor 4
 Motor 5
 Motor 6
 Motor 7
 Motor 8
```

15.10.2.1.1 Motor 1

Quick setup > Frequency converters or
MAIN menu > Configuration > Frequency converters > setup motor data

```
__FC1_DRIVE_DATA___
FC drive:>VLT2800
 015.00 kW    400 V
 032.50 Amp    50 Hz
```

FC drive is VLT2800, FC200, VLT6000, FCM300 (all Danfoss

or MGE (Grundfos), ABB ACS or Vacon 100. Kilo watts, voltage, frequency can all be read from the motor plate.

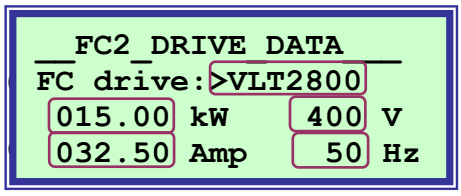
15.10.2.1.2 Copy 1 to others

Quick setup > Frequency converters or
MAIN menu > Configuration > Frequency converters > setup motor data

This copy option is a quick way to copy all the motor data from the first motor to the rest of your motors setups.
After you selected YES, and the copy was executed, you can still change all setups individually.

15.10.2.1.3 Motor 2

Quick setup > Frequency converters or
MAIN menu > Configuration > Frequency converters > setup motor data

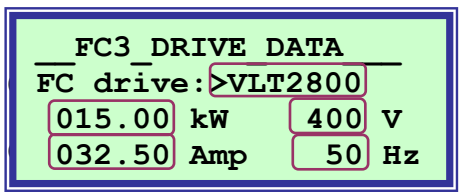


FC drive is VLT2800, FC200, VLT6000, FCM300 (all Danfoss

or MGE (Grundfos), ABB ACS or Vacon 100. Kilo watts, voltage, frequency can all be read from the motor plate.

15.10.2.1.4 Motor 3

Quick setup > Frequency converters or
MAIN menu > Configuration > Frequency converters > setup motor data

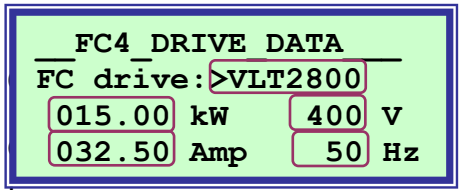


FC drive is VLT2800, FC200, VLT6000, FCM300 (all Danfoss

or MGE (Grundfos), ABB ACS or Vacon 100. Kilo watts, voltage, frequency can all be read from the motor plate.

15.10.2.1.5 Motor 4

Quick setup > Frequency converters or
MAIN menu > Configuration > Frequency converters > setup motor data

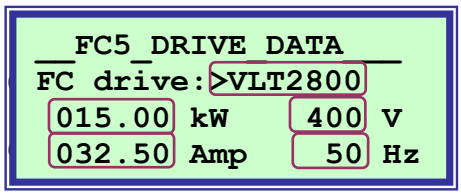


FC drive is VLT2800, FC200, VLT6000, FCM300 (all Danfoss

or MGE (Grundfos), ABB ACS or Vacon 100. Kilo watts, voltage, frequency can all be read from the motor plate.

15.10.2.1.6 Motor 5

Quick setup > Frequency converters or
MAIN menu > Configuration > Frequency converters > setup motor data

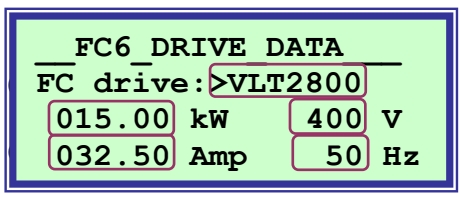


FC drive is VLT2800, FC200, VLT6000, FCM300 (all Danfoss

or MGE (Grundfos), ABB ACS or Vacon 100. Kilo watts, voltage, frequency can all be read from the motor plate..

15.10.2.1.7 Motor 6

Quick setup > Frequency converters or
MAIN menu > Configuration > Frequency converters > setup motor data

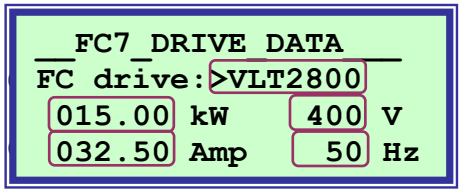


FC drive is VLT2800, FC200, VLT6000, FCM300 (all Danfoss

or MGE (Grundfos), ABB ACS or Vacon 100. Kilo watts, voltage, frequency can all be read from the motor plate.

15.10.2.1.8 Motor 7

Quick setup > Frequency converters or
MAIN menu > Configuration > Frequency converters > setup motor data

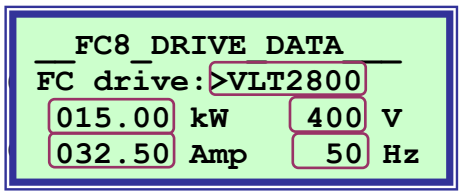


FC drive is VLT2800, FC200, VLT6000, FCM300 (all Danfoss

or MGE (Grundfos), ABB ACS or Vacon 100. Kilo watts, voltage, frequency can all be read from the motor plate.

15.10.2.1.9 Motor 8

Quick setup > Frequency converters or
MAIN menu > Configuration > Frequency converters > setup motor data

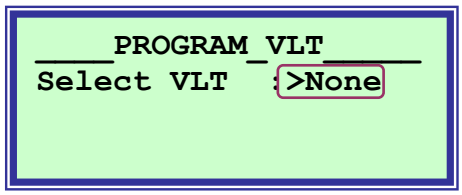


FC drive is VLT2800, FC200, VLT6000, FCM300 (all Danfoss

or MGE (Grundfos), ABB ACS or Vacon 100. Kilo watts, voltage, frequency can all be read from the motor plate.

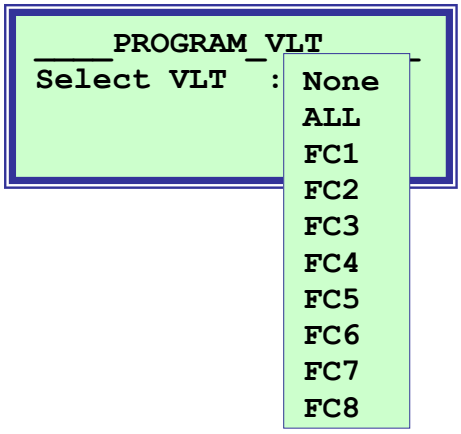
15.10.2.2 Program FC

Quick setup > Frequency converters or
MAIN menu > Configuration > Frequency converters

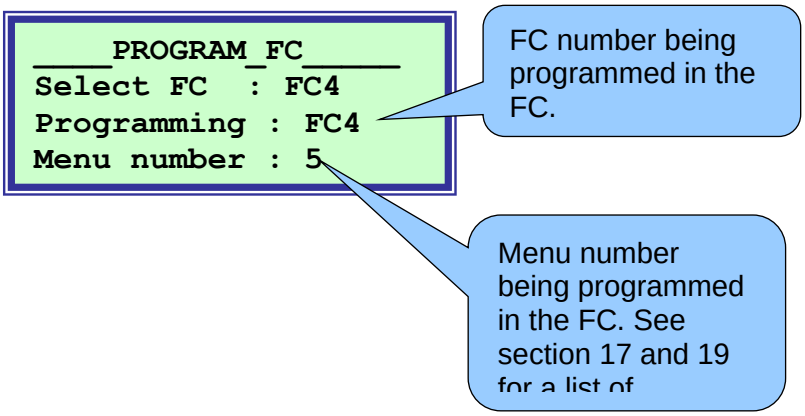


In this menu you can instruct the AUC3400 to program a single or all frequency converters (Danfoss VLTs).
The AUC3400 will program two different setups in each selected FC. Each of those setups contains approximately 22 parameters. One setup is for the automatic control over the RS485 bus by the AUC3400. The second setup is purely for manual control without the AUC3400.
Refer to section 17 and 19 for the parameter setups of Danfoss VLTs by the AUC3400.

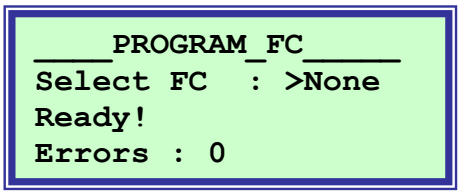
If you want to program a FC you should make sure that FC is standby, that is: powered on and not running a motor. To start the programming, select a FC or all FCs:



After you made a selection, for example FC4 and pressed enter the programming starts:



The menu number being programmed will count up quickly and once all the menus are programmed the following will show:



However, if during the programming an error is detected by the AUC3400, it will show briefly in which FC and menu programming went wrong and it will increment the error counter.

If you program all FCs, by selecting “ALL”, the AUC3400 will start by FC 1 and go through all of your installed FC menus one by one.
Note that you can program a standby FC even when the pump control is operating and other pumps are running.

15.10.2.3 *Enable drive alarms* **

Quick setup > Frequency converters or
MAIN menu > Configuration > Frequency converters >

```
_FC/ACS_DRIVE_ALARMS
Thermistors   : >NO
Current limit: >NO
DC link volts: >NO
```

With these options you can release the warning/error messages which may be present in Danfoss FC drives and ABB ACS drives. However, note that depending on application and motor load these warnings may occur regularly. The default factory setting are all NO's.

15.10.3 Sensors

MAIN menu > Configuration >

```
_______SENSORS______
>Discharge pressure
 Suction pressure
 Remote setpoint
 Flow
 kWh
 High water switch
```

Here you configure items related to the sensors / transmitters.

15.10.3.1 *Discharge pressure* *

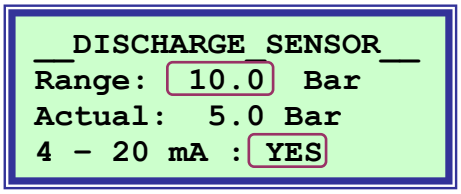
MAIN menu > Configuration > Sensors >

```
__DISCHARGE_SENSOR__
>Sensor range
 2nd sensor
 High alarm
 High alarm reset
 Low  alarm
 Low alarm reset
 Low  alarm override
 High alarm switch
```

Here you configure items related to the discharge sensor.

15.10.3.1.1 Sensor range

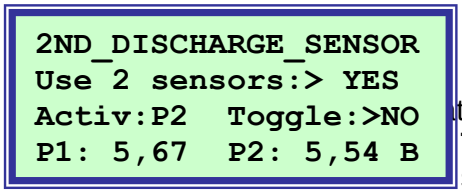
MAIN menu > Configuration > Sensors > Discharge pressure



Range is the value specified by the sensor.
Actual is the actual measured pressure in relation to range.
4 – 20 mA is YES where you connect a **4** – 20 mA sensor.

15.10.3.1.2 2nd Sensor *

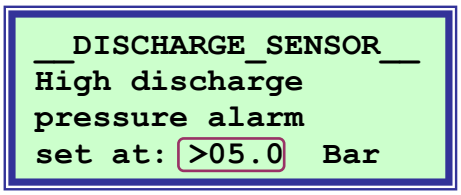
MAIN menu > Configuration > Sensors > Discharge pressure



If you enable two sensors, tha AUC3400 changes over to the te sensor when the active sensor fails (wire break).
TOGGLE: forces the AUC3400 to change over to the alternate sensor.

15.10.3.1.3 High alarm

MAIN menu > Configuration > Sensors > Discharge pressure



If the discharge pressure reaches the high pressure limit and a shut down of the system is created.

15.10.3.1.4 High alarm reset

MAIN menu > Configuration > Sensors > Discharge pressure

```
__DISCHARGE_SENSOR__
High pressure alarm
automatically resets
after: >060 seconds
```

If the pressure returns below the high pressure limit after a shut down, the AUC3400 will automatically restart the pump(s) after the specified period.

15.10.3.1.5 Low alarm

MAIN menu > Configuration > Sensors > Discharge pressure

```
__DISCHARGE_SENSOR__
Low discharge press.
setting: 00.0  Bar
Delay:  001 sec
```

If the discharge pressure drops below the low pressure limit for the specified time delay, the system will be shut down.

15.10.3.1.6 Low alarm reset

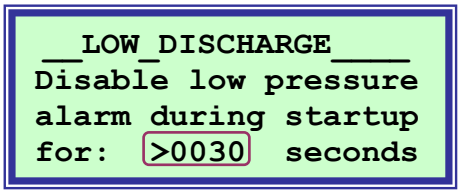
MAIN menu > Configuration > Sensors > Discharge pressure

```
__DISCHARGE_SENSOR__
Low pressure alarm
auto resets? 3  ( 0)
after:  50 seconds
```

If the discharge pressure drops below the low pressure limit the system will be shut down.
Here you can control how the AUC3400 should respond next.
If the auto reset number specified here is set to zero, the AUC3400 will not resume operation again.
If set to a number which is not zero, in this example the number 3, then the AUC3400 will automatically try to resume operation again for 3 times a day (each day at midnight the counter is reset).
The delay specifies the time delay between the time the low pressure alarm was raised and the time that auto reset is tried. The number indicated between parentheses (0) counts the actual number of auto resets.

15.10.3.1.7 Low alarm override

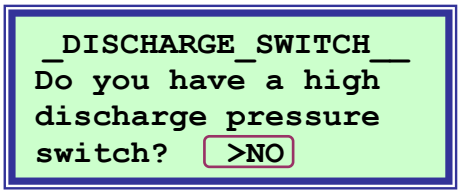
MAIN menu > Configuration > Sensors > Discharge pressure



The low pressure shut down condition is overridden during start-up of the system for the time specified here. It is NOT overridden during filling of the pipes. Therefore, take into consideration the time it may take to fill up the pipes at a low setpoint (refer to section15.7.6).

15.10.3.1.8 High alarm switch

MAIN menu > Configuration > Sensors > Discharge pressure



Beside the high discharge pressure limit that you specified as an analogue value, you can also have a pressure switch input [digital]. When activated the switch will triggers the same high discharge alarm as the analogue input.

15.10.3.2 *Suction pressure*

MAIN menu > Configuration > Sensors >

```
__SUCTION_SENSOR___
>Enable
 Range
 Low alarm
 Low alarm reset
 Low alarm override
 Low alarm switch
```

Here you configure items related to the suction sensor.

*15.10.3.2.1 Enable **

MAIN menu > Configuration > Sensors > Suction sensor

```
___SUCTION_SENSOR__
Use: >NO  Delay: 2 s
If no, or failure
use:   00.00 Bar.
```

Specify if you use an analog suction sensor (i.e. 0/4-20 mA).
The delay time specifies how long it takes before a 'DRY RUNNING' alarm is activated. This timer applies to both the analogue suction sensor as well as the digital low inlet suction input.

Together with the nominal pump head, the suction pressure is needed for minimum speed calculations and a correct calculation of the speed adjustments. If you do not have a suction sensor, specify the correct fixed suction pressure.

IMPORTANT:

Failing to specify the correct inlet pressure value is the number one reason for bad pressure control! It will create oscillation and zero flow detection will fail!

15.10.3.2.2 Sensor range

MAIN menu > Configuration > Sensors > Suction sensor

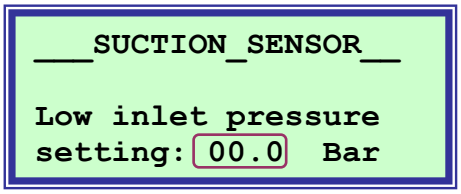
```
___SUCTION_SENSOR___
00.0 to  01.0 Bar
Actual:    0.0 Bar
4 - 20 mA:  YES
```

00.0 to 01.00 is the range of the sensor.
Actual is the actual measured pressure in relation to range.
4 – 20 mA is YES where you connect a **4** – 20 mA sensor.

Note that you may specify any range like -2 to +2 bar.

15.10.3.2.3 Low alarm

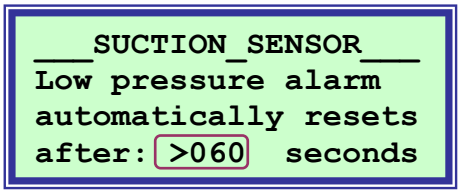
MAIN menu > Configuration > Sensors > Suction sensor



If the suction pressure drops below the low pressure limit for one second, a shut down condition is created.

15.10.3.2.4 Low alarm reset

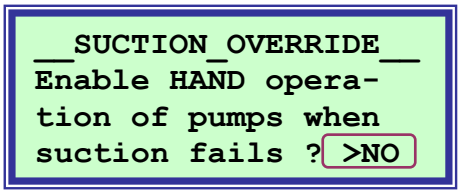
MAIN menu > Configuration > Sensors > Suction sensor



If the pressure returns above the low pressure limit the system will restart after the period that is specified here.

15.10.3.2.5 Low alarm override

MAIN menu > Configuration > Sensors > Suction sensor



When a low suction alarm is active you cannot operate the pumps, not even in HAND mode. However, if the problem is created by a defect in the sensor you may want to be able to control the pumps in HAND mode. If so, select YES in this menu option.

15.10.3.2.6 Low alarm switch

MAIN menu > Configuration > Sensors > Suction sensor

```
___SUCTION SWITCH___
Do you have a low
suction pressure
switch? >YES
```

Beside the low suction pressure limit that you specified as an analogue value, you can also have a pressure switch input [digital]. When activated the switch will create the same low suction alarm as the analogue input.

15.10.3.3 Remote setpoint

MAIN menu > Configuration > Sensors >

```
___REMOTE_SETPOINT__
Enable
Range
Flow limit enable
```

In the remote setpoint menu you can enable a remote setpoint.

The external setpoint reference value is obtained from an analogue input.
An external device can thus change the actual setpoint into a desired setting by applying the corresponding analogue value to the AUC3400 analogue input.

The remote setpoint needs to be enabled both in the software and in the hardware.
In the software the remote setpoint is enabled as described in the following section.
In the hardware the remote setpoint is enabled by a digital switch that is connected to the analogue input at terminal 22 through a resistor (2 kOhms). Only if the switch is activated, so is the external setpoint.

15.10.3.3.1 Enable

MAIN menu > Configuration > Sensors > Remote setpoint >

```
___REMOTE_SETPOINT__
Enable:  >NO
If case of failure
use local setp.: YES
```

The remote setpoint option can be enabled by changing NO into YES.
In case of a wire break from the remote setpoint reference, the AUC3400 will fall back to the local setpoint (or quick setpoint) if you leave the bottom line option YES.
Otherwise the controller will shut down the pumps.

15.10.3.3.2 Range

MAIN menu > Configuration > Sensors > Remote setpoint >

```
___REMOTE_SETPOINT__
Range: >10.0 Bar
Value:   6.3 Bar
4 - 20 mA: NO
```

10.00 is the range of the remote setpoint reference.
Actual is the actual external setpoint in relation to range.
4 – 20 mA is YES where you connect a **4** – 20 mA sensor.

15.10.3.3.3 Flow limit enable *

MAIN menu > Configuration > Sensors > Remote setpoint >

With flow limitation it is possible to limit the flow when it passes a set value.
When the flow grows too high, the AUC3400 will ramp down the setpoint towards 0 bar.
Applications for this feature can be found were cleaning is done with high pressure lances.

```
___FLOW_LIMITATION__
Enable flow limita-
tions for all the
setpoints?  NO
```

IMPORTANT NOTE: when you enable this feature, all setpoints, including the local setpoints L1 to L5 will have additional settings which must be set. Refer to the next section and sections starting at par. 15.7.2.1.

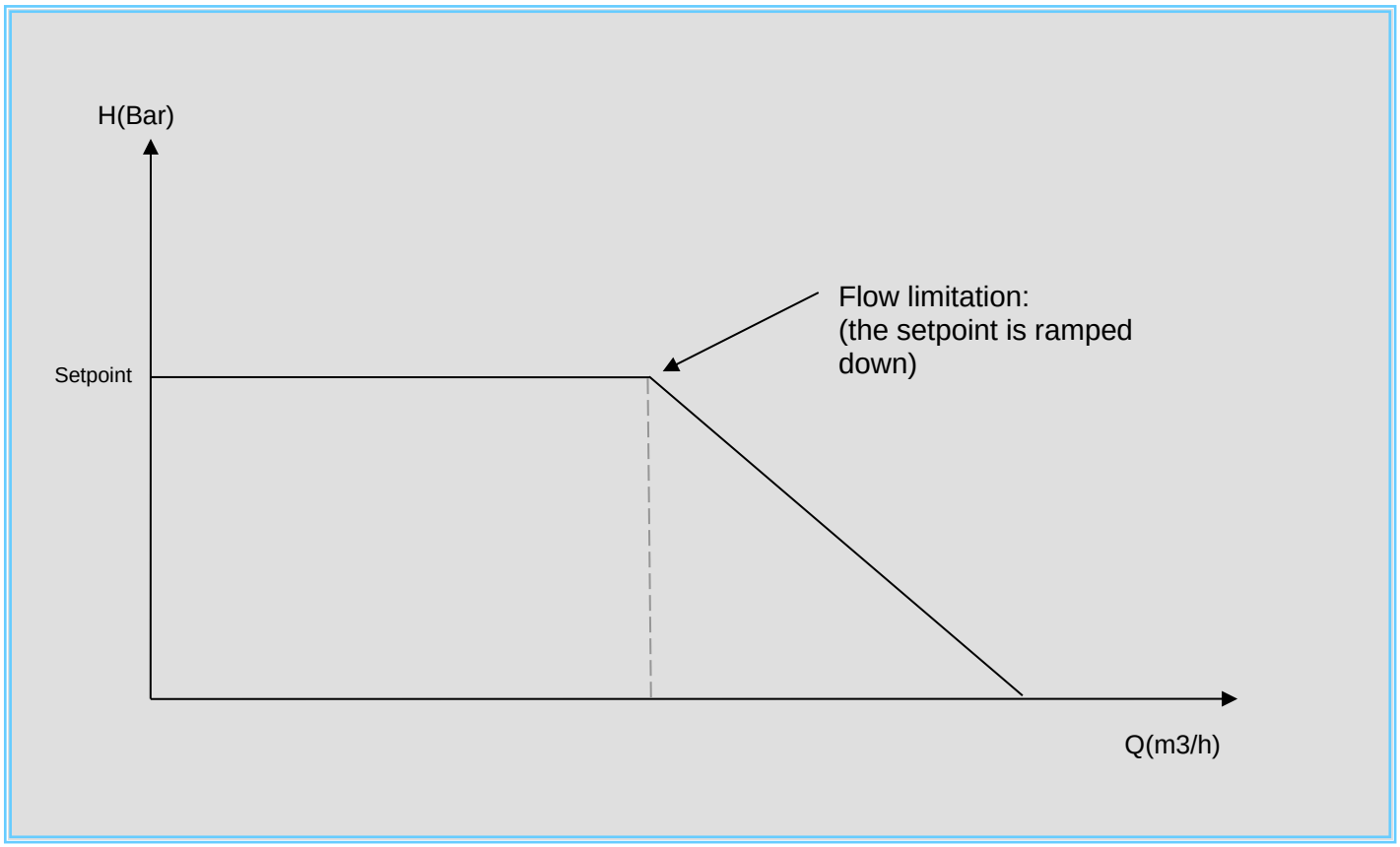
15.10.3.3.4 Flow limit setpoint *

MAIN menu > Configuration > Sensors > Remote setpoint >

With flow limitation it is possible to limit the flow when it passes a set value.
When the flow grows too high, the AUC3400 will ramp down the setpoint towards 0 bar.
Applications for this feature can be found were cleaning is done with high pressure lances.
Flow limitation must be enabled for this menu to become available and visible. You can enable it in the setpoints menu (refer to par. 15.7.12) or in the configuration menu (refer to par. **Fout! Verwijzingsbron niet gevonden.**)

```
___REMOTE_SETPOINT__
Limit at: 100.0 m3/h
by 0.02 bar per m3/h
```

If flow limitation is enabled, you can also define how the setpoint ramps down as the flow increases above a set value. In this example the setpoint of 5 bar wil ramp down by 0,02 bar per m^3/h when the flow passes 100 m^3/h.
At 150 m^3/h the setpoint will be limited to:
5 bar – ((150-100 m^3/h) x 0.02) = 4 bar.



15.10.3.4 *Flow*

MAIN menu > Configuration > Sensors >

```
____FLOW_METERS____
>Analog  flow meter
 Pulsed  flow meter
 Virtual flow meter
 Pumped volume
 Show flow in headup
 Flow limitation
 Flow threshold
 Bypass valve
```

In the flow meters menu you can select one of three sources for flow measuring:

1. Rate flow meter, with an analogue output signal
2. Totalising flow meter, with a pulsed digital output signal
3. Virtual flow meter, an internally calculated flow value based on the pump curve.

From any of these flow sources the following flow measurements can be obtained:

1. Flow rate in m^3/h
2. Total pumped volume in m^3
3. Periodic pumped volume in m^3

15.10.3.4.1 Analogue flow meter

MAIN menu > Configuration > Sensors > Flow

```
_ANALOG_FLOW_METER__
Enable: >NO
Range :  001.0 m3/h
4-20mA:  NO
```

If you have a flow meter with an analogue output connected to the AUC3400 you can configure it here. If you have a flow meter with an pulse output connected to the AUC3400 (for flow rate), proceed to the next section.

15.10.3.4.2 Pulsed flow meter **

MAIN menu > Configuration > Sensors > Flow

```
Enable   :  NO
Filter:     5
K-factor:   001.0000
Pipe X   :  001.0000
```

If you have a flow meter with an pulse output connected to the AUC3400 (for flow rate) select yes. To set up the flow rate you need to specify the K-factor which will be specified by the flow meter manufacturer and possibly a compensation for the placement of the flow meter in the pipe.
The filter will dampen and smooth the reading.

15.10.3.4.3 Virtual flow

MAIN menu > Configuration > Sensors > Flow

```
_VIRTUAL_FLOW_METER_
>Record pump curve
 Pump curve points
 Enable virtual flow
 Show real/virtual
```

The virtual flow meter option offers a way to display flow without actually measuring the flow.

15.10.3.4.3.1 Record pump curve

MAIN menu > Configuration > Sensors > Flow > Virtual flow

```
____VIRTUAL_FLOW____
Record 1-6 (Up/Down)
Enter = store point
DH= 5.931   Q= 57.00
```

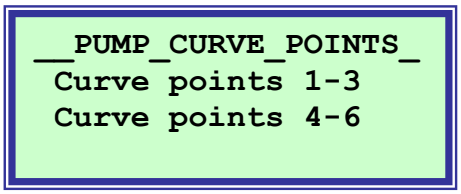
In this menu you can record a pump curve when you run a pump with an external flow meter connected to the analogue input. You might do this once in the workshop where you have a flow meter with an available analogue output.

The recording is a set of 6 points of pressure and flow. You must record 6 points before you enable virtual flow! Refer to par. 15.10.3.4.3.3 to enable the virtual flow and par. 15.10.3.4.3.4 to check the virtual flow against a true flow meter.

With the six points the AUC3400 will generate a pump curve using polynomial mathematics. Using the recorded pump curve enables the AUC to calculate the flow just by reading the pressure. For more information contact your supplier.

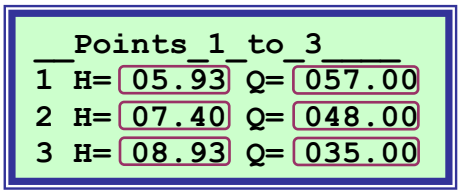
15.10.3.4.3.2 Pump curve points

MAIN menu > Configuration > Sensors > Flow > Virtual flow



15.10.3.4.3.2.1 Pump curve points 1-3

MAIN menu > Configuration > Sensors > Flow > Virtual flow > Curve points 1-3



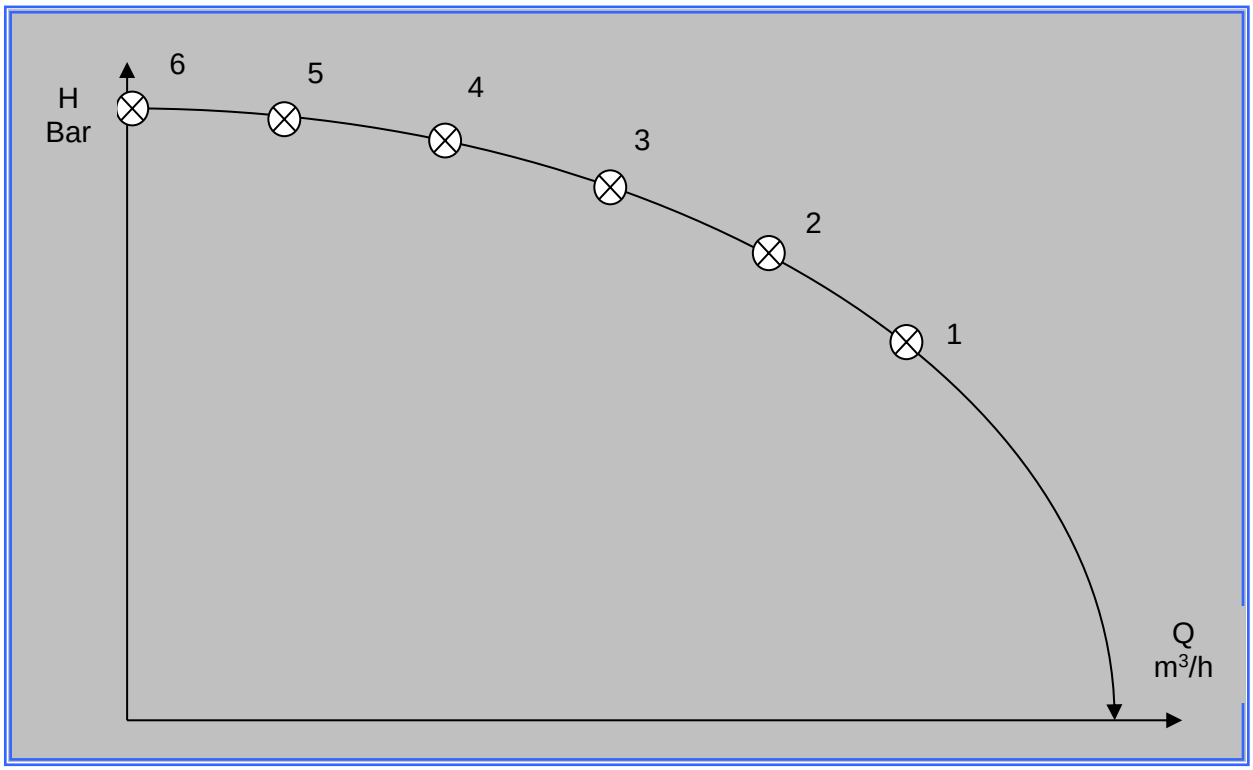
15.10.3.4.3.2.2 Pump curve points 4-6

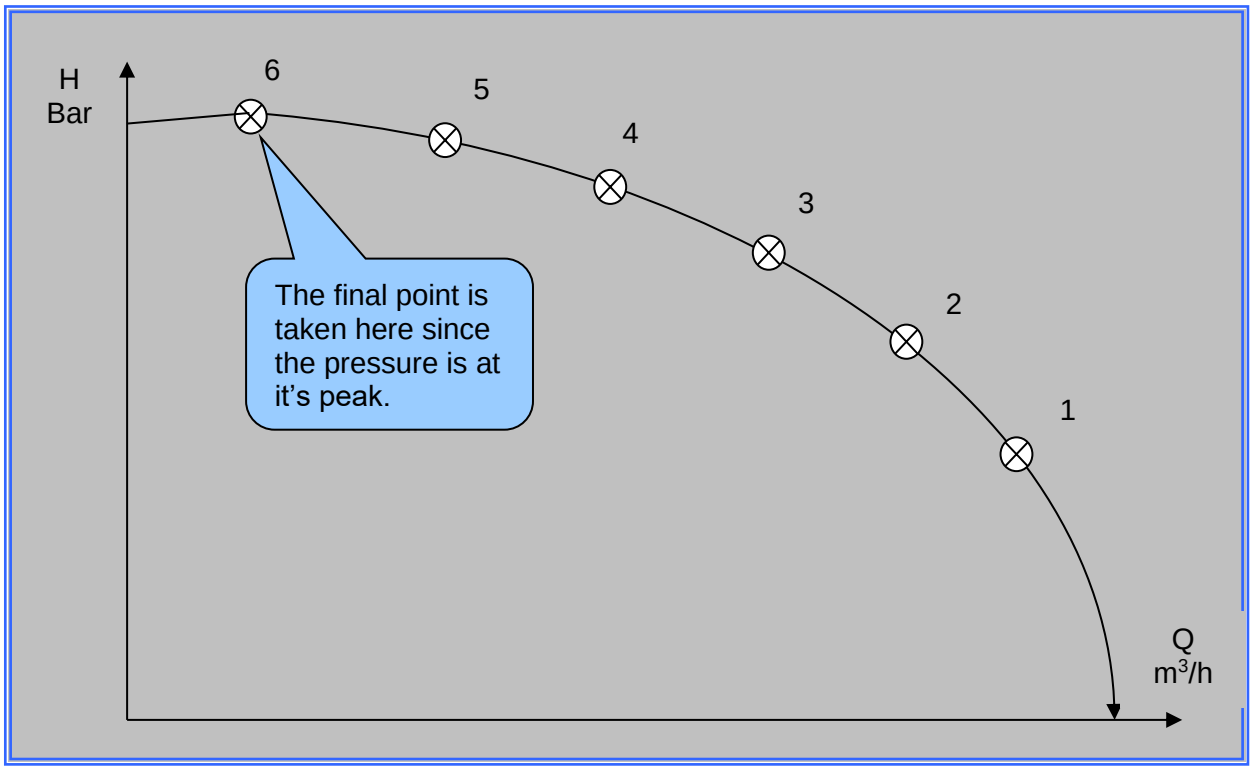
MAIN menu > Configuration > Sensors > Flow > Virtual flow > Curve points 4-6

```
__Points_4_to_6____
4 H= 06.65 Q= 025.00
5 H= 10.00 Q= 013.00
6 H= 10.10 Q= 000.00
```

In these menus you view the recorded pump curve or you can enter the points yourself, right out a data sheet or pump curve.
Important note: - use equal distanced flow points.

- If the pump curve has a maximum head on a flow other than 0, make sure you record a point at that point.
- See the above example setting.
- For more information contact your supplier.





The above figure show what the sequence of recorded point is. They also show the point are taken at equal distance and that the last point should be taken at the highest pressure value, not necessarily zero flow.

15.10.3.4.3.3 Enable virtual flow **

MAIN menu > Configuration > Sensors > Flow > Virtual flow

```
_VIRTUAL_FLOW_METER_
Make sure you speci-
fied 6 Q/H points!
Enable? > NO
```

Once have recorded 6 valid points you can enable the virtual flow calculation here.

15.10.3.4.3.4 Show real/virtual

MAIN menu > Configuration > Sensors > Flow > Virtual flow

```
__FLOW_COMPARISON__
Analog flow =   0.49
Virtual flow=   0.00
dHb=  0.04 dHm=  0.4
```

This menu shows the real and virtual flow, so you can compare the virtual flow curve against the real flow curve of a flow meter.

15.10.3.4.4 Pumped volume

MAIN menu > Configuration > Sensors > Flow

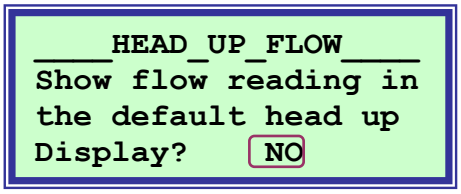
```
___PUMPED_VOLUME___
Calc.from rate: >YES
If digital input,one
pulse = 00.10000 m3
```

The pumped volume counters (total and periodical) need a digital input from a totalising pulsed flow meter or can be derived from the analogue signals from a flow meter with an analogue output or from the internal virtual flow meter.

In case you have a digital input from a totalising pulsed flow meter, select NO and select the conversion rate at the bottom line, otherwise select YES.

Show at head up

MAIN menu > Configuration > Sensors > Flow

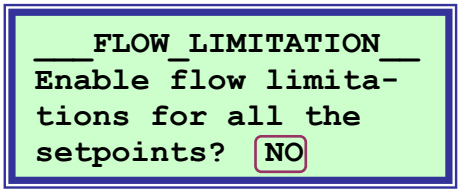


The default head up display normally shows MEFX – VX.X on the third line.
If you are using a flow meter, you can display it on the third line instead of the MEFX text. The question in the bottom line refers to the true flow reading from an external flow meter (NO) or to the calculated virtual flow (YES).

*15.10.3.4.5 Flow limitation *

MAIN menu > Configuration > Sensors > Flow >

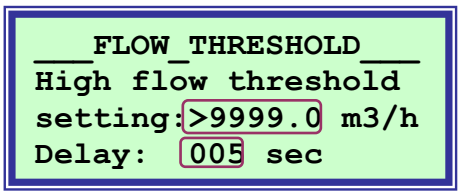
With flow limitation it is possible to limit the flow when it passes a set value.
When the flow grows too high, the AUC3400 will ramp down the setpoint towards 0 bar.
Applications for this feature can be found were cleaning is done with high pressure lances.



IMPORTANT NOTE: when you enable this feature, all setpoints, including the remote and local setpoints L1 to L5 will have additional settings which must be set. Refer to the remote setpoint section in par. 15.10.3.3.4 and the local setpoint sections starting at par. 15.7.2.1.

15.10.3.4.6 Flow threshold

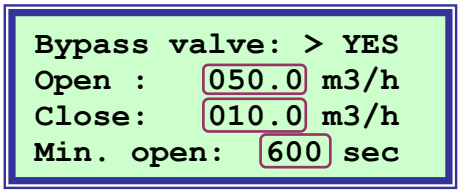
MAIN menu > Configuration > Sensors > Flow >



With this option you can have a high flow alarm and signal the alarm at the AUC3400 terminal designated Flow Threshold (potential free contacts).

15.10.3.4.7 *Bypass valve**

MAIN menu > Configuration > Sensors > Flow



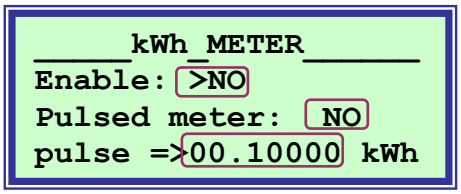
A bypass valve is used in dedicated applications, for example where an inlet filter is applied for a pumping station where the water intake comes from an open water source (lake or canal).

With this option you can control a bypass valve that could be used the spray and clean the inlet filter.

In the above example the bypass valve opens when the flow passes 50 m^3/h.
The bypass valve remains opened until the flow drops below 10 m^3/h or for at least 600 seconds.

15.10.3.5 *kWh*

MAIN menu > Configuration > Sensors >

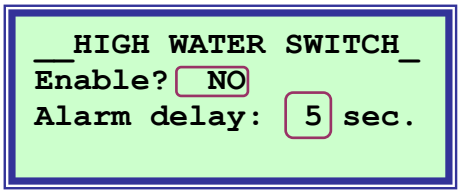


If you enable the kWh meter, the readings will appear in the head up displays and in the status menu. There, you will also be able to reset the periodical counter. Refer to section 15.1.9.

The next thing is to select whether you have an external pulsing kWh meter that you want to connect. The external kWh meter should have its digital output contact connected to the appropriate AUC3400 terminal.
If you do not have an external kWh meter, the AUC3400 will calculate the kWh consumption by processing the kW readings from the frequency converters. Note that this calculated number does not include power consumption from other components such as relays, the AUC3400 and direct on line operated pre-pressure and jockey pumps.

15.10.3.6 *High water switch*

MAIN menu > Configuration > Sensors >



If you have an optional external level controller which can signal a high water level in the well or possibly in the control room, you may enable this menu option. An alarm will be raised if the concerned input is broken.

15.10.4 Controller

MAIN menu > Configuration >

```
_____CONTROLLER_____
>Sample time
 Min. pump stop time
 Control speed
   -> differentiator
 Minimum speed
 Pressure filters
 Anti cavitation
 Friction losses
 Pump simulator
```

In the control menu you will items related to the control behaviour of the AUC3400.

15.10.4.1 Sample time

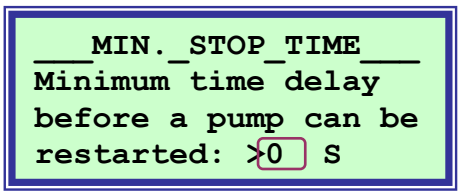
MAIN menu > Configuration > Controller

```
_____SAMPLE TIME____
Note:use value big-
ger than 50 for slow
system only:>0050 mS
```

The AUC3400 has an internal sample time in which the control adjustments are calculated.
For normal installations you will never need to adjust this sample time.
It will only become interesting in systems with a response lag or dead time, for example heating systems.
Always contact Aqualectra before attempting to adjust this setting.

15.10.4.2 *Min. pump stop time* **

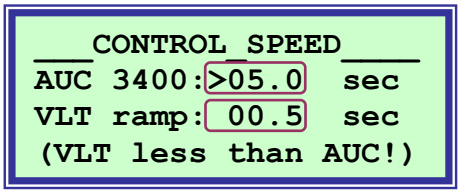
MAIN menu > Configuration > Controller



Here you can prevent each individual main pump from starting directly after it was stopped. Normally you would not need this timer to be set. Use it only in cases where you really need to limit the number of starts due to hydraulic problems. Factory default is zero seconds.

15.10.4.3 *Control speed*

MAIN menu > Configuration > Controller

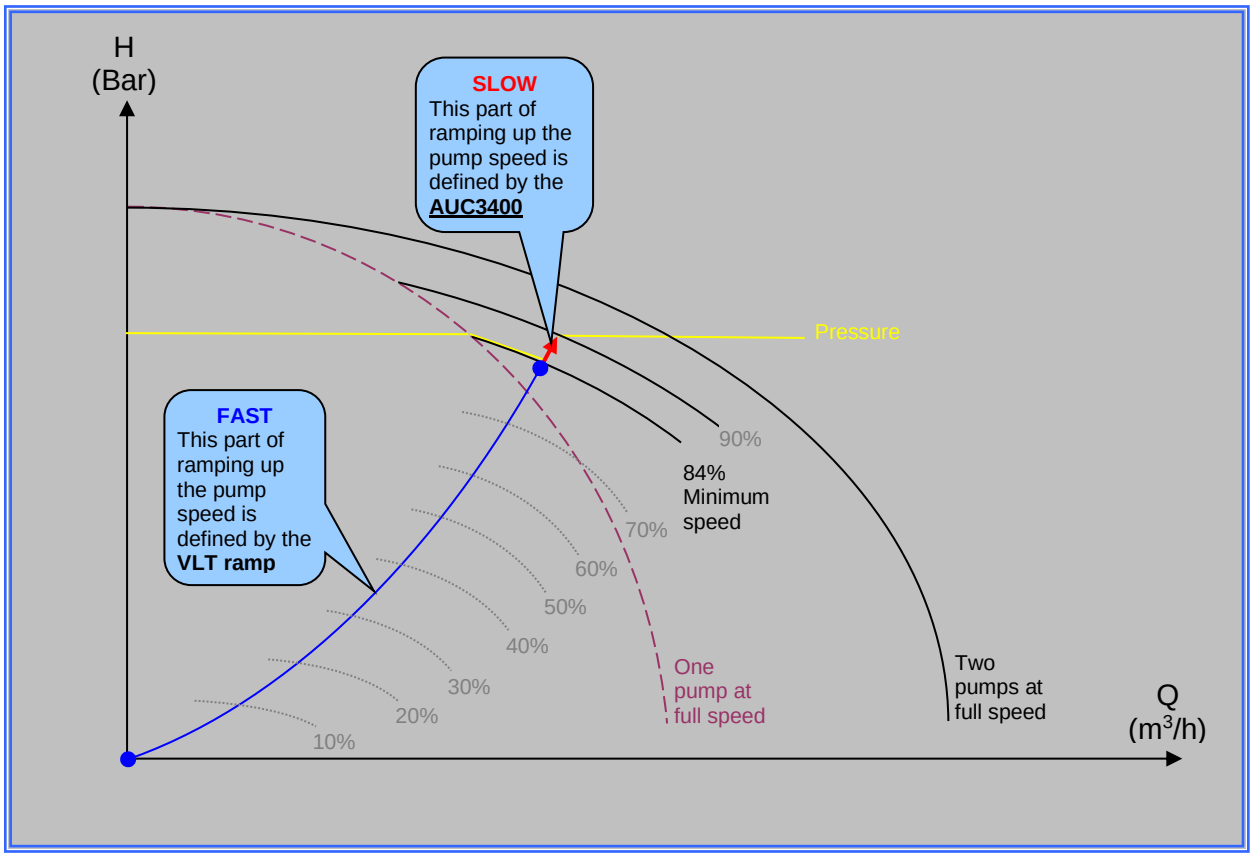


The control speed specifies how fast or how slow the AUC3400 is allowed to control the pressure to the setpoint by speeding up and down the pump.

This is a very important control menu, since the speed of the AUC3400 control should be in line with the hydraulic characteristics of your specified pump application.

In this menu you adjust the AUC3400 control speed and the frequency converter ramp time (Danfoss VLT ramp) which will be programmed by the AUC3400 in the FC when your order it to (refer to section 15.10.2).

The following figure shows what the two ramp parameters are about:

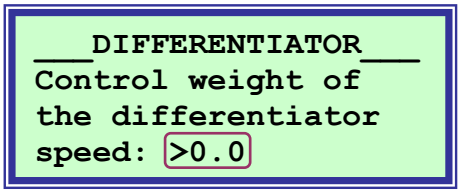


The figure shows what happens when one pump operates at maximum speed and the flow demand increases. The pressure will drop and the AUC3400 will start the second pump.
The second pump ramps up to minimum speed following the FC ramp setting (fast). Then, at minimum speed, the pump ramps up following the AUC3400 ramp (slow).

The reason for using these two different ramp timers lies in the fact that up to minimum speed the second pump will not affect the pressure. Therefore it can be allowed to ramp up to minimum speed as fast as possible.
Even in a (very) slow system the AUC3400 can respond quickly that way. Instead of having to ramp up the pump slowly from zero to the minimum speed, it can pickup the pressure almost instantly. So, in a slow system, you normally slow down only the AUC3400 ramp time!

15.10.4.4 *Differentiator*

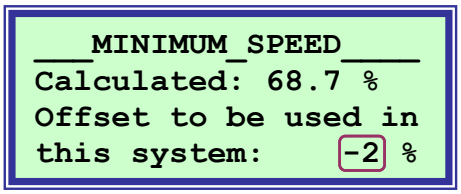
MAIN menu > Configuration > Controller



The differentiator is an option that should be applied with great care.
A differentiator counter acts on pressure changes. The faster the pressure changes, the faster the differentiator acts in the opposite direction. It can make a better control in that it allows a faster control with less overshoot, but it can also easily destroy the pressure control if there is noise on the discharge pressure sensor signal (which it interprets to be fast pressure shifts).
By default this option is disabled (zeroed).
It makes sense to use this option in case you have a slow system where you may have overshoot in the pressure created by pressure reflections in the pipe line. Otherwise we discourage the use of the differentiator.

15.10.4.5 *Minimum speed*

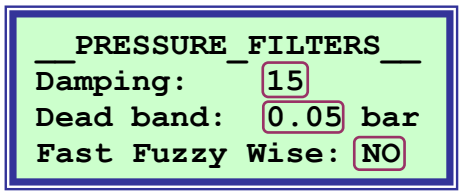
MAIN menu > Configuration > Controller



The minimum speed is automatically calculated by the AUC3400. Input parameters are pumps head, setpoint and suction pressure.
However, because pumps do not always have equal performances and inlet pressure may vary, the minimum speed calculated might prove to be too critical. That could lead to problems such as hunting pumps (when an extra pump is needed) or that the minimum speed at very low flow rates is too high and therefore would trigger the zero flow mechanism in adversely.
To avoid these situations the AUC3400 comes default with a –2% offset allowing for small variations. If you still encounter problems lower the offset. Otherwise you might also increase the fixed inlet pressure (section 15.10.3.2.1) or increase the zero flow nominal pump head (section 15.10.1.3).

15.10.4.6 *Pressure filters*

MAIN menu > Configuration > Controller



This menu controls the following:

- Damping: this is the filter applied to the analogue input signals from the various transmitters. If you have a system with a lot of vibration you may need to increase the damping to create a more stable control.

- Dead band: this is the tolerance around the setpoint where the measured pressure is allowed to move, without the AUC trying to correct the speed to match the setpoint. Again, if you have troubles caused by vibrations, increase this value.

  Note: if you increase the dead band to let's say 0.5 bar, you would never be able to create the pressure boost of 5% at zero flow. Therefore, the dead band during pressure boost will always be set to 0.05 Bar by the AUC3400, so that the boost is really created. Thus, you are allowed to create a wide dead band.

- Fast Fuzzy Wise: this will enable the Fuzzy Wise pressure correction algorithm to make very fast speed corrections when the pressure rises faster than the AUC3400 control ramp allows the speed of the pumps to go down.
  If enabled, the Fast Fuzzy Wise algorithm is activated when the pressure is 5% higher than the setpoint.

  Fast Fuzzy can do miracles in case your application should have a slow and stable pressure control with long setpoint and control ramp timers, but where it should ramp down the pumps very fast when a big valve is suddenly closed in the discharge pipe.

  Fast Fuzzy works only in one direction (down) so it will not cause oscillation due to undershoot.

  Note: refer to section 9 for detailed description on Fuzzy Wise control.

15.10.4.7 *Anti cavitation mode*

MAIN menu > Configuration > Controller

```
__PUMP_CONTROL_MODE_
 Anti cavitation
  + auto detection
  + auto status
```

Normally the pumps are controlled in cascading. That is, when the first lead pump reaches 100% the next one is started at minimum speed and then the speed of that second pump is controlled, whereas the first pump remains at 100% speed. In anti cavitation mode a number of pumps are started at the same time and are controlled at the same speed in parallel, effectively creating one big pump and avoiding pumps to run off their pump curves and avoiding cavitation.

15.10.4.7.1 Anti cavitation

MAIN menu > Configuration > Controller > Anti cavitation

```
__CAVITATION_MODE___
Enable mode:  NO
Pumps to be run in
parallel:  1
```

Normally, in the default cascading control mode, pumps are started one by one.
If you enable cavitation mode by selecting YES and specify 2 pumps to be run in parallel the following will happen:

- When the system is started up after a power failure or a shut down failure the start up setpoint (default 2 Bar) will be controlled with two pumps instead of one pump at 50 % default. This is to fill the pipes.
- After the pipes are filled the 2 pump run in parallel at the same speed.
- When the two pumps reach 105% the third pump is started at minimum speed. It will be controlled up until the setpoint is reached (for example at 87% speed) and the first two pumps running in parallel run at 100 %.
- When the third pump reaches 105% the fourth pump is started at minimum speed. It will be controlled up until the setpoint is reached (for example at 83% speed) and the first three pumps run at 100 %.

If you select 3 pump pumps to be run in parallel the system will start with three pumps in parallel.
If you select 4 pump pumps to be run in parallel the system will start with four pumps in parallel.
All this is true until you enable automatic detection mode:

15.10.4.7.2 Anti cavitation + auto detection

MAIN menu > Configuration > Controller > Anti cavitation

```
__CAVITATION_MODE___
Enable automatic
detection mode:  NO
Max. flow:  080 m3/h
```

If you enable automatic detection mode the AUC3400 will calculate when the pump runs of their curve and cavitation becomes a problem. It will calculate this cavitation point at all speeds, not just at full speed. Therefore you need to enable the virtual flow option, refer to section 15.10.3.4.3.
To setup automatic cavitation detection proceed as follows:

- Enable virtual flow by entering or recording a pump curve (to section 15.10.3.4.3).
- Run a single pump in manual at full speed and listen while gradually creating more flow when the pump starts to cavitate. Enter this cavitation flow (or better a little lower) as the maximum flow per pump in this menu. Optionally you can also directly specify the max. flow just by reading the pump curve in the catalogue.

15.10.4.7.3 Anti cavitation + auto status

MAIN menu > Configuration > Controller > Anti cavitation

```
_CAVITATION_STATUS_
Cav.point: 80.0 m3/h
Q at 100%: 65.9 m3/h
Pumps in parallel: 2
```

If you enabled automatic cavitation mode the AUC3400 will calculated at any speed what the flow of each pump would be at full speed and compare it with the maximum flow per pump allowed. If the flow of any pump passes the maximum flow an extra pump will be started and it will run in parallel. That means that pump will probable not be able up to full speed anymore to avoid cavitation!
This menu show the status, the second line shows the specified maximum flow. The third line shows the calculated flow per pump at 100% speed. The bottom line shows the number of pump required to run parallel.
When pumps are running in parallel and the flow reduces the AUC3400 calculates the exact point where pumps can be stopped without causing cavitation for the pumps left running.
For further information contact your supplier.

15.10.4.8 *Friction losses*

MAIN menu > Configuration > Controller

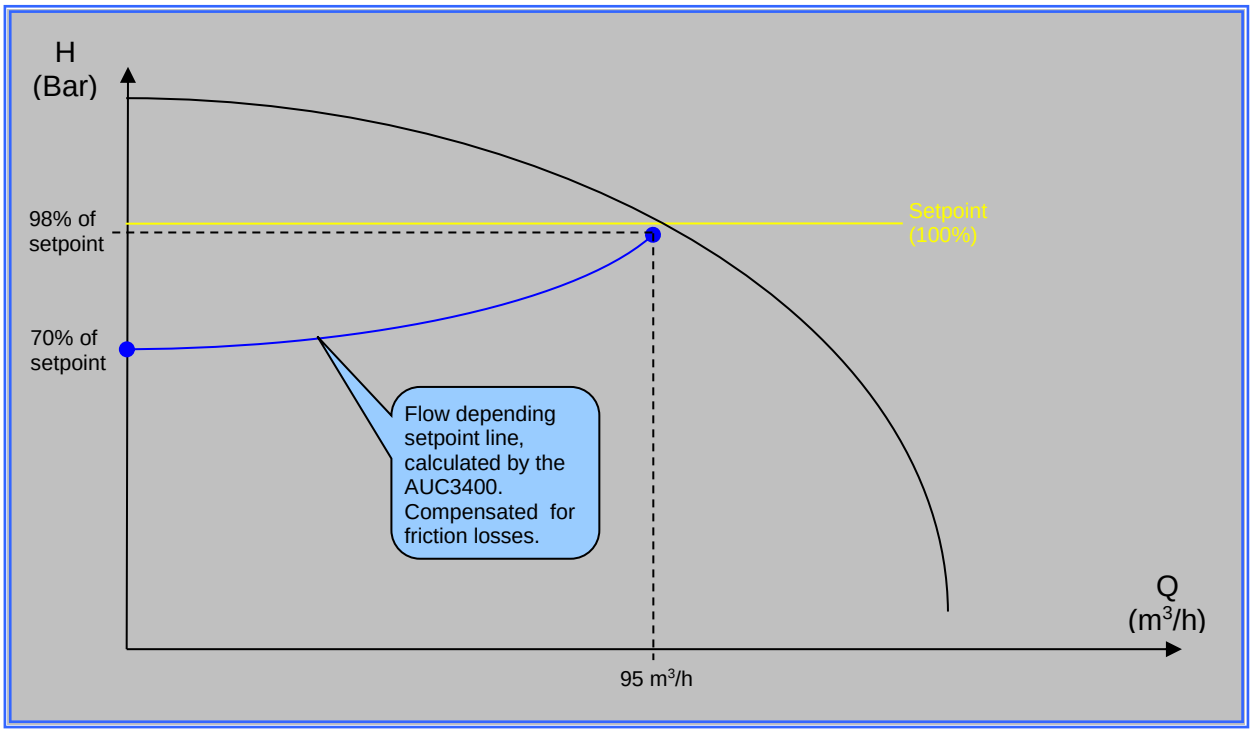
```
_FRICT_COMPENSATION_
At    0  m3/h:   100%
At 0100  m3/h:   100%
Damping factor:  002
```

If you have virtual flow or true flow readings enabled, you can enable good and reliable friction loss compensation.
All the underscored fields can be edited.
Damping means a filter value to avoid, if necessary, up and down hunting of the setpoint.

An example of how to setup friction loss compensation:

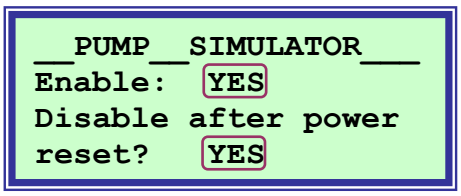
```
_FRICT_COMPENSATION_
At    0  m3/h:   070%
At 0095  m3/h:   098%
Damping factor:  002
```

In this case the setpoint at zero flow will be 70% of the specified setpoint.
At 95 m^3/h the setpoint will be 98%.



15.10.4.9 *Pump simulator*

MAIN menu > Configuration > Controller



Supplier: when you want to simulate the AUC3400 controller in the workshop with all input options enabled you can run the build in pump set simulator. The discharge pressure input can be used to connect a 4-20 mA flow valve simulator. The AUC will control and behave as if it was controlling the pumps and pressure in reality.
Note: if you want to keep running the simulator after a power failure disable select YES at the bottom line. By default the simulator will be disabled after a power failure to avoid problems.

15.10.5 Modem

MAIN menu > Configuration >

The AUC3400, is packed with a sophisticated set of modem commands and tools.
They allow you to:

- **Connect remotely by a PC to the AUC3400** over a modem and operate he menu, view all status graphically and make trends. This has been explained earlier in this manual.

- **Receive alarm SMS messages on your mobile phone** (refer to following sections).

- **Enable a call cycle, so that up to 5 different recipients can receive alarm SMS messages.** The last recipient to receive an SMS should send an acknowledgement or reset SMS TO the AUC3400. If not, the AUC3400 will relay the alarm SMS messages to the next recipients! (refer to following sections).

- **Sent acknowledgment SMS to the AUC3400.**
  This is what you use if you want to keep the AUC3400 from relaying the alarm SMS messages to other recipients. However, pending alarms will NOT reset and the AUC3400 may not resume operation of the pumps when there is a blocking alarm (like multiple low suction pressures).

  To acknowledge pending alarms: on your mobile phone type the following SMS:

  A0001

  and send it the mobile telephone number of the modem connected to the AUC3400.
  Notes:
  - this is not the data number, but the regular voice number.
  - the A in S0001 stands for “Acknowledge”
  - the 0001 in S0001 stands for the user login code, which might be changed by the end customer. You cannot use the service code, so that the end customer remains in control of who can and cannot access the AUC3400.
  - If the user code is changed to, let’s say 3456, the SMS would become A3456.

- **Sent a reset SMS to the AUC3400.**
  This is what you use if you want to acknowledge AND reset pending alarms.

  To acknowledge pending alarms: on your mobile phone type the following SMS:

  R0001

  and send it the mobile telephone number of the modem connected to the AUC3400.

- **Sent a status inquiry SMS to the AUC3400.**

On your mobile phone type the following SMS:

S0001

and send it the mobile telephone number of the modem connected to the AUC3400.

The AUC3400 will reply by sending you the following status update SMS:
<
Name of the site
Setpoint: 5.00 Bar
Pressure: 5.01 Bar
Suction: 0.54 Bar
Flow: 89,7 m^3/h
Speed: 175,7 %
Min.speed: 68,7 %
Pumps: RRSS
>

Note:
the AUC3400 will retrieve your mobile telephone number from your inquiry SMS and send back the reply SMS. So, your number does not have to be set into recipients list, any mobile phone can be used!

Sent a history inquiry SMS to the AUC3400.

On your mobile phone type the following SMS:

H0001

and send it the mobile telephone number of the modem connected to the AUC3400.

The AUC3400 will reply by sending you up to 5 SMS messages, containing the lat 10 entries in the alarm history. Each SMS you receive will look like the following:
<
Name of the site
(Alarm 1 of 10)
- Pump 4 failure
Time: 08:23:46
Date: 22-07-2007
(Alarm 2 of 10)
- Power failure
Time: 10:55:45
Date: 21-07-2007
>

The modem menu contains the following:

```
___GSM_MODEM_MENU___
 Modem selection
 SMS header text
 Total of recipients
 Recipient number 1
 Recipient number 2
 Recipient number 3
 Recipient number 4
 Recipient number 5
 Enable alarm SMS
 Enable call cycle
 Initialize modem
```

Note that the number of menu's appearing for recipient numbers depend on the number of total recipients defined in the concerned menu.

15.10.5.1 *Modem selection*

MAIN menu > Configuration > Modem >

```
__MODEM_SELECTION___
Use MC55i
modem:        >NO
```

If you have a the MC55i wireless GSM modem connected you should set this options to YES. If you don't, the modem will probably malfunction due to a constant data stream coming from the AUC3400. This data is display information (the text to be displayed). Setting this option to YES will inhibit the data stream. When a remote PC running the AUC3400.exe program contacts the AUC3400 over the modem the data stream will be enabled by codes generated by the PC program. AUC3400 detects these codes and will then enable communication.

15.10.5.2 *SMS header text*

MAIN menu > Configuration > Modem >

```
__SMS_HEADER_TEXT__
Edit the next line:
 AAAAAAAAAAAAAAAA
```

If you are going to receive SMS alarm text messages they will be preceded by the text specified here. Type the name or location of your pump site here, so the receiver of the SMS will now the location of the pump set.

15.10.5.3 *Total of recipients*

MAIN menu > Configuration > Modem >

```
___SMS_RECIPIENTS__
Total number of SMS
Recipients to be
activated:  >5
```

If you are going to enable an SMS call cycle set the number of SMS recipients here.

An SMS call cycle may be used when you require that alarm SMS messages need to be remotely acknowledged and/or reset.
That is possible by sending an SMS message TO your AUC3400 controller!
Upon receiving of a proper acknowledgement or reset SMS within a predetermined response time, the AUC3400 will not “call” other recipients to relay the alarm SMS message again.
However, if no reset or acknowledge SMS is received by the AUC3400 within the response time, the AUC3400 will resend the SMS error messages to the next recipient in the list.
If this next recipient responds to the AUC3400 by sending an acknowledgment or reset SMS the AUC3400 will cease sending SMS messages (until a new alarm is raised).

15.10.5.4 *Recipient number 1*

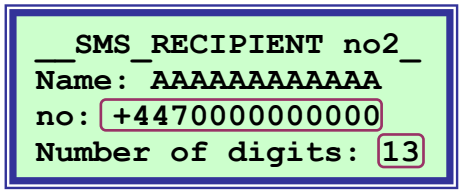
MAIN menu > Configuration > Modem >

```
__SMS_RECIPIENT no1_
Name: P. Gerritsen
no: +4470000000000
Number of digits: 13
```

Enter the name and mobile phone number of the prime recipient for alarm SMS messages here.
Also specify the length of the telephone number, which may differ per country, area or provider.

15.10.5.5 *Recipient number 2*

MAIN menu > Configuration > Modem >

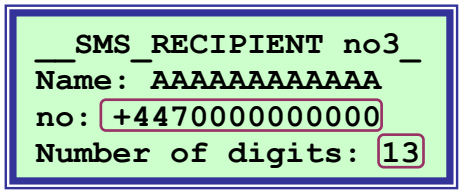


Note: this is an optional menu. If your have specified less than 2 recipients, this menu will not appear.

Enter the name and mobile phone number of the next recipient for alarm SMS messages here.
This will be the next recipient to receive alarm SMS messages when the prime receiver fails to reset or acknowledge the alarms with the sets response time.
Also specify the length of the telephone number, which may differ per country, area or provider.

15.10.5.6 *Recipient number 3*

MAIN menu > Configuration > Modem >

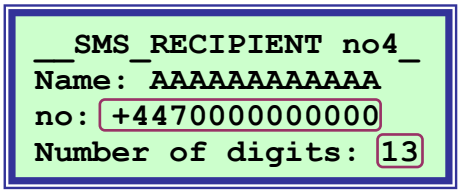


Note: this is an optional menu. If your have specified less than 3 recipients, this menu will not appear.

Enter the name and mobile phone number of the third recipient for alarm SMS messages here.
This will be the next recipient to receive alarm SMS messages when the second receiver fails to reset or acknowledge the alarms with the sets response time.
Also specify the length of the telephone number, which may differ per country, area or provider.

15.10.5.7 *Recipient number 4*

MAIN menu > Configuration > Modem >

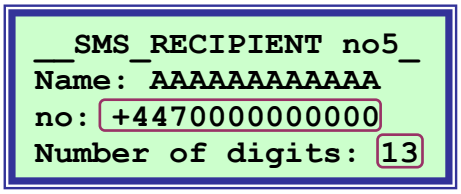


Note: this is an optional menu. If your have specified less than 4 recipients, this menu will not appear.

Enter the name and mobile phone number of the fourth recipient for alarm SMS messages here.
This will be the next recipient to receive alarm SMS messages when the third receiver fails to reset or acknowledge the alarms with the sets response time.
Also specify the length of the telephone number, which may differ per country, area or provider.

15.10.5.8 *Recipient number 5*

MAIN menu > Configuration > Modem >



Note: this is an optional menu. If your have specified less than 5 recipients, this menu will not appear.

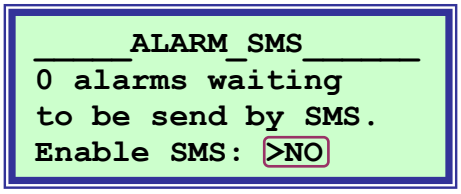
Enter the name and mobile phone number of the fifth recipient for alarm SMS messages here.
This will be the next recipient to receive alarm SMS messages when the fourth receiver fails to reset or acknowledge the alarms with the sets response time.
Also specify the length of the telephone number, which may differ per country, area or provider.

15.10.5.9 *Enable alarm SMS*

MAIN menu > Configuration > Modem >

Note: this option is also accessible from the alarm history menu.

SMS messages are sent when you set the following option to YES:

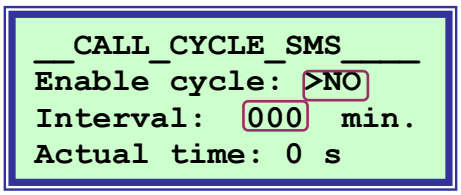


On the second line the AUC3400 indicates the number of alarms waiting to be send by SMS. However, if you disable SMS (by selecting NO) the send buffer will remain empty and no alarms will be transmitted. Therefore, when you do a commissioning or servicing you can disable the transmittal of SMS messages. When you are done commissioning or servicing, enable the SMS messages again.

If you have enabled SMS and alarms occur, they are placed in an internal transmission buffer of the AUC3400. The alarms in the buffer will be send one at the time with an interval of 20 seconds. This delay is necessary for the modem, because it needs time for each SMS transmittal.
When you power up the panel there will be a one minute delay before the first possible SMS will be transmitted. This delay is required for the start up sequence of the modem (connecting to the GSM network and provider).

15.10.5.10 *Enable call cycle*

MAIN menu > Configuration > Modem >



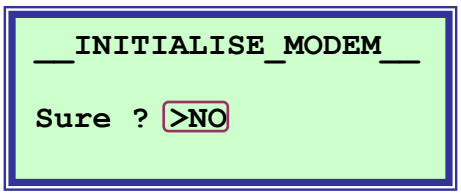
In this menu the SMS call cycle can be enabled.
Furthermore, the response time, in which a recipient should respond by sending an acknowledgment or reset SMS TO the AUC3400, is specified here.

On the third line you can see the actual time left for the recipient to send an acknowledgment or reset SMS to the AUC3400. When the timer elapses the following recipient will start receiving alarm SMS messages.

15.10.5.11 *Initialise modem*

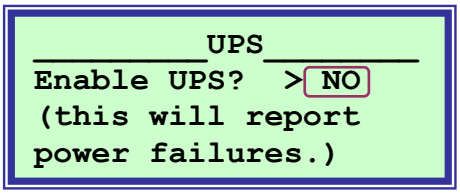
MAIN menu > Configuration > Modem >

The first time you connect a Siemens MC55i modem, it must initialised to work properly.



15.10.6 *UPS*

MAIN menu > Configuration >



UPS may be used in conjunction with the AUC3400.
During a power failure, the AUC3400, the pressure sensors and the modem will retain power through the UPS.
The AUC3400 will report the power failure by sending an SMS (if enabled).
The AUC3400 will also report the restoration of power by sending an SMS (if enabled).

Other failures, like phase failure, communication failures, pump failures and flow meter failures which will be detected during UPS operation will will be suppressed by the AUC3400.

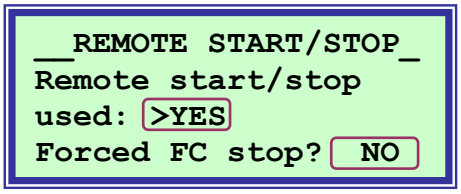
15.10.7 Pump / tank test

MAIN menu > Configuration >

This option directs to the pump / tank test menu, which is described in section 15.6.

15.10.8 Remote start/stop

MAIN menu > Configuration >



If you have an external remote start/stop switch or potential free contact set this option to YES.

Note that when the remote start or stop signal changes, the setpoint will ramp up (START) or down (STOP) following the specified setpoint ramp (refer to section 15.7.11). The AUC3400 will not stop the pumps instantly when a remote stop is activated.

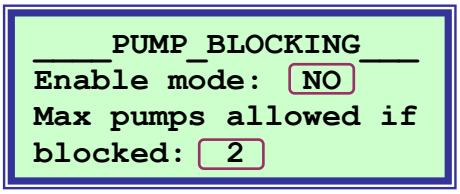
If you require an immediate forced stop of all the pumps and like an emergency stop, then you can enable the forced stop option at the bottom line.
You need to order this option too, because there will be some contacts from the forced stop circuity wired directly into the frequency converter drives at terminals 27. When you enable this option you will need to direct the AUC3400 to reprogram the frequency converters, so that the function RESET, Coasting STOP, is activated for terminal 27 in the frequency converters.

When the contact on AUC3400 terminal 49 (remote start/stop) is now broken, there will be no ramped stop, but an immediate stop. This stop is initiated both by the AUC3400 and each individual frequency converter, since each unit has an incoming terminal for the contacts that trigger the immediate forced stop. So, if one of both fails to interpret the forced stop signals, there will still be an immediate stop, also in manual operation.

Note that we call this a forced stop and not an emergency stop. The reason for that lies in the requirements of emergency stop categories. In the lower category 1 and 2 this option may be interpreted like a valid emergency stop circuit, but definitely not in categories 3 and 4. For more info call your supplier.

15.10.9 Pump bocking

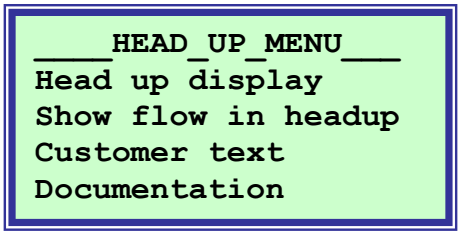
MAIN menu > Configuration >



In the menu you can limit the total number of pumps in operation.
This may be useful if the power supply is limited or when there are hydraulic restrictions.

15.10.10 Head up displays

MAIN menu > Configuration >

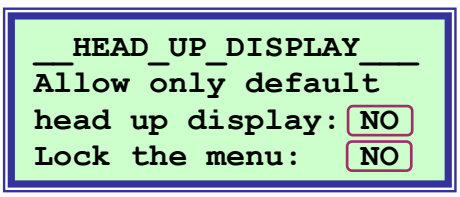


15.10.10.1 Head up display

MAIN menu > Configuration > head up displays

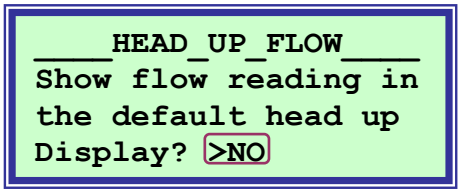
When you have commissioned the AUC3400 and specified what text you would like to see in the top two lines of the default head up display, you may want to lock the default head up display. There are two options:

1. You allow the default head up display to be the only visible head display. That means that no operator can select any other head up display. However the menu is still accessible.
2. You can lock the menu as well. Now no operator can selected any other head up display and not access the menu system either. The default head display (with your specified text) will remain the only visible display. To access the menu system, the operator will have to specify the service access code.



15.10.10.2 *Show flow in head up display*

MAIN menu > Configuration > head up displays

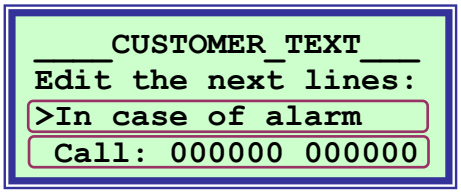


As discussed in section 13.1 the default head up display can be partly configured by you. You can show the flow reading if you want, refer to section 0 for more information.

15.10.10.3 *Customer text*

MAIN menu > Configuration > head up displays

As discussed in section 13.1 the default head up display can be partly configured by you. You can edit the contents of the top two lines.

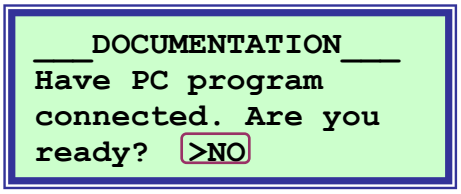


You may want to edit the telephone number, but you may just as well put in any other desired text. You can change each character of the text strings by using up and down cursor keys.

15.10.10.4 *Documentation*

MAIN menu > Configuration > head up displays

When you have commissioned the AUC3400 you may want to have full documentation of all the readings and setting which are active.
You can achieve this simply by selection the following option:

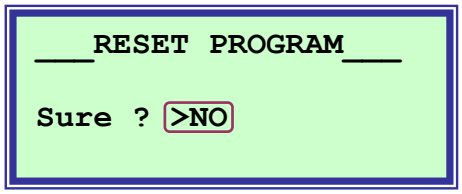


Make sure you have the PC connected and the AUC3400.exe program running.
Change NO into YES…
What you will see now is a fast replay of all relevant submenus and status displays. The AUC3400.exe PC program will write all the documented displays into a text file. The name of the file is made up off the date and extension .txt. (for example. “AUC3400 Documentation 20041116.txt)

For further information refer to section 11.5.

15.10.10.5 *Reset program*

MAIN menu > Configuration >

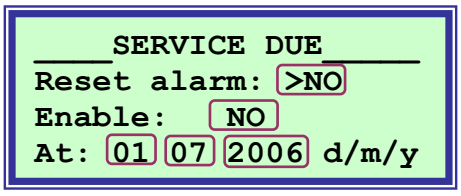


This option should never be used. It resets the program to factory defaults. All your settings will be lost.

15.10.11 Service setting

MAIN menu > Configuration >

The service setting option comes in when you want to create an alert in the future that service is due.
The alert will be shown in the alarm list and it will trigger the alarm led and alarm relay.
The end users will not e able to reset this alarm!

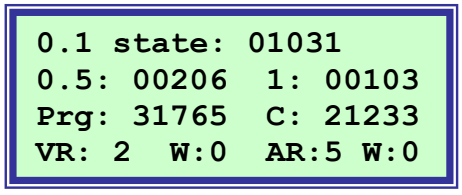


The second line prompts you (at service login level) to reset the alarm.
At the third line you can enable the service due alert on the date specified at the bottom line.

Note that enable will change from YES to NO when the service due date is arrived.

15.10.11.1 *Test Timing*

MAIN menu > Configuration >



0.1 second multi task state counter
0.5 and 1 second multi task state counter
Program cycles and continuous states executed.
FC read and writes and ADAM reads, writes errors.

This option shows the execution states of several internal multi task processes and communication read and writes cycles. It has little relevance for the use or service personnel, other than to check the bottom line for high numbers if you seem to have communication problems.

15.11 Password

Passwords prevent tampering by unauthorised personnel.
The AUC3400 does not require you to log in if you just want to view head up displays.
However, if you want to go into the menu system you will be prompted for a valid password.

There are two passwords:
- For the end user or customer (default password is 0001)
- For service personnel (this password can be obtained from your supplier)

In the menu there are settings for which you need a user password and there are settings for which a service password is required. The latter concerns settings which we only would allow service personnel to change.

If you try to enter the menu and there is no valid login level you will be prompted:

```
_______Log_In_______

User
password: 0000
```

The display asks for a user password. The user password or service password are both accepted by the AUC3400. If you enter the user password the display shows:

```
Password OK!

User level active.
```

If you enter the service password the response would be:

```
Password OK!

Service level active
```

If you enter a wrong password the response is:

```
Password wrong!
Note: use the LEFT
and RIGHT arrow keys
to view all readings
```

15.11.1 Log out

MAIN menu > Password >

```
______PASSWORD______
>Log out
 Change password
```

You can log out in three ways:

1. By not touching any key for 5 minutes.
2. By pressing the home key three times in a row
3. By going to the following menu:

(MAIN menu > Password >)

```
OK, you logged out!

You can also log out
by pressing 3x HOME.
```

15.11.2 Change password

MAIN menu > Password >

The user password can be changed. When you select the change password option you will be prompted to enter the password (either user or service password) and enter the new user password twice.

```
__Change password__
Password     : 0000
New password: ****
New password: ****
```

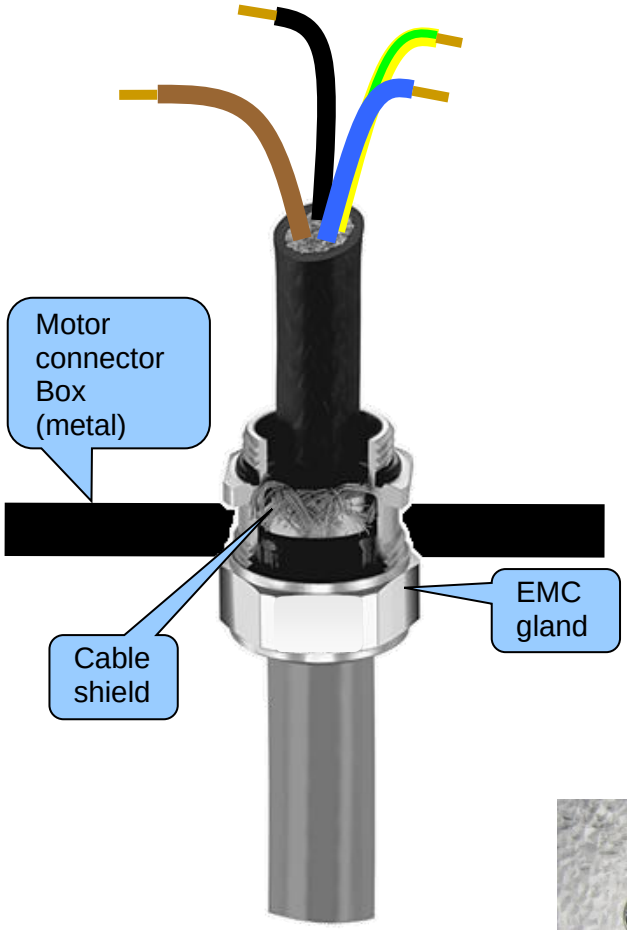
If you do it correctly the response will be:

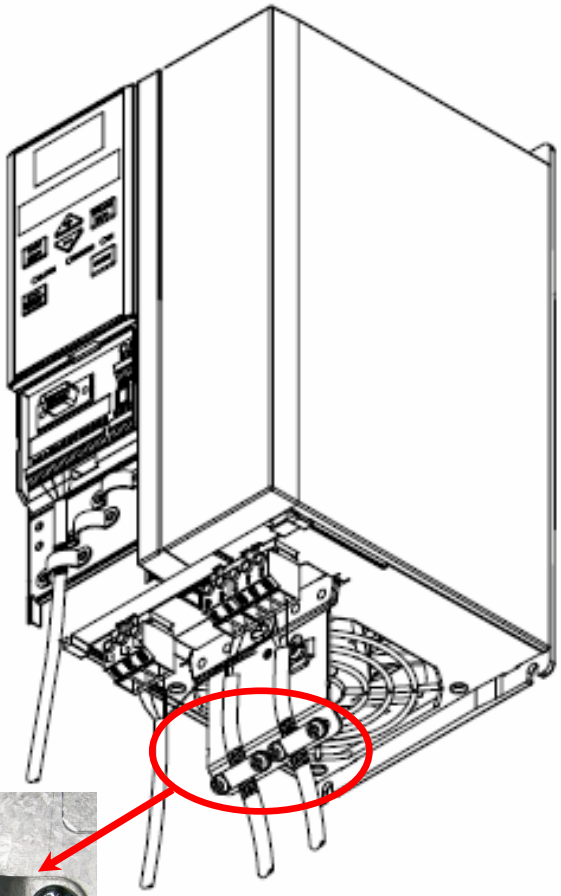
```
__Change password__
User password has
been changed into
New password: 0001
```

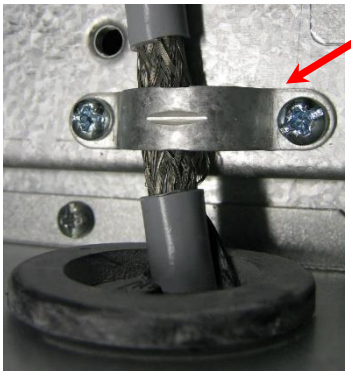
16 Commissioning

Motor cables

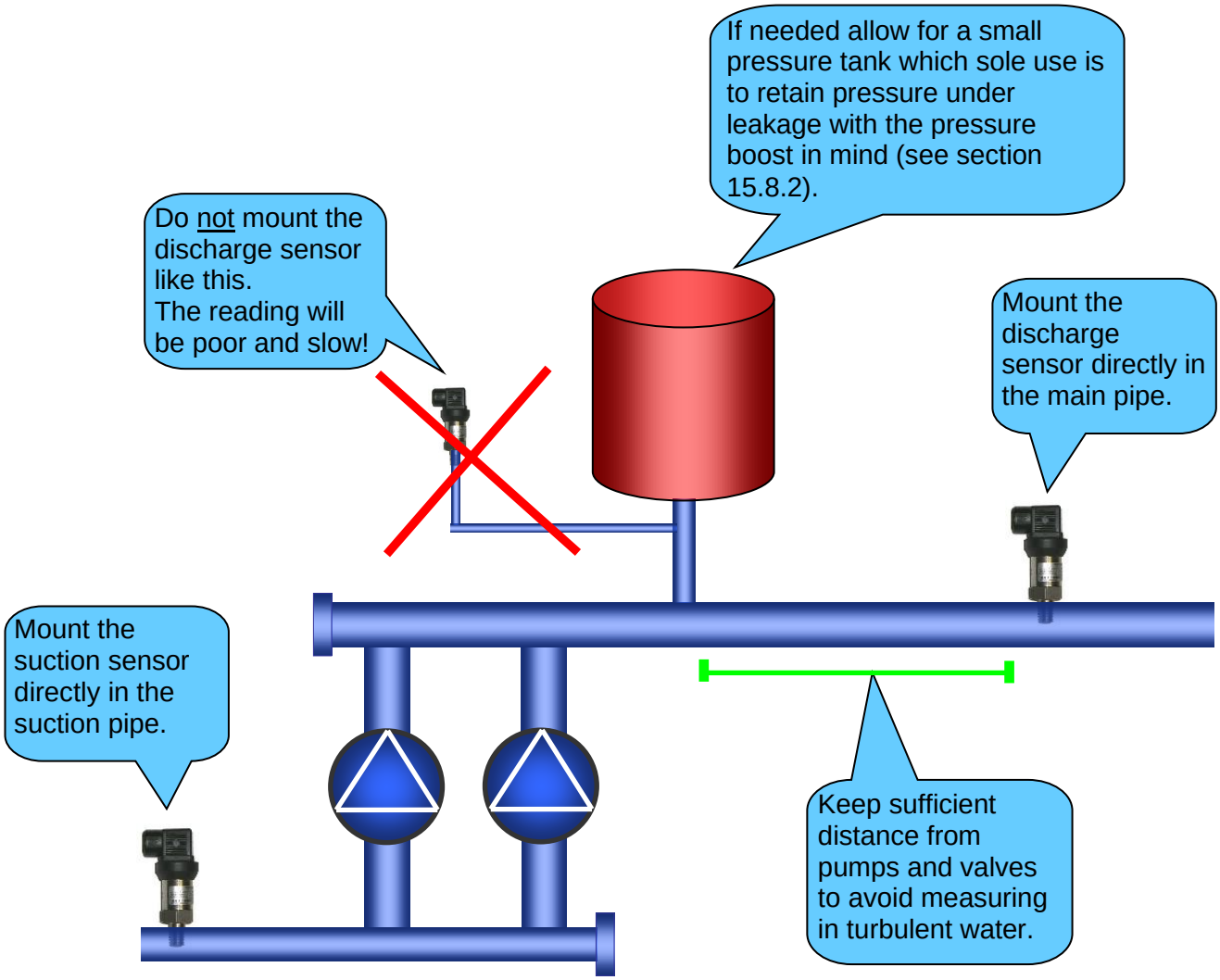
- Use shielded or armoured cables for the motor connections.
  To avoid problems related to EMC: keep the shield surface as big as possible, also where it connects it to earth! Use a direct cable connection between motor and frequency converter. Never use a massive cable to connect the shield of the motor cable to earth, nor twist the shield. Always bear in mind that when you twist the motor cable shield or use a massive earth cable, you may expect EMC problems. That's because a small surface eliminates the skin effect that EMC currents experience as a low resistant barrier to flow back to their source; the frequency converter.







Sensors and pressure tank



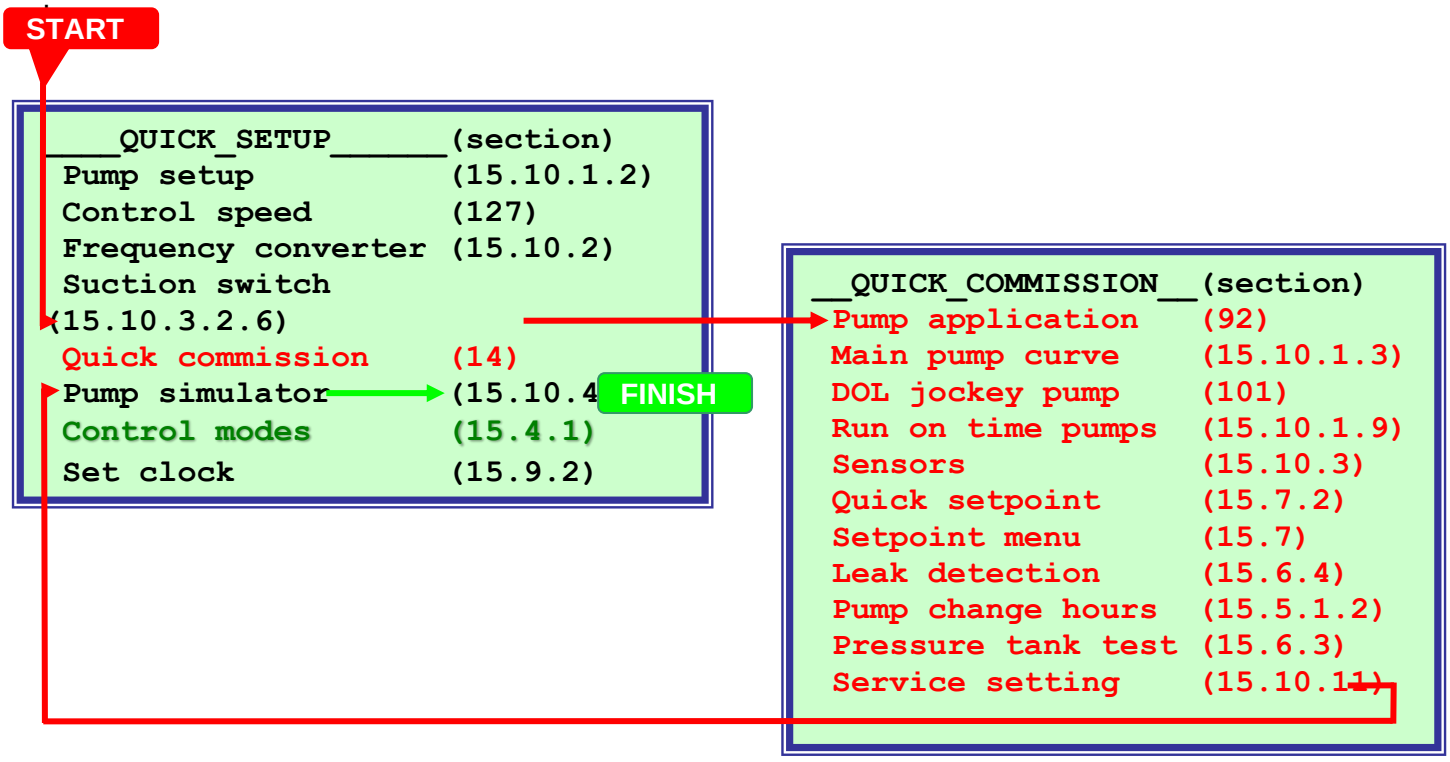
Frequency converters

Do not program the frequency converters!

The frequency converters will be programmed by the AUC3400. Anything you change yourself should be unnecessary and could ruin the operation of the pump control.
Therefore, you will find that the frequency converters menus are locked.
In sections 17(VLT 2800 parameter setup) and 19 (FC200 parameter setup) all the parameters are listed that are programmed by the AUC3400.

AUC3400

For the supplier in the workshop: go through all options in the quick commissioning menu.
To get there: press the arrow up key from the head up displays and enter your service access code.
You get to the Quick Setup menu where you use the arrow down key to point to the Quick Commissioning menu option. Press enter to access the menu.
Below you will find the sections where all the options in the menus are discussed in detail.



17 VLT 2800 parameter setup

VLT 2800 - Setup 1 (for automatic control by the AUC3400)	
VLT menu	**Description**
5	Programming setup is no. 1
18	Lock keyboard
101	Torque characteristic no. 2, low torque
102	Motor power adjustable per pump
103	Motor voltage adjustable per pump
104	Motor frequency adjustable per pump
105	Motor current adjustable per pump
202	Output frequency high limit, fmax is VLT_FREQUENCY * 10 Hz
205	Maximum reference, Refmax is VLT_FREQUENCY * 1000 Hz
206	Ramp type is no. 0, lineair
207	Ramp up time is adjustable per pump
208	Ramp down time is adjustable per pump
214	Reference function is no. 0, SUM
218	Digital reference no.4 is 0, to avoid a start (AUC write register)
303	Terminal 19 is no 0, no function
304	Terminal 27 is no 0, no function or 3, Reset and Coast stop
305	Terminal 29 is no 31, selection setup 1 or 2
307	Terminal 33 is no 0, no function
341	Terminal 46 (trans.output) is no 3, running in range
502	Coasting stop nr. 1 control by serial port
513	Bus time out is 15 seconds
514	Bus time out function is no. 2, STOP

Notes

The AUC3400 will let you specify the following parameters in the table above:

- 102: power (refer to section 15.10.2.1)
- 103: voltage (refer to section 15.10.2.1)
- 104: frequency (refer to section 15.10.2.1)
- 105: current (refer to section 15.10.2.1)
- 206: ramp up (refer to section 15.10.4.3)
- 207: ramp down (refer to section 15.10.4.3 and 15.10.4.6)

VLT 2800 – Setup 2 (for manual control through external switches and potentiometer)	
VLT menu	**Description**
5	Programming setup is no. 2
18	Lock keyboard
101	Torque characteristic no. 2, low torque
102	Motor power adjustable per pump
103	Motor voltage adjustable per pump
104	Motor frequency adjustable per pump
105	Motor current adjustable per pump
202	Output frequency high limit, fmax is VLT_FREQUENCY * 10 Hz
205	Maximum reference, Refmax is VLT_FREQUENCY * 1000 Hz
206	Ramp type is no. 0, lineair
207	Ramp up time is adjustable per pump
208	Ramp down time is adjustable per pump
214	Reference function is no. 2, External/Preset
218	Digital reference no.4 is 0, to avoid a start (AUC write register)
303	Terminal 19 is no 0, no function
304	Terminal 27 is no 0, no function or 3, Reset and Coast stop
305	Terminal 29 is no 31, selection setup 1 or 2
307	Terminal 33 is no 0, no function
341	Terminal 46 (trans.output) is no 3, running in range
502	Coasting stop nr. 1 control by serial port
513	Bus time out is 15 seconds
514	Bus time out function is no. 0, No Error
4	Active setup is no. 5 multi setup
5	Programming setup is no. 5 active setup

Notes

The AUC3400 will let you specify the following parameters in the table above:

- 102: power (refer to section 15.10.2.1)
- 103: voltage (refer to section 15.10.2.1)
- 104: frequency (refer to section 15.10.2.1)
- 105: current (refer to section 15.10.2.1)
- 206: ramp up (refer to section 15.10.4.3)
- 207: ramp down (refer to section 15.10.4.3 and 15.10.4.6)

18 VLT 6000 parameter setup

VLT 6000 - Setup 1 (for automatic control by the AUC3400)	
VLT menu	**Description**
2	Programming setup is no. 1
16	Lock keyboard
101	Torque characteristic no. 0, AEO function
102	Motor power adjustable per pump
103	Motor voltage adjustable per pump
104	Motor frequency adjustable per pump
105	Motor current adjustable per pump
202	Output frequency high limit, fmax is VLT_FREQUENCY * 10 Hz
205	Maximum reference, Refmax is VLT_FREQUENCY * 1000 Hz
206	Ramp up time is adjustable per pump
207	Ramp down time is adjustable per pump
210	Reference function is no. 0, SUM
303	Terminal 19 is no 0, no function
304	Terminal 27 is no 0, coasting stop
305	Terminal 29 is no 4, selection setup 1 or 2
307	Terminal 33 is no 0, no function
314	Terminal 60 is no 0, no function (analog input current)
323	Relay 1 no 1, ready
326	Relay 2 no 3, running
503	Coasting stop by bus only
555	Bus time out is 15 seconds
556	Bus time out function is no. 2, STOP

Notes

The AUC3400 will let you specify the following parameters in the table above:

- 102: power (refer to section 15.10.2.1)
- 103: voltage (refer to section 15.10.2.1)
- 104: frequency (refer to section 15.10.2.1)
- 105: current (refer to section 15.10.2.1)
- 206: ramp up (refer to section 15.10.4.3)
- 207: ramp down (refer to section 15.10.4.3 and 15.10.4.6)

VLT 6000 - Setup 2 (for manual control through external switches and potentiometer)	
VLT menu	**Description**
2	Programming setup is no. 2
16	Lock keyboard
101	Torque characteristic no. 0, AEO function
102	Motor power adjustable per pump
103	Motor voltage adjustable per pump
104	Motor frequency adjustable per pump
105	Motor current adjustable per pump
202	Output frequency high limit, fmax is VLT_FREQUENCY * 10 Hz
205	Maximum reference, Refmax is VLT_FREQUENCY * 1000 Hz
206	Ramp up time is adjustable per pump
207	Ramp down time is adjustable per pump
210	Reference function is no. 2, External/Preset
303	Terminal 19 is no 0, no function
304	Terminal 27 is no 0, coasting stop
305	Terminal 29 is no 4, selection setup 1 or 2
307	Terminal 33 is no 0, no function
314	Terminal 60 is no 0, no function (analog input current)
326	Relay 2 no 3, running
323	Relay 1 no 1, ready
503	Coasting stop by digital inputs only
555	Bus time out is 15 seconds
556	Bus time out function is no. 0, No Error
2	Programming setup is no. 5 active setup

Notes

The AUC3400 will let you specify the following parameters in the table above:

- 102: power (refer to section 15.10.2.1)
- 103: voltage (refer to section 15.10.2.1)
- 104: frequency (refer to section 15.10.2.1)
- 105: current (refer to section 15.10.2.1)
- 206: ramp up (refer to section 15.10.4.3)
- 207: ramp down (refer to section 15.10.4.3 and 15.10.4.6)

19 FC200 parameter setup

FC 200 - Setup 1 (for automatic control by the AUC3400)	
VLT menu	**Description**
2	Reference in in Hz
11	Programming setup is no. 1
12	Programming setup 1 is linked to setup no. 2
103	Torque characteristic no. 3, AEO function
120	Motor power adjustable per pump
122	Motor voltage adjustable per pump
123	Motor frequency adjustable per pump
124	Motor current adjustable per pump
190	Thermistors used (yes/no)
193	Thermistor source on analog input 2 terminal 54
414	Output frequency high limit, fmax is VLT_FREQUENCY * 10 Hz
303	Maximum reference, Refmax is VLT_FREQUENCY * 1000 Hz
304	Reference function is no. 0, SUM
315	Reference source 1 is no. 0, no function
316	Reference source 2 is no. 0, no function
317	Reference source 3 is no. 0, no function
341	Ramp up time is adjustable per pump
342	Ramp down time is adjustable per pump
351	Ramp up time is adjustable per pump
352	Ramp down time is adjustable per pump
511	Terminal 19 is no 0, no function (used to detect EL506 print)
512	Terminal 27 is no 0, coasting stop (or braked stop if em. Stop used)
513	Terminal 29 is no 23, selection setup 1 or 2
515	Terminal 33 is no 0, no function
540	Relay term 1 to 3 no 2, drive ready
540	Relay term 2 to no 6, drive running
650	Terminal 60 is no 0, no function (analog output motor current)
850	Coasting stop by bus only
801	Control by bus and digital IO
802	Control by FC port
803	Bus time out is 15 seconds
804	Bus time out function is no. 8, Go To setup 2

Notes

The AUC3400 will let you specify the following parameters in the table above:

- 102: power (refer to section 15.10.2.1)
- 103: voltage (refer to section 15.10.2.1)
- 104: frequency (refer to section 15.10.2.1)
- 105: current (refer to section 15.10.2.1)
- 206: ramp up (refer to section 15.10.4.3)
- 207: ramp down (refer to section 15.10.4.3 and 15.10.4.6)

FC 200 - Setup 2 (for automatic control by the AUC3400)	
VLT menu	**Description**
2	Reference in in Hz
11	Programming setup is no. 1
12	Programming setup 2 is linked to setup no. 1
103	Torque characteristic no. 3, AEO function
120	Motor power adjustable per pump
122	Motor voltage adjustable per pump
123	Motor frequency adjustable per pump
124	Motor current adjustable per pump
190	Thermistors used (yes/no)
193	Thermistor source on analog input 2 terminal 54
414	Output frequency high limit, fmax is VLT_FREQUENCY * 10 Hz
303	Maximum reference, Refmax is VLT_FREQUENCY * 1000 Hz
304	Reference function is no. 2, External/Preset
315	Reference source 1 is no. 0, no function
316	Reference source 2 is no. 0, no function
317	Reference source 3 is no. 0, no function
341	Ramp up time is adjustable per pump
342	Ramp down time is adjustable per pump
351	Ramp up time is adjustable per pump
352	Ramp down time is adjustable per pump
511	Terminal 19 is no 0, no function (used to detect EL506 print)
512	Terminal 27 is no 0, coasting stop (or braked stop if em. Stop used)
513	Terminal 29 is no 23, selection setup 1 or 2
515	Terminal 33 is no 0, no function
540	Relay term 1 to 3 no 2, drive ready
540	Relay term 2 to no 6, drive running
650	Terminal 60 is no 0, no function (analog output motor current)
850	Coasting stop by digital inputs only
801	Control by by digital input only
802	Control by no port or option
803	Bus time out is 15 seconds
804	Bus time out function is no. 8, Go To setup 2

Notes

The AUC3400 will let you specify the following parameters in the table above:

- 102: power (refer to section 15.10.2.1)

- 103: voltage (refer to section 15.10.2.1)
- 104: frequency (refer to section 15.10.2.1)
- 105: current (refer to section 15.10.2.1)
- 206: ramp up (refer to section 15.10.4.3)
- 207: ramp down (refer to section 15.10.4.3 and 15.10.4.6)

20 FAQ (Frequently Asked Questions)

Question

- *What to do if a pump is oscillating?*

Answer

The AUC3400 controls the speed of the pump(s) based of a number of input variables: setpoint, pressures, head of the pump and control speed. Since all these variable are used in calculations by the AUC3400, the correct outcome greatly depends on what you specify in the related menus. If one of those menus contains wrong settings, the outcome of the internal calculation will be inadequate to control the pressure correctly and so oscillation may be the result.
Here is a prioritized list of what you should check to solve oscillation problems:

1. Check your inlet suction menu settings. If you have a no suction pressure sensor, make sure you have entered a true value for the fixed inlet pressure (refer to section 15.10.3.2.1).
2. Check your setting of the nominal pump head at zero flow ((refer to section 15.10.1.3).
3. Check the discharge pressure sensor range ((refer to section 15.10.3.1.1).
4. Check the control speed (refer to section 15.10.4.3).
5. Check the setpoint ramp time (refer to section 15.7.11)

Note: if you have oscillation at seemingly random moments, then you probably have a fluctuation suction pressure. Use a suction pressure sensor to overcome this problem.

Question

- *Why does the lead pump not stop when there is no flow?*

Answer

The AUC3400 offers a number of algorithms to stop the final pump. By default only the zero flow detection algorithm is enabled. This algorithm will try to detect zero flow every 15 seconds when the speed of the remaining last pump is within 10% of the minimum speed. Therefore, a wrong calculation of the minimum speed could prevent the zero flow detection mechanism from working.
To allow the AUC3400 to calculate a correct minimum speed you should first:

1. Check your inlet suction menu settings. If you have a no suction pressure sensor, make sure you have entered a true value for the fixed inlet pressure (refer to section 15.10.3.2.1).
2. Check your setting of the nominal pump head at zero flow ((refer to section 15.10.1.3).

If these setting are correctly adjusted and still the pump won't stop then you must ask yourself if there is actually no flow. Maybe you have too much leakage or there is no buffer capacity in your system.

If you read section 15.8 about zero flow detection, you will learn that the AUC3400 will just lower the speed of the remaining last pump and see if the pressure drops. If it does, it will conclude that there is no zero flow. In most cases that is correct, but it may prove wrong if you have leakage(s) and no water

buffer, such as a pressure tank, in you system. Since water cannot be compressed, only one drop of water may be enough the let the pressure drop.
Here is a few suggestion of what you may consider:

1. Is there a leak in your system? Shut down the system while there is pressure on and see what the pressure will do. Is the pressure holding or does it drop (too) fast?
2. Check you non return valves, are they tight?
3. Do you have a pressure tank? Is the air pressure in the tank OK? It should be about 0.7 times the pressure setpoint.
4. If you have no pressure tank, is there enough expansion in your discharge pipe?

If you have answered positively on these suggestions then maybe there is not a problem in detecting zero flow, but in boosting, and holding, the pressure.
The AUC3400 will boost the pressure by default by 5% on top of the setpoint. Maybe it will reach that pressure and is able to hold it there, but it may loose the pressure again as soon as it want's to actually stop the pump. If it sees that the pressure drops immediately after it has boosted the pressure, it will return to the original setpoint and keep the pump in operation.

1. Check if you are loosing the pressure because of some transfer delay in your system. That may be the case if you have a large network of pipes. In hat case you should not allow the AUC3400 to boost the pressure when it has detected zero flow. Instead you should use a low restart setpoint (refer to section 15.7.7). The result will be that the AUC3400 will just stop the pump after it has detected zero flow, without boosting the pressure. The AUC3400 will then lower the setpoint while no pump is in operation to the level specified by the restart setpoint. Only then, when the pressure drops below the restart setpoint, it will restart the pump(s).