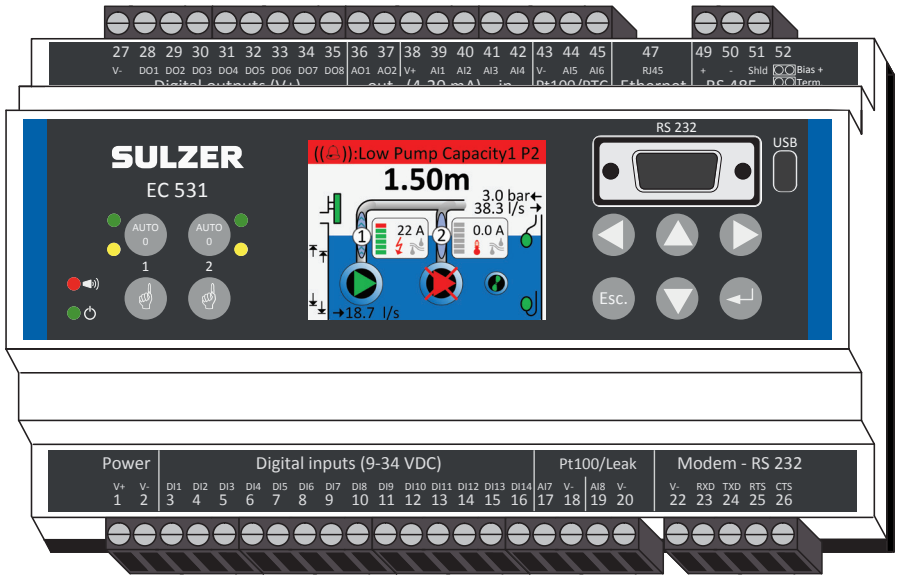
Equipment controller EC 531



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User Guide

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Contents

ABOUT THIS GUIDE, AUDIENCE AND CONCEPTS

This guide describes the equipment controller EC 531. The equipment controller can either be used stand-alone or communicate values and conditions to a central SCADA system or a web based alarm and monitoring solution like AquaWeb from Sulzer.

Installation guide There is a separate document Installation guide that describes how to physically install the pump controller (printed document in the installation package, and also a PDF on www.sulzer.com).

Audience This guide is intended for system administrators and operators of EC 531 equipment controller.

Prerequisites This guide assumes that you already are acquainted with those pumps you are set to control and have the sensors connected to EC 531.

The system administrator must also know and decide on the following:

1. The pump controller can either use an analog level-sensor, which measures the water level in the pit, for precise control over start and stop levels, or it can use simple float switches placed at start and stop levels.

   • Float switches can be used in addition to an analog level-sensor, as a backup, and as an additional alarm input.

   • An analog level-sensor has several advantages over float switches: it is more robust (cannot get stuck or be mechanically jammed); it is more accurate; it is more flexible (the start and stop levels can easily changed); you can get readings of the water level in the pit, the inflow, overflow and the pump capacity; you can optimize the pump performance in various ways, including exercising, alternative stop levels, tariff control etc.

   • It is also possible to employ an alternative stop level, usually a lower level than normal, that is effective once after a number of pump starts. This can be useful if it is desirable to “completely” empty the pit once in a while.

2. You need to know if the pump(s) should be exercised in case of long idle periods. If the installation has one or two pumps, you need to decide if the pumps should alternate.

3. If the electricity has daily varying tariffs, you must know the times of high / low tariffs.

4. You must know how overflow will be measured: if it will be measured using both an overflow detector (to detect the start of the overflow) and a level sensor (to measure the actual flow), you must know the parameters (exponents and constants) to be entered as settings so that the overflow can be accurately calculated by the EC 531.

5. You need to know which alarm class, A-alarm or B-alarm (see **Glossary and conventions**), to assign each alarm.

Reading guide For installation, see the separate document Installation guide, which covers EC 531. Before you make any settings, or use the control panel, read **chapter 1 Oiverview of the display symbols** —it describes the general functionality and the meaning and usage of the controls on the panel.

The system administrator must ensure that all settings according to chapter 2 Setup the EC 531 are suitable for your application.

NOTE! ***The default settings are listed in the Installation guide.***

Text appearing and declaration in this guide

Text in italic is a description of text on the display or a description how you find your way through the menus by key strokes. Text in bold, is how you have to do a change of the settings in the EC 531 menu.

Most settings in **chapter 2** only apply to the system administrator, but the following also apply to those who operate the controller: language selection, date and time settings, units, backlight time-out, buzzer, operator passcode, start / stop levels.

Glossary and conventions

To designate a menu item in a hierarchy, an angle bracket is used to separate the levels. Example: Settings > System means the menu item you reach by first choosing the menu item Settings, which has a number of submenus, where you choose the menu item System.

Text in **blue** indicates a hypertext link. If you read this document on a computer, you can click on the item, which will take you to the link destination.

Pump exercising: Long idle periods in a corrosive contaminated environment are not good for pumps. As a countermeasure, they can be “exercised” at regular intervals, which will reduce corrosion and other detrimental effects.

Alarm class: The alarm class can be either A-alarm or B-alarm. A-alarms are those that require immediate action, so operational staff in the field should be alerted regardless of the time of day. B-alarms are less important, but should be taken care of during normal work hours.

Digital in: A signal that is either ON or OFF (high or low), where high is anything between 5 and 35 volts DC, and low is anything below 2 volts.

Digital output: A signal that is either ON or OFF. At ON condition output current is sourced from the power supply and the output is high (~V+). At OFF condition the output is low but it cannot serve as a drain function (no output current). Are typically connections to relays.

Analog output: Signal in the range 4-20 mA. Sourced from power supply.

Analog input: Eight analog inputs used for connecting sensors. **Ain:1** to **Ain:4** are 4-20mA inputs. **Ain:5-Ain:6** are configurable for Pt100 and PTC. **Ain:7-Ain:8** are configurable for or Pt100 and Leakage.

Pump reversing: The controller can reverse the pump if the necessary external equipment is installed in the station. The controller can reverse the pumps on number of occasions, e.g. low capacity, pump fail, fallen motor protector, over currents and after number of starts

RS 485 modules: Refer to surrounding units connected to the RS 485 bus, e.g. soft starters, VFDs, and an energy meter.

1. OVERVIEW OF THE DISPLAY SYMBOLS

EC 531 is designed to control 1-2 pumps. It can operate a pump station stand alone and / or within a surveillance system together with some communication equipment. For configuration and operator interaction, use the menus which can be selected using the arrow, Enter and Esc keys. With the AquaProg software, configuration and back up of settings can be stored on a PC.

Add the 3G modem CA 523 to create a full remote alarm and monitoring solution, together with an AquaWeb rental contact or by any SCADA system.

This section will guide you through all the symbols on the display of EC 531.

1.1 EC 531 panel

The default screen (top-level view) of the display on the EC 531 dynamically shows the operating status of the pumps and conditions in the pit, displaying just about everything you need to know about the current situation. Figure 1-1 shows symbols and explains their meanings. The unit will always revert to this view after 10 minutes of inactivity in any other view (such as showing menus or submenus). In the submenus you can always return to the default screen by pressing ESC.

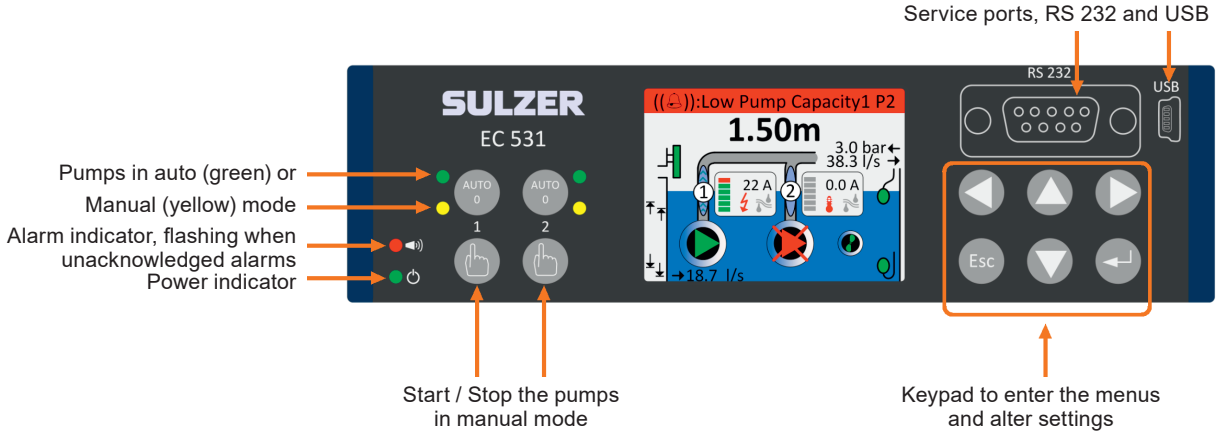


Figure 1-1: EC 531 panel

1.2 Symbols on the graphic display

There are several symbols in the EC 531 display which are described below.

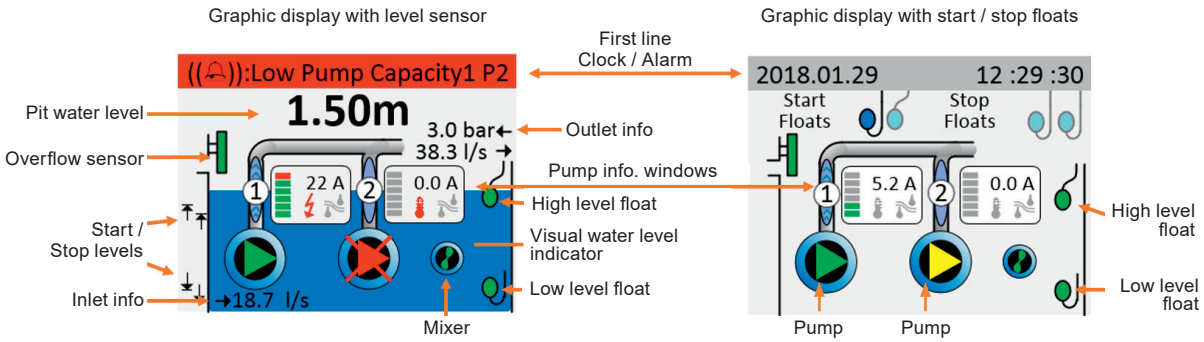


Figure 1-2: Symbols on the display

The top screen appears differently depending if there is a level sensor in the system or not. There is no level value presented if the pit is without a level sensor. If no analog (Ain1-4, preferred Ain1) input is dedicated for Level sensor, the controller assumes there are Start / Stop floats. The start / stop floats are animated and must have a dedicated input if they are to appear on the display.

1.2.1 Time and date

When an alarm occurs, this field turns red for A-alarm or yellow for B-alarms and the alarm text is also shown here. The time and date is no longer visible.

First line in normal mode

2018.01.29 12 :29 :30

First line when A-alarm

((🔔)):Low Pump Capacity1 P2

Figure 1-3: Examples of the first line

Alarm line	
When no active or unacknowledged alarm, System time and date will be shown instead. (This is the clock used for time stamped events such as logging)	
((🔔))	Unacknowledged alarm (red line = A-alarm, yellow line = B-alarm) Symbol and alarm text will be shown.
🔔	Acknowledged active alarm Symbol and alarm text will be shown.

If level sensor is installed on one of the analog inputs, the height of the level in the pit is presented, shown with two decimal places, and by means of a visual water level indicator on the graphics display. Level can be referenced from sea level (if set). If there is a high-level alarm setup and it gets activated, the dynamic field turn into red. If the system runs on floats, no level or visual water level indicator will be shown on the display.

1.2.3 Outlet value on the display

Outflow: After the controller has calculated the pump capacity, a value appears on the display when the pump or pumps run. See the **section 3.1** Pump capacity calculation for information on how the calculation is done and which parameters are necessary to set.

Outlet pressure: If there is an outlet pressure sensor installed, the value appears on the display. See the **section 3.1** Pump capacity calculation for information on how the calculation is done and which parameters are necessary to set.

1.2.4 Pump information window

The pump information window contains several symbols and not all of them are visible if there isn't an alarm. Without any alarms or fault conditions, only Current and grey shaded Temperature and Leakage symbols are shown.

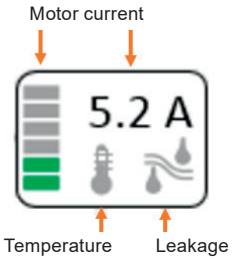


Figure 1-4: Pump information window without alarms or fault conditions

Summary of the symbols in pump information window:

	High temperature, combination of set up sensors. Orange when pending. Turns red when there is an active alarm associated. Grey when inactive..
	Leakage, combination of set up sensors. Orange when pending. Turns red when there is an active alarm associated. Grey when inactive.
	Vibration fault, only shown when active. Orange when pending alarm and red when active alarm.
	Electric fault, only shown when active. Combination of electric faults (Fallen motor protector, High / low motor current, Phase missing). Orange when pending alarm and red when active alarm.
	Current indicator bar, top turns red when reaching high current limit..
Motor Current	Will be shown: • with one decimal in range 0 to 9.9, otherwise without decimals • will show kilo ampere as integers if above 999 A

Active alarms are prioritized, if more than two alarms are active they are prioritized as follows
1) Temperature, 2) Leakage, 3) Vibration, 4) Electric faults

1.3 Floats and overflow sensor on the display

High- and low level floats are green in normal mode. They switch position (animated) and are flashing red when activated.

Start / stop floats are gray in non-active mode, and blue when activated.

Overflow sensor is green in normal mode, turn to flashing red when activated.

1.4 Pump, mixer, pipe and start / stop symbols

The symbols are as follows:

	Pipe with pump reference • Animated flow when pump running in forward direction
	Pump symbol, will rotate when pump running Triangle can be: • Green – Non blocked • Yellow – Externally blocked or in reverse • Red – Blocked by pump fault • When blocked, symbol will be crossed • If manual reset is needed a flashing '!' will appear.
	Mixer symbol • Same colour coding as pump symbol

Start and stop symbols are just relative to each other and no value is shown on the top screen.

1.5 Power and alarm indicator

The two leftmost symbols on the panel are for power and alarm indication:

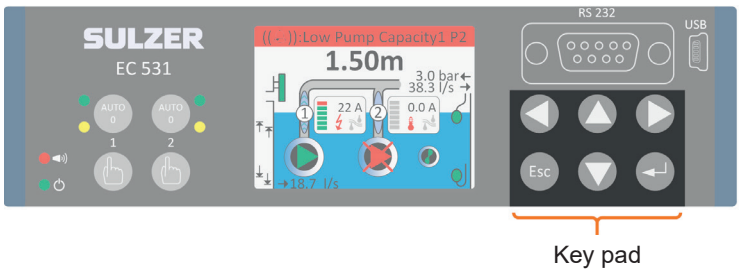
A green light indicates that the unit is powered.

The red alarm indicator flashes whenever there is an unacknowledged alarm, and the display tells the type of the alarm. When the alarm is acknowledged, the light turns steady red, and remains so until the active alarm is remedied.

1.6 Menus and submenus, passcodes and personal alarm

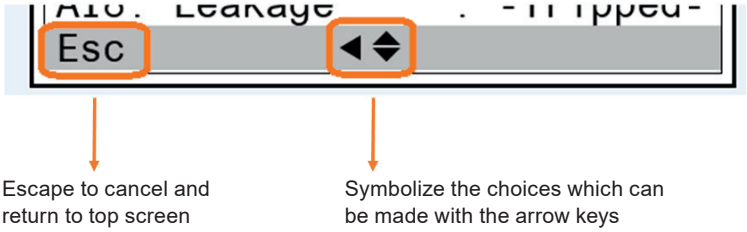
The arrow keys on the key pad have different functions depending where in the menus you are. From the top screen, the functions are following:

Key pad shortcuts		
◀	Left arrow	Will open "Quick status" menu for pump 1
▶	Right arrow	Will open "Quick status" menu for pump 2
↵	Enter	Will acknowledge present alarm in alarm list
▲▼	Up / down arrows	Will open the menus



Key pad

Press either the up or down arrow button to switch to the menu view. When entering the menus and submenus, you can navigate through them all by using the arrow buttons and Enter. If there are visible triangles on the last line on the screen, these symbolize which choices could be made. Step through the lines by pressing up / down arrow and press Enter to enter a submenu or change value. Esc button will cancel the current operation and goes back to top screen (or default screen). A right arrow indicates that a submenu is available.



Use the left / right buttons to choose the insertion point. Use the up / down buttons to increase / decrease a value or letter. Press Enter to enable editing of a value. Values and strings can also be altered through the alphanumeric keyboard. Finish the editing by pressing enter.

You confirm an operation with the Enter button, or acknowledge an alarm. Pressing the Escape will cancel operation and leave setting unchanged or return animated top screen.

Passcodes There are three security levels:

1. Daily operations, such as acknowledging an alarm or stopping a pump, do not require any passcode or authorization.
2. Operational settings, such as setting the start or stop levels for the pump, require a passcode at the level of Operator; default **1**.
3. Configuration settings that affect the basic functionality or access, such as the type of level sensor, require a passcode at the level of System; default **2**.

After entering a passcode a timer is started, all settings are unlocked until timer resets. The factory default passcodes are 1 and 2 respectively, but the codes can be changed under the menu item **Settings > System**. Whenever a passcode for Operator is requested, you may supply either the passcode for Operator or System.

Personal alarm When the pump station is manned, a personal alarm can be issued if the maintenance person hasn't shown activity within a certain period of time. For details about settings related to this, see **section 4.1 Digital in: Personnel alarm and local mode** (assigning **Alarm type, Alarm delay** and **Max time to reset)**, how to set up the digital input and digital output for staff in station.

After the specified **Alarm delay,** the assigned output is activated so a visual or audio signal can alert the maintenance person that the alarm timer must be reset. If the alarm timer is not reset within **Max time to reset,** a personal alarm is sent out.

NOTE! ***To reset the timer, just push any button on the control panel.***

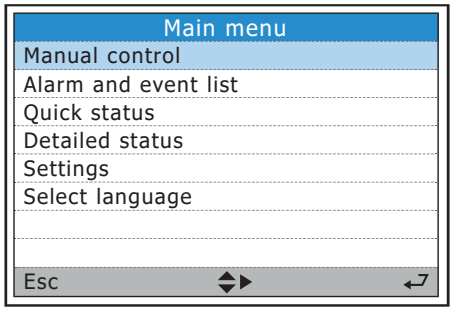
1.6.1 Status view

Status view is easy to access by pressing [left arrow] for pump 1 or [right arrow] for pump 2 on the key pad. Status view shows **Pump running time, Number of starts, Start / Stop level, Pump capacity, Motor current, Motor power, Last pump capacity calculated value, Starts since last reverse,** if the pump is **Blocked** or not and **Detailed status.**

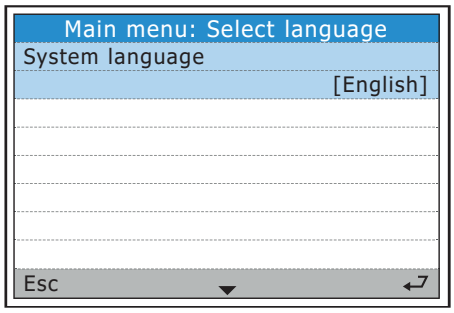
Pump running time, Number of starts and **Blocked** have submenus which are accessible by pressing Enter at current line.

1.7 Entering the main menu and set the language

Press up- or down arrow and following screen appears:

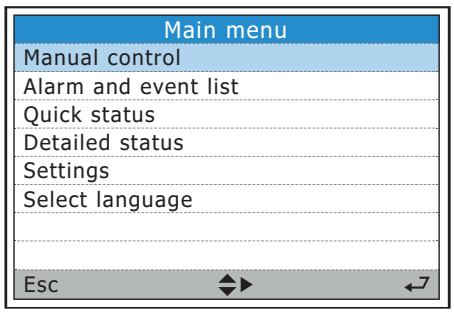


Step down to Select language and press Enter.



Press Enter again and use the down arrow to step between the languages, press Enter when your language of choice is highlighted. After the language is selected, press left arrow to return to main menu or Esc to return to default screen.

1.7.1 Manual control

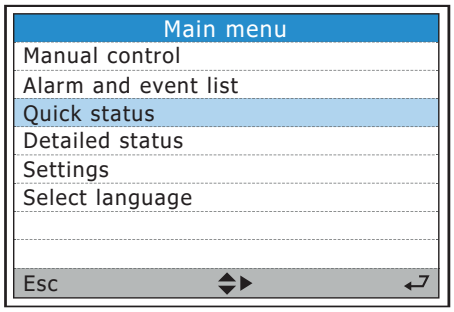


Enter the menu by pressing up- or down arrow from main screen. Press Enter at **Manual control**, then the menu and sub menus are as follows:

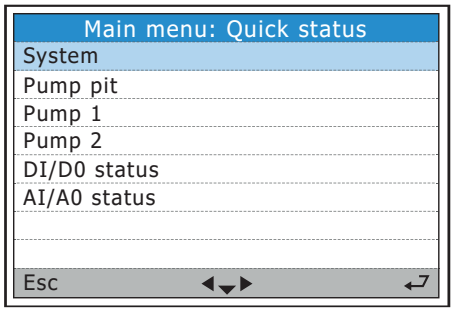
Submenu	Parameter	Value	Type/Passcode
Pump 1	Manual start	NO; YES	Setting, Operator password
	Pump reversing	NO, YES	Setting, Operator password
	Fallen motor protect	NO, YES	Status value
	Reset motor prot.	NO, YES	Setting, Operator password
	Reset temp. prot.	-OK-/[YES], -Tripped-	Setting, Operator password
	State of M-0-A switch	MANUAL, Pump not in auto, AUTO	Status value
	VFD frequency	0.01 Hz	Status value
	Set manual frequency	0.1 Hz	Setting, Operator password
Pump 2	Manual start	NO; YES	Setting, Operator password
	Pump reversing	NO, YES	Setting, Operator password
	Fallen motor protect	NO, YES	Status value
	Reset motor prot.	NO, YES	Setting, Operator password
	Reset temp. prot.	-OK-/[YES], -Tripped-	Setting, Operator password
	State of M-0-A switch	MANUAL, Pump not in auto, AUTO	Status value
	VFD frequency	0.01 Hz	Status value
	Set manual frequency	0.1 Hz	Setting, Operator password
Mixer control	Start/Stop	STOP, START	Setting, Operator password
	Run indication	NO, YES	Status value
	Reset motor prot.	NO, YES	Setting, Operator password
Cleaning control	Start/Stop	STOP, START	Setting, Operator password
Drain pump control	Start/Stop	STOP, START	Setting, Operator password
	Run indication	NO, YES	Status value
	Reset motor prot.	NO, YES	Setting, Operator password

1.8 Quick status

To get an overview status of signals and condition of the station or installation.



Pressing Enter on Quick status opens the sub-menus as shown below.



To get an overview of these menus, see **Appendix.**

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2. CONFIGURE THE EC 531

Overview of settings

Every station will have its own unique configuration but the procedure to setup the station is similar. This chapter will guide you through the basic settings in the EC 531. Note this does not cover all configuration, you must take into account your prerequisites.

The menu item *Settings* has 14 submenus with a large number of settings that need to be entered by the system administrator (although they all have default values). The notes below are a recommended procedure to setup the EC 531.

Each of the 14 submenus under settings are described in separate tables in appendix.

To enter the settings area:

- Press *down arrow* once and you are in the menus, continue to press down arrow to **Settings**, press Enter.
- The majority of the settings require a passcode for **System** except some settings under the submenu System and the start / stop levels under submenus **Pump 1** and **Pump 2** which only require a passcode for **Operator**.
- All the settings can be configured locally from the menus or by AquaProg. The advantage of AquaProg is you can save the configuration at your PC and easily restore the controller if needed.

2.1 Set general configuration, system, ID and communication settings

Setup the language, System ID, units (metric or US units) by the menus:

- From the base screen under **System** will be selected. Press Enter again.
- From the base screen under **System** is **Language**. Press Enter and give passcode (default **2**) by using **Up / Down** arrows. Scroll to the language of your choice by using the Up / Down buttons.
- Select Station ID, Press **Enter.** Type in your station ID by using Up / Down arrows, required for AquaWeb or any other surveillance system.
- Select Date format, press Enter. Choose your date format.
- Set Date, Time, Units (Metric or US) and all other settings under this parameter.
- Set System alarms according to your preferences.
- Press **Left arrow** to return to **Main menu**; **Settings.** Scroll down to **Communication.**
- Set the Protocol of USB (Modbus RTU or TCP), cross reference (if used).
- Set the Protocol of Service port (DB9 in front).
- Modem port (screw terminals 22-26) and the communication parameters.
- Set the baud rate at the RS 485 bus and protocol ID to VFD and Energy meters (if used).
- Set the Ethernet parameters according to your network preferences.

System, ID and communication settings in AquaProg

In AquaProg:

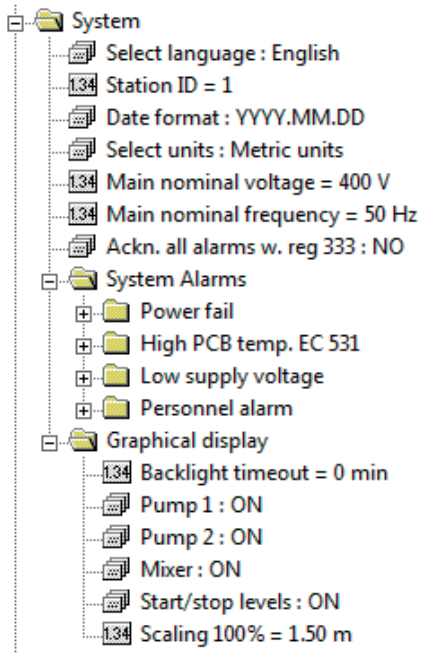


Figure 2-1: System Settings

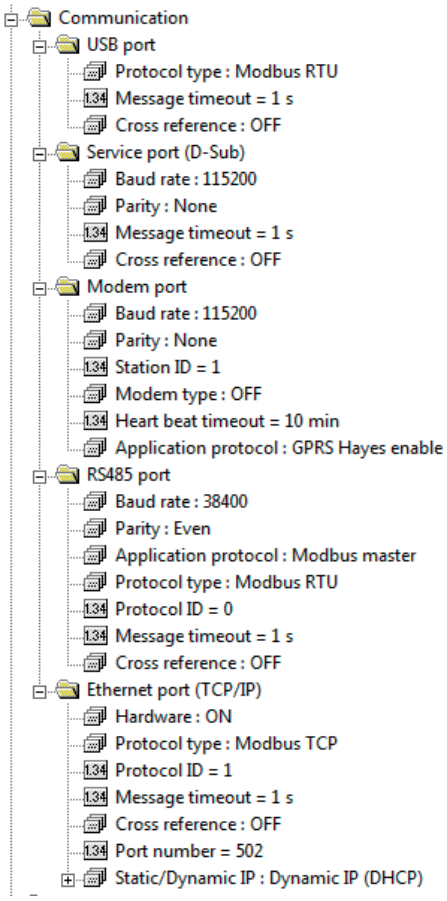


Figure 2-2: Communication

NOTE! ***The ID number can be set either via system or the communication settings.***

2.2 Configure the digital inputs, digital outputs, analog inputs and analog outputs

Set designated IO-functions according to the electrical wiring drawing. See your drawings of the station.

Under Settings, Digital inputs; choose appropriate input according to list.

Table 2-1

Digital inputs
OFF
Run indication
Manual start
Set manual
Set auto
Start float
Pump failure
Motor protector
High motor temp. pump
Leakage pump
Stop float
Low level float
Overflow sensor
High level float
Start float drain pump
Local mode
Alarm reset
Power fail
DI pulse channel 1-4
Block PID controller
Alarm input
Block operation
Leakage mixer-drain pump
High temp. mixer or drain pump

Table 2-2

Digital outputs
OFF
Pump control
Reset motor protector
Pump fail
Not enough pumps avail
One pump fail
Mixer control
Drain pump control
Cleaner control
Modem control
Remote control
Personnel alarm
High level
Alarm alert
Not ackn. alarm
Active alarm
Pump reversing
Logic IO
Data register set point
Extern reset alert

Table 2-3

Analog input 1-4
OFF,
Pit level
Motor current
Outlet pressure
Vibrations
Xylem MiniCas Sim
Outflow meter
Motor temperature
Free choice

Note
Analog 1 is recommended to be used for the level sensor due to its higher resolution

Table 2-4

Analog outputs
OFF
Pit level
Pit inflow
Pit outflow
Pit overflow
Pulse channel 1
Pulse channel 2
Pulse channel 3
Pulse channel 4
PID ctrl output
Data register
Data register 2 compl.
Set freq. P1
Set freq. P2

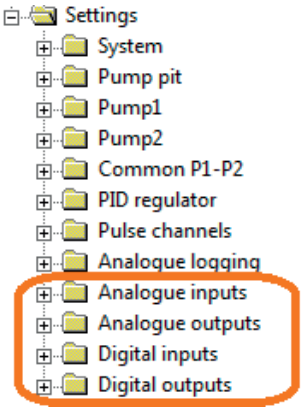
Table 2-5

Analog input 5-6
OFF
Motor temperature
Free choice

Table 2-6

Analog input 7-8
OFF
Motor temperature
Leakage
Free choice

In AquaProg:



2.3 Configure the pump pit parameters

Table 2-7

Pit settings
Station flow*
Overflow
Pit alarms
Cleaning control
Mixer control
Drain pump control
Motor protector auto-reset
Level sensor check
Tariff control
Level above sea

* ***MUST*** for accurate pump capacity calculation

Recommended is to setup the **Pit area** under **Station flow**. That's because the pump calculations shall perform as accurate as possible. This are bound to **Energy calculation**, **Pump capacity** and **Outlet calculations**. Best accuracy of pump capacity calculations and pumped volume is when an **Outlet pressure sensor** is used. See section 3.1 for more information.

Station flow (recommended parameters)
Under Meas. parameters set the Inflow calculation=ON and your pit shape, also the function Emptying or Filling the pit must be set. System curve at duty point is used if there isn't any Outlet pressure sensor.

Overflow (optional parameter)
Overflow can be detected by an overflow detector (MD 131) or by the certain level. See more information about overflow in section 3.2.

Pit alarms (some parameters are recommended)
There are several alarms which can be set under **Pit alarms.** Each alarm is configurable to be A- or B-alarms. Consult your drawings and verify which are important for your installation. See section 3.7 for further information about crash log.

Cleaning control (optional parameter)
Start on **at pump start** or **pump stop**. Configurable running time in second and interval. To disable function; set time and interval to zero. A dedicated digital output controls the cleaner.

Mixer control (optional parameter)
Mixer can be controlled by number of pump starts and/or by a time interval. Require a digital out signal to control the Mixer.

Drain pump control (optional parameter)
Drain pump require a digital input signal allocated as **Start float drain pump** and a digital output as **Drain pump control** to control starts and stops of the drain. Drain pump is running in configurable time in seconds.

Motor protector auto reset (optional parameter)
Pulse time and delay must be set as Max number of attempts. A digital output controls the reset.

Level sensor check (optional parameter)
Level sensor check It is possible to check the level sensor reading compared to the installed floats. See the settings under **Level sensor** check set this up.

Tariff control (optional parameter)
This function is to reduce energy consumption in hours of high cost of energy. You can set this up for separate days in the week.

Level above sea (optional parameter)
If you type in a value here, this value will be added in the pit level but not affect the start/stop levels.

2.4 Set pump 1 and pump 2 settings and their alarms

Important parameters to configure for each pump:

Type of pump control
Running indication
Start / stop level
Pump alarms
Optional parameters: Pump curve

Pump 1 and pump 2

Type of pump control:

- **Pump disable**
  If using only one pump in the system; recommended to have pump 2 as disable
- **ON / OFF control**
  A digital output starts the pump without any RS-485 communication to VFD or soft starter
- **VFD manuel speed**
  Start a VFD which has predefined frequency
- **VFD PID control**
  Start / stop pump with digital output and VFD controlled by 4-20mA analog output from the controller
- **VFD best efficiency point**
  Require RS 485 communications to VFD

Select run indication:

- **Any discrete source**
  Output signal or digital input
- **Output signal**
  No return signal from the pump, just activated output signal from the relay contact
- **Motor current**
  Current transformers connected to an analog input
- **Fieldbus RS 485**
  RS 485 communication to / from VFD or soft starter

Start / Stop levels for each pump
Recommended to have different start levels if there are two pumps. Same stop level for two pumps is fine.

Pump alarms
There are several pump alarms to setup. Each alarm is configurable to be A- or B-alarms. The first part, table 2-8 below, is to setup the types of alarm (A- or B), alarm delay and if the alarm shall trigger the crash log.

Pump alarms
No run indication
Fallen motor protector
Motor protector reset error
Pump not in auto
Pump error
Max continuous runtime
Alarm blocked
Max reverse attempts
Low pump capacity
Vibration
Leakage
High temperature
High motor current
Low motor current

Every alarm can trigger the crash log, see **section 3.7** for further information about crash log.

Block pump on alarm
These alarms must be acknowledged on site or remotely to allow the pump to start again.

Hold pump on alarm
All the alarms here will block the pump when the alarm is active. When the criteria for the alarm have returned to normal state, the pump starts again automatically.

2.5 Common P1–P2

To avoid possible station problems this option has many useful functions like, **Pump exercising, Pump reversing, Max number pumps running, Min relay intervals, Alternations** and **Pump blocking.**

Pump exercising

It is possible to exercise a pump if required. A maximum pump off time and exercising time can be set.
The level must be within the parameters.

Pump reversing

Several parameters can trigger reversing.
See also chapter **3.4** and **5.20**

Alternation

See chapter **3.3**

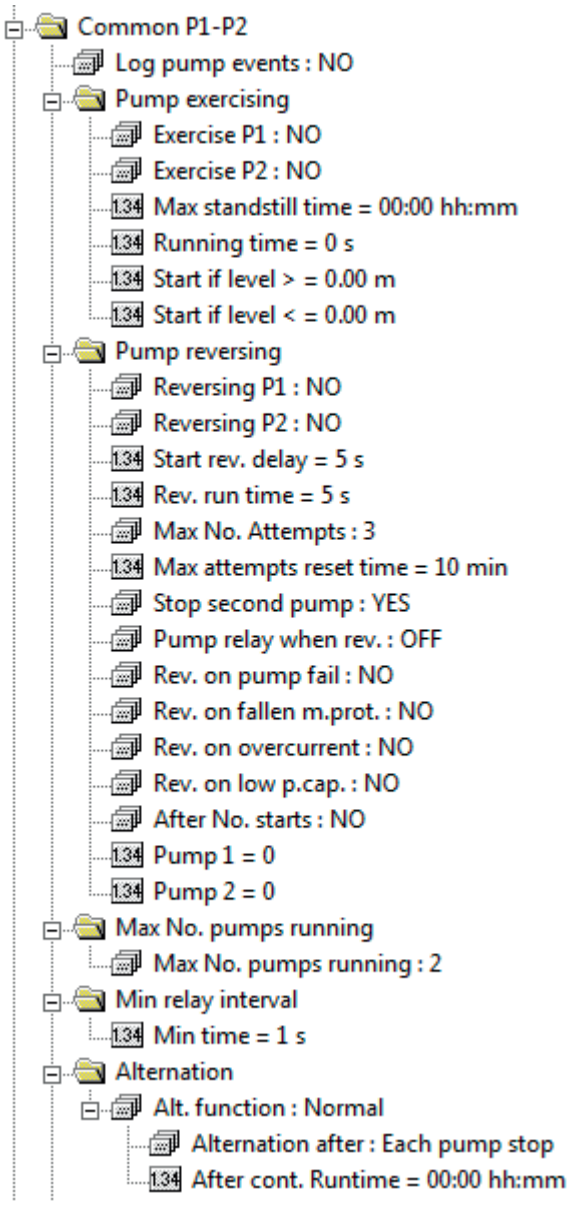


Figure 2-3: AquaProg view of common P1-P2

2.6 Set log settings and events

There are 16 configurable analog log channels on the EC 531. It is recommended to the use the log channels in sequential order from channel 1, as having log channels disabled between active channels will cause unnecessary data traffic to the surveillance system.

The logs are kept in the controller for 15 days and the oldest will be deleted when the memory is full.

The settings are:

Log signal
Log function
Log interval

There are 36 **Log signals** which can be logged. The **Log functions** can be set as follows:

Closed
Actual value
Average value
Min value
Max value

Closed: No logging.
Actual value: A momentarily value will be stored at the log sequence.
Average value: An average value during the log interval will be stored.
Min and max value: The min or the max value in the interval will be stored.

The log interval can be set from 1 minute to 9999 minutes.

Table 2-9

Log signals
Level pit
Inflow pit
Outflow pit
Overflow level
Overflow flow
Outlet pressure
Motor current
Pump capacity
Power factor
Temperature motor
Temp. stator wiring L1
Temp. stator wiring L2
Temp. stator wiring L3
Temp. upper bearing
Temp lower bearing
Vibration
Main voltage
Main frequency
Free choice AI1-AI8

Table 2-9

Log signals
Power supply
Pulse channel 1-4
PID control output
Data register
Data register 2-compl.
Set frequency
Actual frequency
Motor power
Motor voltage
Torque
Outflow meter
Total head
PCB temperature EC531
BEP frequency
BEP efficiency
Mains power
Actual head

Events

Event list stores individual events such as pump starts / stops, alarms, alarm types and when the alarms occur and when it was acknowledged. The controller stores 4096 time-stamped events.

The event list is always active for alarms. To activate event list for pump starts / stops,
Go into Settings – Common P1-P2 – Log pump events - Yes

2.7 Set up communications to surrounding units VFD, soft starters and energy meter

See installation guide how to connect the surrounding units. Note that all the surrounding units must have unique Modbus IDs and same communication parameters.

EC 531 has BIAS-jumpers for high and low signals which by default are active on EC 531. If any of the other units also have this BIAS feature, it can be necessary to take out the BIAS-jumpers from EC 531. Consult the manuals for all units connected to RS 485 bus if there are other units using BIAS pull-up / down resistors.

2.8 Set up cleaner, mixer or drain pump (if used)

If using cleaner, mixer or drain pump, a corresponding digital output must be configured.

Cleaner
The settings for cleaner are to be found:

Settings – Pump pit – Cleaning control

The cleaning can be done At pump start or At pump stop.
Running time in seconds.
Start counter interval is how many starts / stops before cleaning starts.

Mixer
The settings for Mixer is to be found:

Settings – Pump pit – Mixer control

The mixer can be started after a certain number of regular pump starts or after a time interval. There is also a criteria to set the level to be within a certain span. The mixer run time must also to be set.

The mixer status is visibly on the main screen on EC 531.

Drain pump

A drain pump requires a start float to be connected to a digital input which is configured with the start float drain pump option. The settings for drain pump is to be found:

Settings – Pump pit – Drain pump control

The drain pump runs only on time settings, there is no stop float for the drain pump.

A digital output must be configured as “Drain pump”.

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3. DETAILED DESCRIPTION OF THE FUNCTIONS

In this section we will explain more in depth how different functions work and how the controller calculates flows. Explanations will also be given for different input and output types.

Each chapter contains examples on how to configure functions in the controller and in some cases, where to find the settings when using Aquaprog.

3.1 Pump capacity calculation
This covers the importance of choosing the right scaled level sensor for the application, shape and size of the pump pit, pump curve and the parameters for each pump which must be set.

3.2 Overflow flow calculation
Here is explained the number of ways to calculate overflows and how it can be detected by the controller. Also lists the advantages and disadvantages of the different calculation methods used to detect overflows.

3.3 Pump alternation
Describes the different options, normal-, asymmetrical- and runtime alternation. The max number of pumps running is also explained here.

3.4 Pump reversing
Pump reversing is explained and what criteria are used by the controller to reverse the pumps.

3.5 Speed controlled pumps (VFD)
How to setup a speed controlled pump and how the PID regulator works.

3.6 Best efficiency point
Best efficiency point is a function which require VFDs and RS 485 communication to VFDs.

3.7 Crash log
The crash log is explained here, and how to read out the crash log from the controller.

3.8 Communication
Describes the communication ports and how to set up communication to external system.

3.9 Cross reference table
How to setup cross reference table is explained here.

3.1 Pump capacity calculation

In EC 531 controller there are some crucial parameters which have to be set for accurate calculation of in / outflow and pump capacity. We will describe each parameter in general terms later in this document. The parameters considered for pump capacity calculation in the controllers are:

- Level sensor
- Shape and size of the pump pit
- Pump curve
- Parameters under settings in Calculation of pump capacity
- Option: outlet pressure sensor

Level sensor

There must be a level sensor or an accurate level measuring device (from now on referred as: level sensor) present in the system so the controller can track the level and changes in level in detail. The sensor shall be connected to an analog input signal, normally “Ain:1” which has the highest resolution. The analog input channel shall be scaled as the property of the sensor.

Note that the smaller span the level sensor has, the greater is the accuracy.

The resolution of a flow calculatio, based on a 1,8 m diameter round pit -->

Enter pit diameter in meters:	3,57
Area m^2	10,00982

Impact of the monitoring device technical capability												
Bit	Digits	Resolution depending on range using a 0 – 20 mA input:										Unit
		0 - 2 m in mm	0 - 2 m in litres	0 - 4 m in mm	0 - 4 m in litres	0 - 5 m in mm	0 - 5 m in litres	0 - 10 m in mm	0 - 10 m in litres	0 - 40 m in mm	0 - 40 m in litres	
10	1024	1,9531	19,550	3,9063	39,101	4,8828	48,876	9,766	97,752	39,0625	391,009	Many older PLC’s
12	4096	0,4883	4,888	0,9766	9,775	1,2207	12,219	2,4414	24,438	9,7656	97,752	
14	16384	0,1221	0,1221	0,2441	2,444	0,3052	3,055	0,6104	6,110	2,4414	24,438	EC531 (Ain 1) PCx (Ain 1)
15	32768	0,0610	0,0610	0,1221	1,222	0,1526	1,527	0,3052	3,055	1,2207	12,219	
20	1048576	0,0019	0,0019	0,0038	0,038	0,0048	0,048	0,0095	0,095	0,0381	0,382	

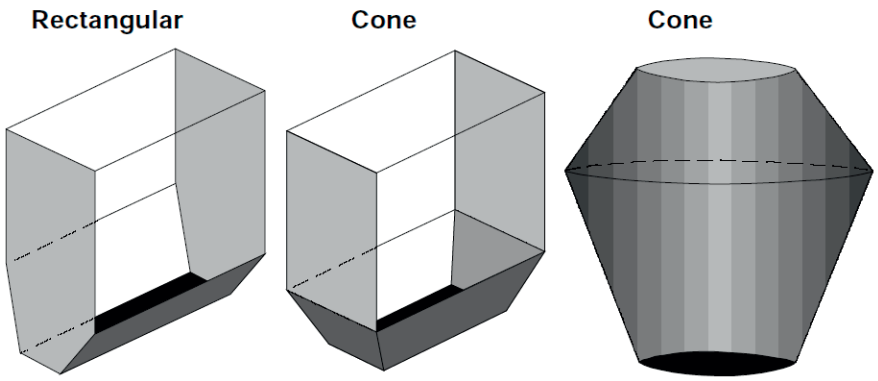
Impact of the monitoring device technical capability												
Bit	Digits	Resolution depending on range using a 0 – 20 mA input:										Unit
		0 - 2 m in mm	0 - 2 m in litres	0 - 4 m in mm	0 - 4 m in litres	0 - 5 m in mm	0 - 5 m in litres	0 - 10 m in mm	0 - 10 m in litres	0 - 40 m in mm	0 - 40 m in litres	
10	1024	2,4414	24,438	4,8828	48,876	6,1035	61,095	12,207	122,207	48,8281	488,761	Many older PLC’s
12	4096	0,6104	6,110	1,2207	12,219	1,5259	15,274	3,052	30,548	12,2070	122,190	
14	16384	0,1526	1,527	0,3052	3,055	0,3815	3,818	0,763	7,637	3,0518	30,548	
15	32768	0,0763	0,764	0,1526	1,527	0,1907	1,909	0,381	3,818	1,5259	15,274	EC531 (Ain 1) PCx (Ain 1)
20	1048576	0,0024	0,024	0,0048	0,048	0,0060	0,060	0,012	0,119	0,0477	0,477	

Table 3-1: Accuracy of the level sensor to be expected

Shape and size of the pump pit

Shape

In the settings in EC 531 where it is possible to set the shape of the pit. To get an accurate calculation at all levels, the pit shape must be defined as the calculation is different for different geometrical shapes. A shape that ends in a point is set as conical; if it ends as a wedge (2 parallel sides) it is set as rectangular shape, see figures below



Two parallel sides	Sides sloping towards the center	Sides sloping towards the center

Figure 3-1: Pit shapes

Size of the pit

The continuous flow measurement is based on the fact that the EC 531 can calculate the volume by measuring the level difference during a set calculation time. For this calculation to be accurate, it is essential that the area and the level should always be known. This can be achieved by setting the level and area for all levels where the pit changes shape, up to nine break points plus the area at zero point can be set. Those nine points shall be distributed along whole range of the pit up to the maximum fill level, with emphasis on areas where the pit shape changes form.

When the controller has the level sensor installed and it's correctly scaled, and the shape and size of the pit is known; the EC 531 can easily calculate the volume. Any changes in the level are directly proportional to the amount of in / outflow and to the volume in the pit.

Pump curve

If you imagine a very deep pit or well, the out pumping from the pit is much easier when the level is very high. That's because the water pressure from the surface down to the pump "helps" the pump to lift the water. So in principle you can say that the pump lifts the water only from the surface and out – rather than from bottom and out. Depending where the level is; the duty of the pump is shifting. Dependant on the motor and impeller type each pump will have a different **Pump curve**, see figure 3-2. From the pump curve three points within the range where the pit will operate can be taken, these three points are named as **Hmax, Hmid, Hmin** and stands for **Total head max, Total head middle** and **Total head min.** Check the Sulzer software ABSEL for the pump curve for your pump.

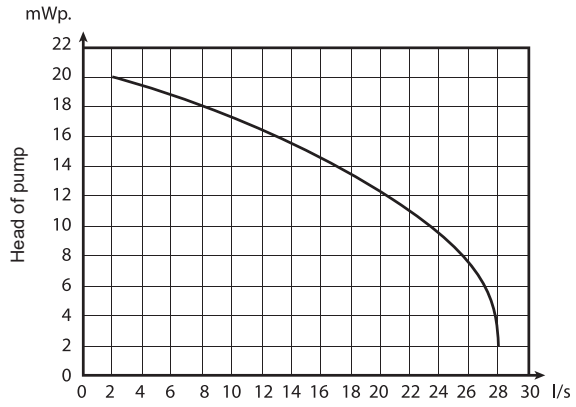


Figure 3-2: Example of a given pump curve

In EC 531

Under settings for each pump it is possible to set three points for the **Pump curve** and it's flow at the given points; Head (max); Head (mid) and Head (min) which correspond to **Hmax, Hmid** and **Hmin. Total head** can also be configured as a fixed value. If there is an **Outlet pressure** sensor in the system, then the **Total head** value is replaced in the calculation with the value from the outlet pressure sensor as **Actual static head.**

Typical the mid value is the best BEP and recommended operating range define **Hmax** and **Hmin.**

Hmax **(at pump outlet to pit outlet)**; is the highest lifting point and lowest level in the pit. At this point the pump has hardest load and is least efficient.

Hmin **(the highest point the surface of the level can reach; to the level of overflow etc.)**; is the highest level the pit can reach and lowest lifting point for the actual system and most efficient pumping.

Hmid is a value somewhere in between Hmax and Hmin.

If sensor is mounted according to figure 3-3 below in example 1 where the pit bottom is 0.4 m below pump outlet, set parameter **Total head zero level** = 18 + 0.4 = 18.4 m.

Type in pump curve parameters in EC 531:

In the menu of EC 531:

Settings – Pump X (X = Pump 1–2) – Pump curve (QH)

- Point 1 head (max) = X.XX m (ft.) There XX is manually replaced with new value
- Point 1 flow (min) = X.X l/s (gal./min)
- Point 2 head (mid) = X.XX m (ft.)
- Point 2 flow (mid) = X.X l/s (gal./min)
- Point 3 head (min) = X.XX m (ft.)
- Point 3 flow (min) = X.X l/s (gal./min)
- Total head= X.XX m (ft.)

Example 1

A pit where the pump(s) has the lifting height of 18 meter from the pump outlet to pit's outlet. Therefore the **Hmax** is 18 meter. We have also an overflow outlet 5 meters from the pump(s) outlet where the overflow sensor is placed. The level can never be higher than 5 meter. Hmin is then 18 – 5 = 13 meter and Hmid is 15.5 meter, see figure 3-3 below.

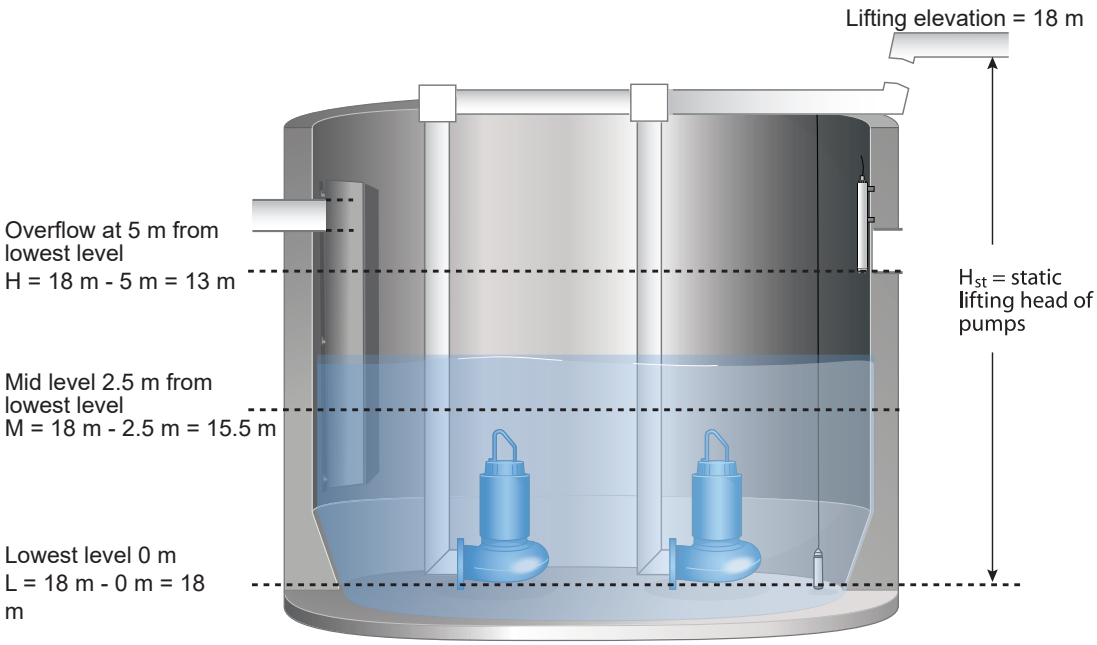
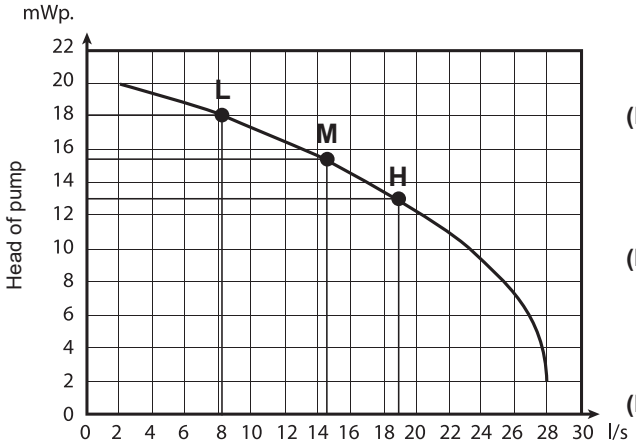


Figure 3-3: Explanation of Hmax, Hmid and Hmin

Actual head of pump = Total head of pump - actual level.

From pump curve, we can find the corresponDing flow rate for each of; Hmax, Hmid and Hmin.



(L) Point 1 Hmax tot. head 18.0 m (ft.)

Point 1 Flow 8.2 l/s (GPM)

(M) Point 2 Hmid tot. head 15.5 m (ft.)

Point 2 Flow 14.4 l/s (GPM)

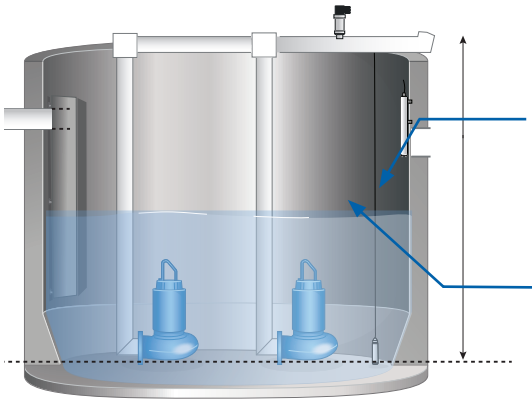
(H) Point 3 Hmin tot. head 13.0 m (ft.)

Point 3 Flow 19.0 l/s (GPM)

Figure 3-4: Hmax, Hmid and Hmin in the chart

Actual static head

If using an analog input sensor allocated as **Outlet pressure,** on the outgoing mains the value of total head is replaced with value from the sensor in outlet and pump capacity calculations. Actual static head makes the calculation much more accurate than a fixed value for Total head in the settings for each pump.



Calculated outflow based on a given static head

OR

Note!

When a pressure sensor is mounted on the mains the setting "Sensor offset to pumps" needs to be set for an accurate calculation.

A pump is almost always used in a system of pipelines and valves. These give losses that the pump must overcome for a specific flow. The outlet pressure sensor gives the sum of the dynamic height and pipeline system losses at a specific flow (total head). It could be assumed that if two pumps of the same type are running in parallel then the outflow would increase by two, however sometimes due to the increase in back pressure the outflow will increase by less than this. This is because the pipeline losses increase with increased flow and higher back pressure thus the total lift height. If you do not compensate for this, the calculation of the output flow and pumped volume will be less accurate in the case of several pumps running. This is especially true when we have large pressure losses in the pipes in relation to the static height. This can happen, for example, when several pump stations are working in the same pipe system or if the pipes are partially blocked or if air entrapment occurs. An outlet pressure sensor takes into account all this.

As in the general description of the pump curve above, the back pressure is dependent on the level in the pit, but also on the flow rate in the pipes, number of pumps running and the outlet pressure. We have two ways to handle this; by Flow compensation and or use an Outlet pressure sensor.

Flow compensation has fixed calculation factors depending on the number of pumps running which is multiplied with the pump capacity for each pump but does not consider the level, flow rate and outlet mains-pressure.

Outlet pressure sensor considers the level, pressure on the outlet, the number of pumps running, pump capacities and pipe losses.

Therefore, with an outlet pressure sensor the calculation is much more accurate compared to using only the Flow compensation and a fixed value for static head.

Calculations

Inflow

If the controller knows the shape and size of the pit and together with a level sensor; the unit will at all times know the momentary volume of the pit and its inflow.

Pump capacity

A pump capacity calculation is performed every time the pump starts **alone** with no other pump running. If two pumps are running, the EC 531 will not perform any new calculation and will use the existing nominal pump capacity for the outflow calculation.

Important parameter in EC 531 to perform automatic calculations of pump capacity

All the important parameters for pump capacity calculation are to be found in the menu of EC 531 under:

Settings – Common P1-P2 – Calc. pump capacity

- Calculation ON / OFF, must be **ON**
- Min level for calculation default 0.50 meter
- Start delay default 10 sec.
- Calculation time default 10 sec.
- Stop delay default 10 sec.
- Max level for calculation default 2.00 meter

It may be necessary to adjust above parameters for accurate measurement of the capacity.

Pump capacity calculation rules

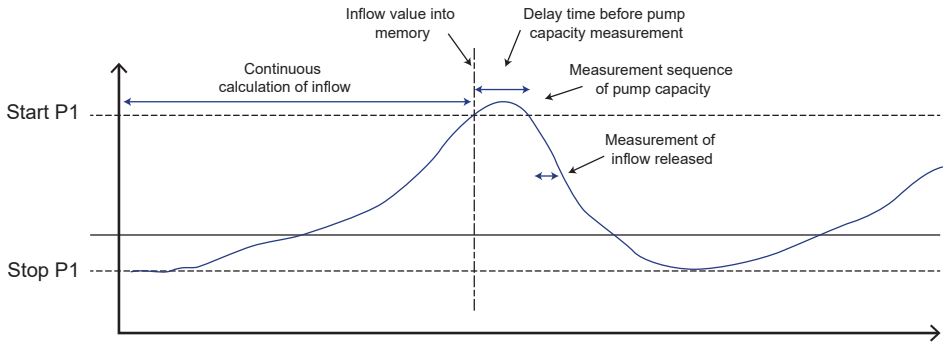
- Only one pump is allowed to run during the whole sequence, otherwise no new calculations will start.
- The level must be over “Min level for calculation” during the whole calculation sequence .
- The level must be under “Max level for calculation” during the whole calculation sequence.
- The level after calculation must be lower than when the calculation started.
- The Calculation delay time must be long enough for the pump to reach full speed and for the water to reach full velocity in the pipes.
- All the times in Calculation delay + Calculation time + Stop delay must be in one and the same pump sequence.

When one pump starts alone

- The actual indicated inflow value is frozen when the pump starts and temporarily stored in EC 531.
- The outflow is now ramped up for a configurable time frame set in settings for “Start delay”.
- When the pump is running at full speed and the water has full velocity in the pipes after the “Start delay”, the pump capacity is calculated over the time defined in the “Calculation time” setting.
- After the “Calculation time”, there is a “Stop delay” and when this time has passed, the inflow value is updated again.
- The EC 531 does this calculation five times for each pump, the two most divergent results are removed and an average of the three remaining results is taken to give the new pump capacity value.

Example of calculation cycle:

1. No pump is running, level increasing due to inflow that is then calculated based on the area/level and time settings.
2. Start level reached.
3. Current inflow stored.
4. Time delay before pump capacity measurement, this to enable the flow to pick up speed depending on size of pit, pump, head and collection network design.
5. Measure speed of level reduction during a preset time to a pump capacity value is now obtained.
6. This capacity value is now adjusted to the pump curve (if entered).
7. Release the inflow calculation.
8. The inflow is now a function of the pump capacity and entered pump curve.
9. If yet a pump starts the outflow and inflow is then also adjusted according to the system curve.
10. If a pump is running and there is a stable level reading, this would indicate that the inflow matches the outflow.
11. If the level increases it indicates that the inflow is higher than the pump capacity and the calculation is rejected.



Increased calculation accuracy

To improve the calculation accuracy and alarm handling, especially with varying start levels we recommend that the pump curves are entered.
For a more accurate outflow calculation, the use of an outlet pressure sensor is recommended in the system. In this case the EC 531 will recalculate and adjust the outflow calculation based on the momentary level.

Presentation of the pump capacity calculation

The pump capacity is presented as Pump capacity and Last sample value in EC 531.

Pump capacity:

- The nominal pump capacity is calculated from five readings of a single point on the “Pump curve”. From these five values the two most divergent are removed and the average of the three remaining give the pump capacity.

Last pump capacity:

- As it sounds, the last calculation, unfiltered and without compensation for Pump curve and it is just a raw value. Five of the “Last pump capacity” -values will create a new Pump capacity-value after all other parameters which are involved are set as described above.

In order for the EC 531 controller to change the calculated Pump capacity (nominal-) value, there has to be five starts and stops for each pump and that pump must have been running alone those times.

Outflow

The internal outflow calculations are closely linked to the pump capacity calculation. When the pump starts and the running indicator is on, the EC 531 calculates the outflow by multiplying run time with the capacity of the pump(s). The calculation will also take into account the Pump curve, Outlet pressure and number of pumps running. If there is an analog input assigned as Outlet pressure sensor in the system, the Total head-parameter in the calculation is replaced with the value from the outlet pressure sensor.

If there is an analog input assigned as Outflow meter, EC 531 will ignore internal calculation of the outflow and only store the valve from outflow meter. Neither the pump curve or outlet pressure is in the value of outflow when using an Outflow meter.

Example 2

How to read out the expected pump capacity based on the mains pressure and actual basin level.

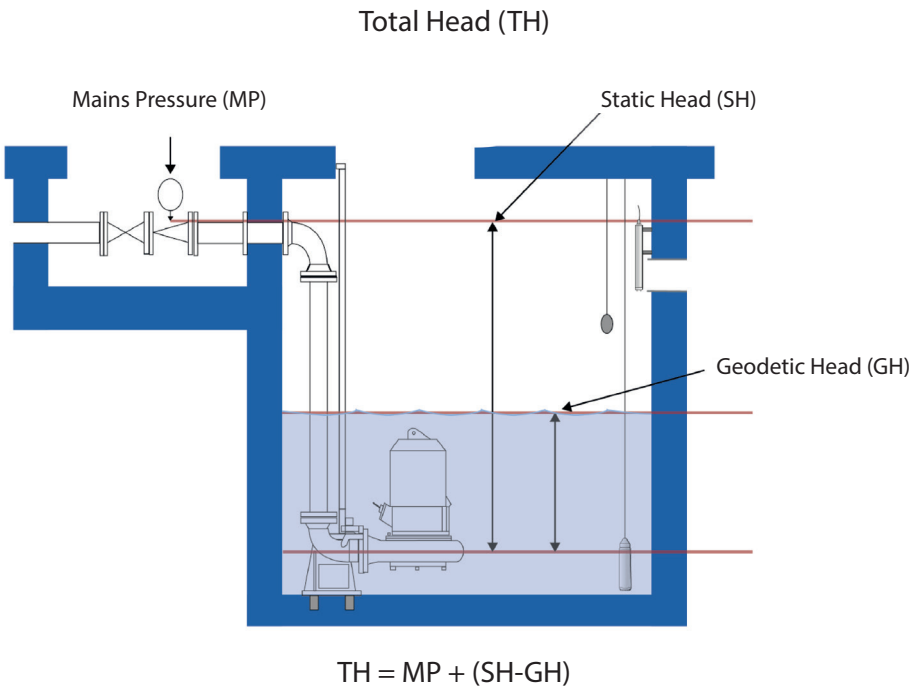


Figure 3-5: Relation between pump curve and the pit

Estimated theoretical pump capacity at start level

Bar → m H2O = 10.1972

Mains pressure = 1.95 bar → 19.89 m

Static head = 3 m

Start level = 0.5 m

Geodetic head = 0.5 m

Total head at start level = 19.89 + (3 – 0,5) = 22.39 m

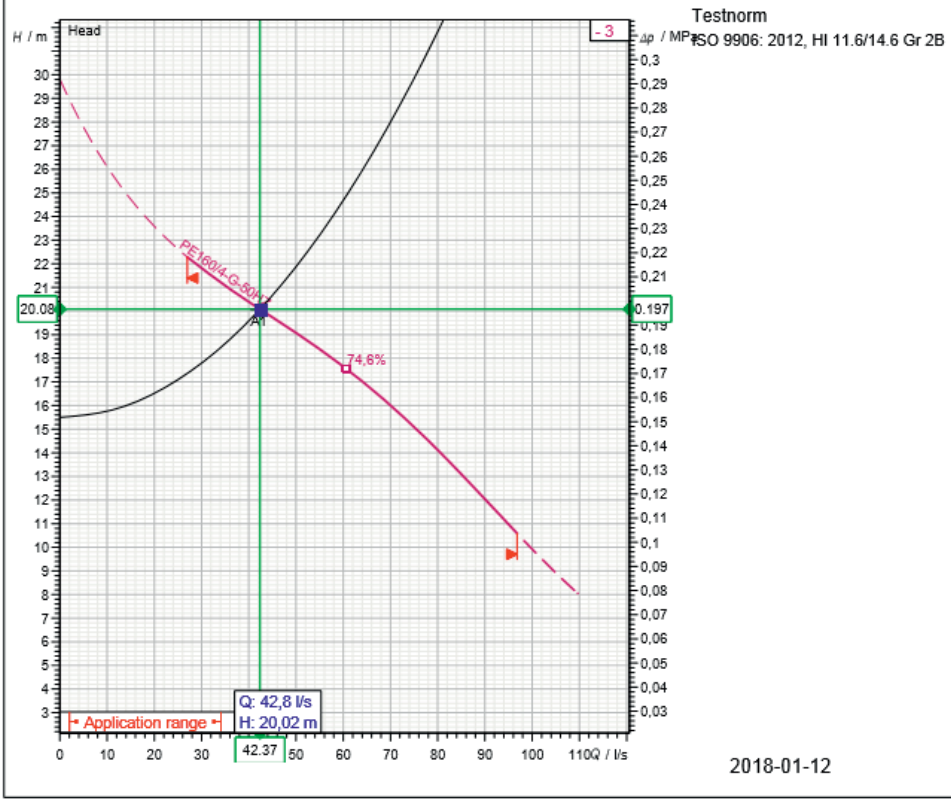
Above would give an estimated pump flow as at new conditions of approximately 26 l/s

In practice

A fictional station with two Sulzer pumps, XFP 150G CB1 50 Hz and a EC 531 controller.
The data sheet for the pump:

SULZER

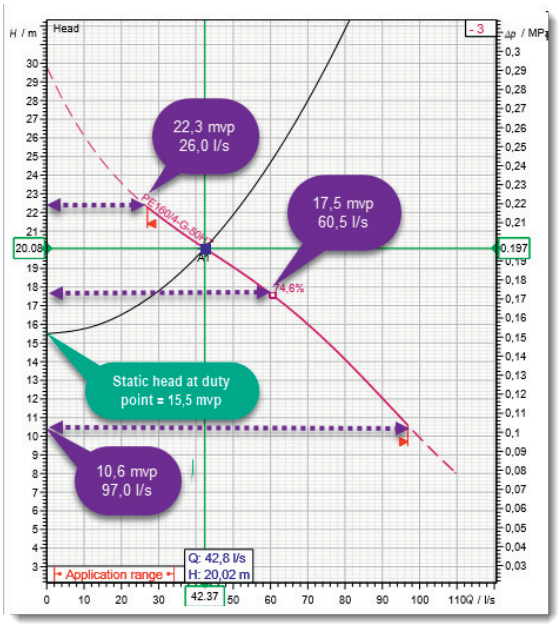
XFP150G CB1 50HZ



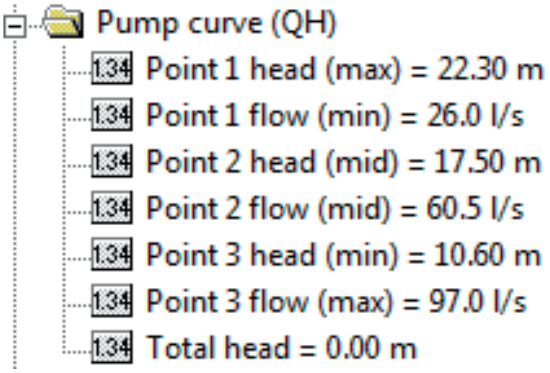
Operating data specification			
Flow	42,4 l/s	Head	20,1 m
Efficiency	71,2 %	Shaft power	11,7 kW
NPSH	1,97 m	Fluid	Water
Temperature	20 °C	Nature of system	Single head pump
No. of pumps	1		
Pump data			
Type	XFP150G CB1 50HZ	Make	SULZER
Series	XFP PE1-PE3	Impeller	Contrablock Plus impeller, 1 vane
N° of vanes	1	Impeller size	275 mm
Free passage	100 mm	Suction flange	DN150
Discharge flange	DN150	Type of installation	
Moment of inertia	0,104 kg m²		Not chosen
Motor data			
Rated voltage	400 V	Frequency	50 Hz
Rated power P2	16 kW	Nominal Speed	1470 1/min

Figure 3-6: Example of data sheet

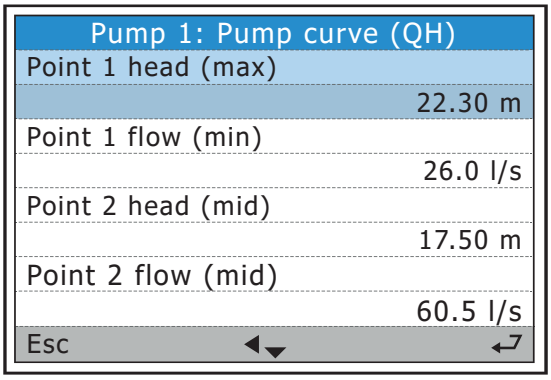
Data from Graph



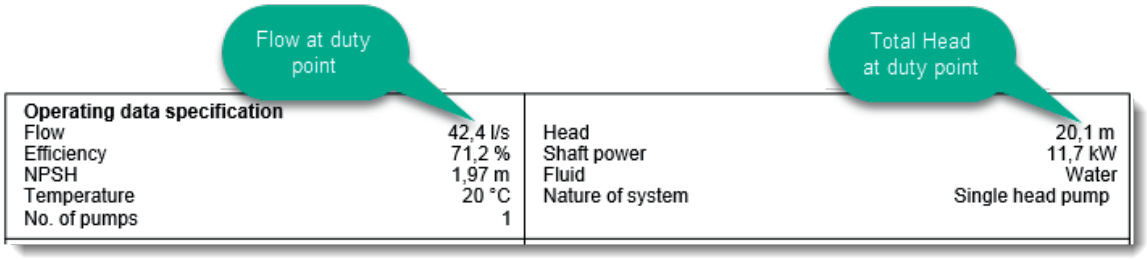
Settings / Pump 1 / QH Curve (pump curve)



If not using an outlet pressure sensor - a value for Total Head must be given; in this case: 20.1 m

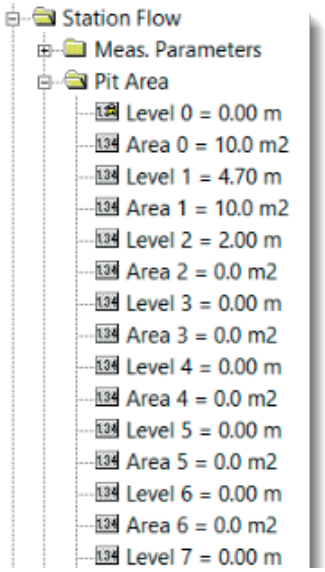


Data from Specifications

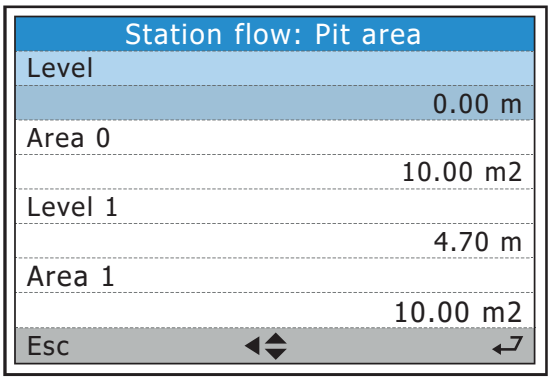


Other parameters needed for the flow calculation set-up:

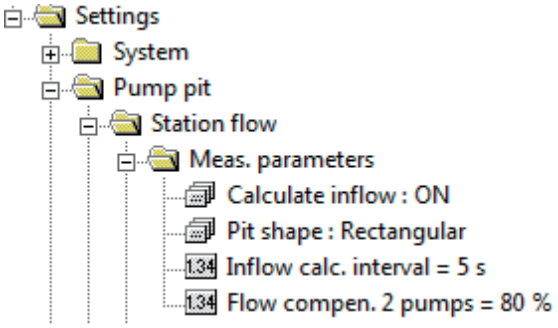
Settings / Pump pit / Station flow / Pit area

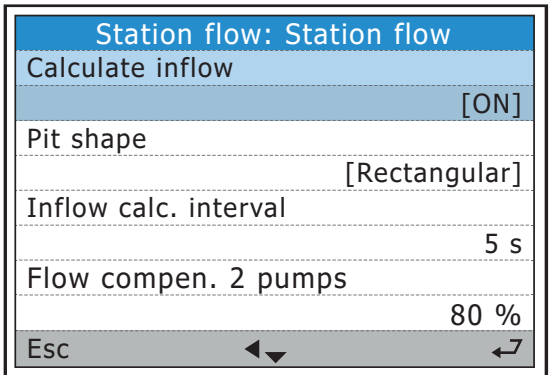


Settings / Pump pit / Station flow / Meas. Parameters

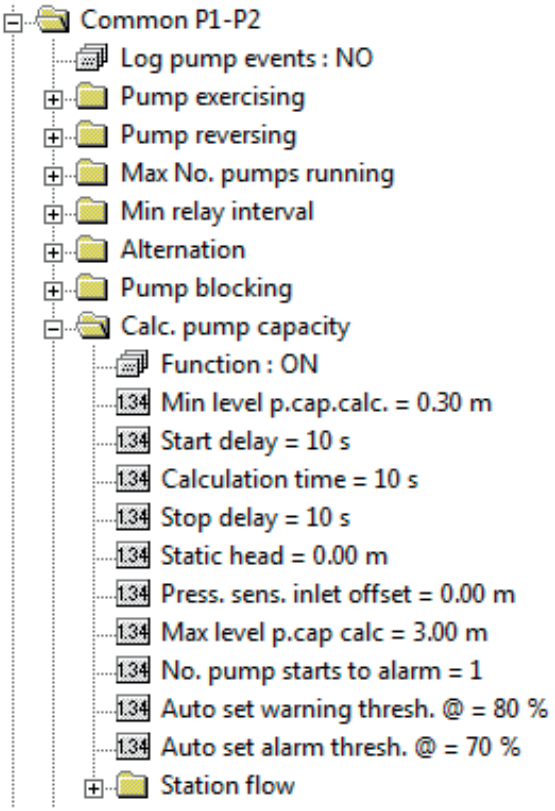


Station flow settings



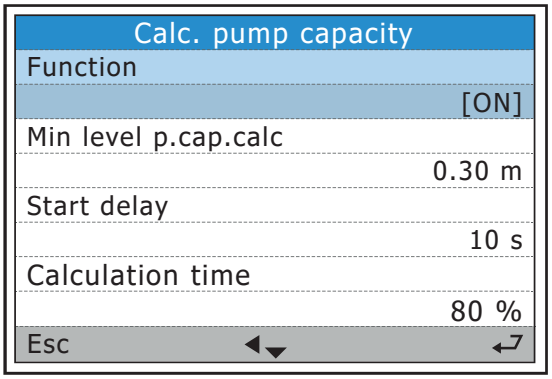


Settings of criteria for calculation of pump capacity

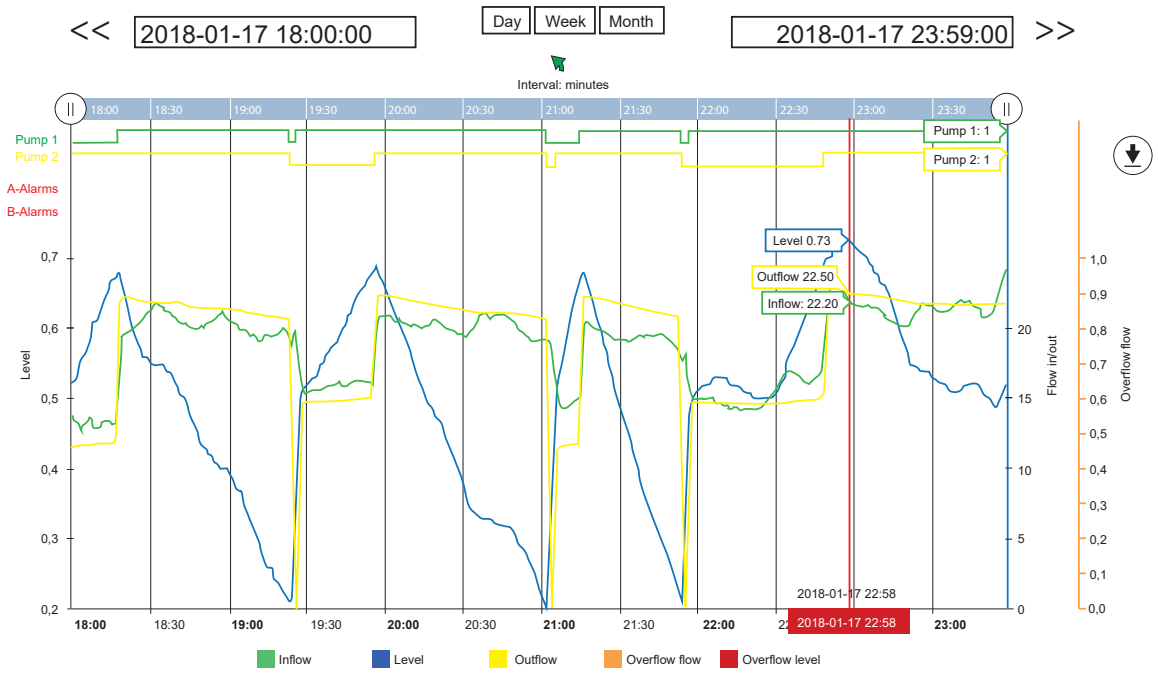


The level settings will set boundaries for the possible levels in the basin where calculations can be conducted.

The start delay time is a crucial setting. Verify that the flow rate in the pipe has reached full velocity before the calculation is executed!



Example from a run sequence based on described set data in EC 531 shown in AquaWeb



If the start delay time is set too short the calculated capacity is often too low.

If the inflow value “jumps” at every pump sequence this is normally because of:

- wrongly set calculation parameters
- back flush valve not working correctly

3.2 Overflow flow calculation

There are three main methods that can be used to measure and calculate overflow rate:

1. **Use a conventional flow meter.**

   Advantage: In most cases for standard PLC-systems this will increase the accuracy on the measurement.

   Drawbacks: Expensive. Also during normal operating conditions, sensors which only measure overflow, can accumulate dirt which will affect their readings, therefore the sensor has to be cleaned regularly to ensure accurate measurements.

2. **Use the same sensor that is used for the level measurement in the pit remove and start the flow measurement on an analog set point.**

   Advantage: The investment cost is low and the sensor will not need regular cleaning.

   Drawbacks: The system must have very good resolution on the input to be able to measure the overflow correctly and a very accurate 0-point otherwise the measurement will be inaccurate.

3. **Use the same level sensor that is used for the level measuring in the pit and use a level switch to start the overflow measurement.**

   Advantage: The Investment cost is low and the sensor does not require regular cleaning. The accuracy of the 0-point does not affect the measurement as the switch is used as the 0-point.

   Drawbacks: The analog input needs to have very good resolution to be able to measure the signal. The EC 531 does not have this problem, for example a sensor with the range of 10 meters the EC 531 has the resolution of < 0.7 mm.

The third method is the preferred one to be used in the EC 531

A digital overflow switch, like Sulzer MD 131 connected to a digital input indicates if an overflow is occurring independent of what the level signal shows. The EC 531 locks this actual level and the EC 531 starts calculating the overflow level / flow from this value.

This means that the level is measured with a very high accuracy with an accurate 0- point. If an exact flow measurement is needed a weir or channel should be used.

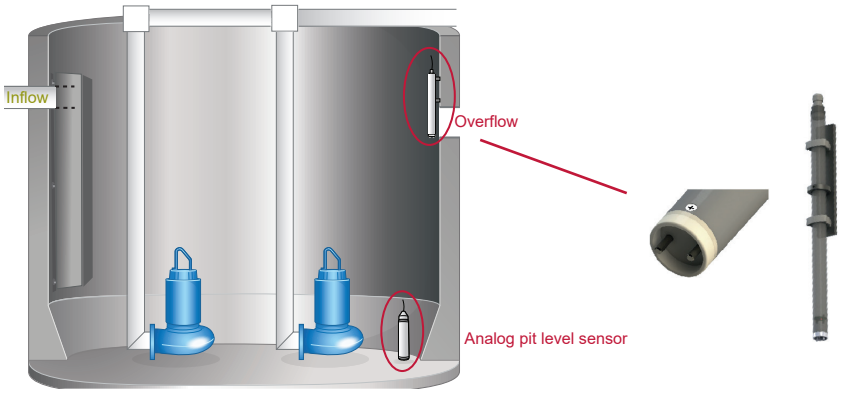


Figure 3-7: Illustration of a pump pit with overflow sensor

The EC 531 program has all the functions available for calculating flow in weirs and channels. Number of overflows, overflow time and overflow level and the flow are logged.

The levels sensor is used as the actual level signal, when the switch is activated it sets the 0- point for the flow measurement. If no level switch is connected to the EC 531 the 0- point for the overflow can be set in:

Settings – Pump pit – Overflow – High level limit

Overflow / Overflow detect “manually”. Overflow will be registered when the level exceeds pre-set overflow level on the usual level sensor.

NOTE! ***This set point has no function if a digital input (overflow switch) is set for overflow indication in the pump pit.***

A delay can be set to prevent disturbances or waves that could trigger the switch. After this delay the flow measurement starts and the time of the overflow is recorded. A counter keeps track of how many times the pit has overflowed. The overflow time is only trigged when the level is higher than the stored (set) 0-point. If a float sensor is used for a pump pit, which has no level sensor, the overflow time counts all the time the float is active.

Once the float goes back to normal, the overflow alarm will cease after the configured stop delay duration to avoid errors in the counter and to compensate for the start delay.

NOTE! ***Overflow alarm and counter is only detected if alarm is enabled.***

How to calculate overflows by using constants and exponents

- In Settings – Pump pit – Overflow you can type in the constant and exponents manually.

There are two different exponents and two constants which can be set in EC 531 which are dependent on manufactures and nature of the weirs.
Those constants shall normally be provided by the manufactures. If you don’t have the e2 and c2 values, you can put e2 and c2 to 0 (zero), only use the left side of the equation. For the basic weir types, the c2 constant is set to 0 (zero).

Overflow= h^{e1} c1+ h^{e2} c2 [m^3/s]

Type of weir	Exponent	Constant
Thompson 30°	2.5	0.373
Thompson 45°	2.5	0.569
Thompson 60°	2.5	0.789
Thompson 90°	2.5	1.368
Straight weir 1 m	1.5	1.76

For other width on straight weirs, multiply the constant with the width in meters. Ex. c = b * 1.76 (b in meters)

NOTE! ***If ”Locked on inflow” is chosen, it assumes overflow will be the last calculation of inflow in the pit minus the capacity of the pumps which are running.***

3.3 Pump alternation

EC 531 has three different methods in order to alternate pumps.

1. Normal alternation

Pumps are started alternately according to a rotating schedule. The pump that started first in the previous pump cycle, will start last in the next cycle. In this way the running time is divided equally between alternating pumps. Pumps that are not set for alternation, start and stop at their own defined levels.

One can choose that alternation occurs at each pump stop or when all pumps are stopped.

It is preferred that alternation at each pump stop is used when the inflow is so high that the pumps don’t have enough capacity to fully empty the pit. This prevents the situation where one pump is running continuously.

It is preferred that alternation at all pumps stopped is used when the inflow is such that the pumps have enough capacity to fully empty the pit.

Example 3-1: Continuous high inflow. A single pump can't empty the pit.

Start level pump 1 = 2.0 m

Start level pump 2 = 3.0 m

Stop level pump 1 = 1.0 m

Stop level pump 2 = 1.5 m

Method used	Alt. each pump stops	Alt. when all pumps stop
Pit level increase At level 2.0 m	Pump 1 start	Pump 1 start
At level 3.0 m	Pump 2 start	Pump 2 start
Pit level decrease At level 1.5 m	**Pump 2 stop**	Pump 2 stop
Pit level increase At level 3.0 m	Pump 2 start	Pump 2 start
Pit level decrease At level 1.5 m	**Pump 1 stop**	Pump 2 stop
Pit level increase At level 3.0 m	Pump 1 start	Pump 2 start

If alternate when all pumps stop method is used pump 1 will never stop.

Example 3-2: Temporary high inflow

Start level pump 1 = 2.0 m
Start level pump 2 = 3.0 m
Stop level pump 1 = 1.0 m
Stop level pump 2 = 1.5 m

Method used	Alt. each pump stops	Alt. when all pumps stop
Pit level increase At level 2.0 m At level 3.0 m	 Pump 1 start Pump 2 start	 Pump 1 start Pump 2 start
Pit level decrease At level 1.5 m At level 1.0 m	 Pump 2 stop Pump 1 stop	 Pump 2 stop Pump 1 stop
Pit level increase At level 2.0 m At level 3.0 m	 Pump 1 start Pump 2 start	 Pump 2 start Pump 1 start
Pit level decrease At level 1.5 m At level 1.0 m	 Pump 2 stop Pump 1 stop	 Pump 1 stop Pump 2 stop

If alternate each pumps stop method is used, pump 1 will always start first.

2. Asymmetrical alternation

It is possible to set a pump to be the main pump and let the other pump run less in time. This is to save one of the pump so that the maintenance does not occur simultaneously on both pumps, which avoids a total stop for the entire station.

P1 run time ratio = 70% - means that the pump 1 will run 70% of the time.

3. Runtime alternation

The pumps can also be alternated based on continuous runtime. At exceeded maximum run time the pump will stop and an alternative pump will be started. The pump will only stop if the other pump is available and ready to run.

Max number of pumps running

If the piping system cannot take the pressure when two pumps are running there is a possibility to set the max number of pump that is allowed to run at the same time to one. It could also be used when there is a limit for the power load in the station.

If max number of pump is set to one the system will not allow the other pump to start.

A pump is running when the relay of the pump is activated or there is a run confirmation from the pump.

If max number of pump is running and the run confirmation is lost or some other errors that block the pump occur. The following will happen.

- Alarm for the error will be indicated.
- The faulty pump stops.
- If alternation is active, after a delay the other pump will be start.
- If alternation is not active the other pump will start at the next start level.

3.4 Pump reversing

The reverse pumps may be trigged on

Digital input “Pump fail”
Tripped motor-protection
High motor current
Low capacity
After number of pump starts

- In Settings – Common P1-P2 – Pump reversing

These are the events that can trigger pump reversing

Reverse on Pump fail
Reverse cycle start when digital input signal Pump fail goes active.
The signal must go back to inactive state before the pump start reversing, if not reversing cycle is aborted.

Reverse on Fallen motor-protector
Reverse cycle start when the digital input signal Motor protector goes active. Motor protector will be reset before the pump start reversing.
You must enable auto reset motor protector function for the pump. Set the cold down time and pulse time in the auto reset menu. If the motor protector reset fails reversing cycle is aborted.

Reverse on High current
Reverse cycle start when alarm for High motor current is activated.
For this function to work you need to enable the alarm in the pump alarm menu. Use the alarm delay time to delay the start of reversing (don’t trigger on pump start current).

Reverse on Low pump capacity
Reverse cycle start when alarm for Low pump capacity is activated.
For this function to work you need to enable the alarm in the pump alarms menu. After reversing the function is disabled until at least 10 new pump capacity calculations have been done.

Reverse on After number of pump starts
Counter for cyclic reversing of pump.

Other settings regarding pump reversing:

In menu Settings / Common P1-P2 / Pump reversing

- Set **[Reversing pump x]** to **[Yes]**.
- Set **[Start rev. delay time]**. The time to hold the pump in off position before the start of pump reversing
- Set **[Rev. run time]**. The reversing run time.
- Set **[Max no. attempts]** After the reversing the pump will start again.
- Set **[Max attempts reset time]**
- Set **[Stop second pump]** to **[Yes]** if you want the other pumps to stop and stay blocked when reversing cycle run.
- Set **[Pump relay when rev.]**

If the pump fails again, a new reversing cycle will begin. Here you set max number of attempts. The reversing has succeeded if the pump has been running for the same time as the **[Start rev. delay time]** without any pump error. If successful the attempt counter is reset to 0.

If the attempts counter reach max number of attempts, an alarm will be generated and all further reversing stopped until motor protector alarm or pump fail alarm have been reset manually.

If **[Pump relay when rev]** is set to **[ON],** the pump relay will be activated 1 sec after the reversing relay and will be set to OFF 1 sec before the reversing relay goes off. Here pump relay is used to control the pump (ON / OFF) and reversing relay is used to shift two phases before reversing.

If **[Pump rel. when rev]** is set to **[OFF]** only the reversing relay is activated during reversing. Pump relay is always off.

3.5 Speed controlled pumps (VFD)

EC 531 has a Modbus RS 485 interface which can communicate with VFDs. It is highly recommended to use this feature when there are VFDs in the system.

VFD pumps are mainly controlled by start / stop level and the digital outputs similar to fixed speed pumps. The best way to control the VFDs is via the RS 485 bus which can control the speed, read the information from the pumps such as currents, speeds and loads. It is also possible to use the analog output signals to control the speed in VFD unit(s) which drive the pumps. Normal start and stop levels are used to start and stop the VFD pump(s). The built-in PID controller is used according to the constant level control method and outputs frequency set points to the VFD. The PID controller will raise the frequency when the water level tends to rise above the set level and lower the frequency when the water level tends to fall below the set level. In some cases, the control logic will override the output signal from the PID controller.

At start level the pump will always start at max frequency. Output signal is kept at max freq. until the set level is reached. If calculation of pump capacity is enabled the pump will run at max frequency, until the calculation is completed. If the pump is running at min frequency for an adjustable time you can set a force speed for pumping out the pit. The pump will go on force speed until stop level is reached (or set level).

If the pump is exercised, the pump will run on max frequency. When reversing the pump, the specified reverse speed value will be used (50% default). In high tariff pre pump down mode the pump will run on the same force speed as specified for min freq. timeout.

If there is more than one pump connected to VFD, the pumps will be synchronized. The output signals will always be the same if the scaling is the same. The VFD is responsible for speeding up and down the pump. EC 531 doesn't handle ramp times. The min and max frequency for the pump normally is set on the VFD. The PID controller also has adjustable min and max value for the output signal that can be used.

There is a possibility to run VFD pumps with two different set points, connected to day and night settings. PID operator settings are found under:

Settings – PID controller

Setup EC 531 for VFD pump(s)

- In Settings – Pump x menu: Set Type of pump to [VFD manual speed or VFD PID control or VFD best efficiently point] (see section 2.4 for explanations of different types). If a second VFD pump is used. Set the same type for that one.
- In Settings / Pump x menu: Set the start and stop level for the pump the start level should be ` higher than the set level on the PID controller. The stop level should be lower than the set level.
- In Settings / Analog outputs / Analog output 1 menu: Set output function to [PID controller].

The same for Analog output 2, if a second VFD pump is used, the output should be connected to the frequency input on the VFD

- In Settings / Digital outputs; Set output function **[Pump relay]** as for fixed pumps. The output should be connected to the “Run input” on the VFD.

PID settings

In the Settings – PID regulator menu:

- **External set point (On/Off)**
  If using external input for set point, specify the analogue input here or set to OFF.
- **Setpoint tracking (Yes / No)**
  Rarely used. Is that the internal setpoint follows the external that comes via an analogue input. When you then switch to the internal setpoint, it has the same starting value as the external (AI) had before wrapping. Is to prevent the setpoint from jumping to when switching between external and internal setpoint.
- **Setpoint when start**
  Last: last value, Setup start: start value, Extern: value according to specified input.
- **Max set point and Min set point**
  Levels for the set point and a start set point. Here you can set max and min values to corresponding levels for the output signal (min / max freq). Value at Min level = 4 mA and Max level = 20 mA. What frequencies these correspond to depends on the settings in the VFD.
- **Setpoint**
  Set point value
- **Setpoint high tariff**
  The set point value at high tariff
- **Start set point**
  Behavior when the controller is powered on
- **Output state when start**
  Last state, Auto, Manual or Internally blocked.
  Only valid when the controller is powered up.
- **Output when blocked**
  Freeze output or Setup block signal
  Behavior when the PID gets blocked
- **Block output (%)**
  Percentage of output signal when blocked
- **Max output change**
  The change speed of the output signal (%/s)
- **Max output**
  Normally 100% (20mA)
- **Min Output**
  Normally 0% (4mA)

- **Start output (%)**
  Which output regulator should have after booting (e.g. after network interruption)
- **Direct / Reverse effect**
  Direct: The pumps start at full speed and decrease in speed as the level decreases
  Reverse: The pumps start at low speed and increase in speed as the level decreases.
- **P-band**
  Amplifying factor
- **I-time (s)**
  Integration time
- **D-time (s)**
  Derivation time
- **Zero dev. output (%)**
  Is which output regulator should when the Setpoint = actual value thus at zero-deviation normally not used (normally 0%). Mostly used for clean P regulation.
- **Calc. pump cap. At max speed (Yes/No)**
- **Min speed (%)**
  Here you set the minimum pump speed
- **Locked speed pumping out (%)**
  The speed of the pump when it has run for an adjustable time at lower speed and starts to pump out.
- **Lock speed delay**
  If the pump is running at min frequency for an adjustable time you can set a force (lock) speed for pumping out the pit. If locked speed delay = 0 the function is disabled.

3.6 Best efficiency point pump control

Offers many advantages:

- Reduced energy cost
- Extended bearing life
- Longer maintenance intervals (slower degradation)

Instead of trimming impeller, a variable frequency drive is used to optimize performance. This is possible whenever actual operating point is on the right side of BEP in pump curve, the normal for most wastewater pump installations.

EC 531 connects to most variable frequency drives with the RS 485 Fieldbus for monitoring and control. With just a level sensor and a supported VFD attached, the pump will always run at the BEP.

By also setting up the pit area, required for pump capacity calculation, comparable data in engineering units opens for benchmarking between pump stations, and easy finDing the worst behaviors and best pay-off of new improvements.

EC 531 is continuously searching for the best efficiency point to get out as many m3 water / kWh as possible.

Calculation is done every time a pump starts alone by calculating a new efficiency index and a new BEP in kWh/m3 from a snapshot of energy consumption and change in pit volume short after the set motor RPM is reached.

Some conditions require full speed of the pumps. Following reasons can be configured in EC 531 for full pump speed.

- Start at full speed every n (adjustable number-) of pump start for a preset time frame to flush pipes.
- At high inflow, if both pumps are running for a preset time.
- High level alarm

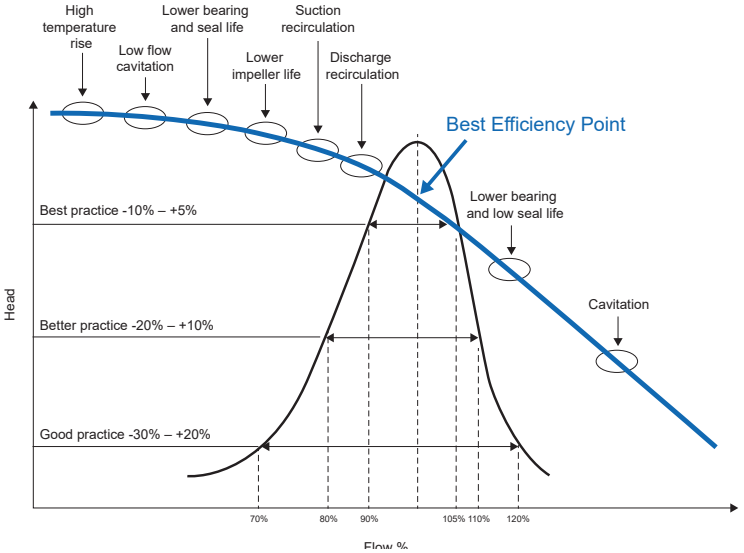


Figure 3-8: BEP (best efficiency point) diagram

3.7 Crash log

In case of any type of a severe equipment or station problem, a crash log can provide useful and detailed information. This can provide us with the data needed to reveal problems not otherwise detectable in a normal 1-minute average log.
Every alarm which can be configured in the controller, can also generate a crash log. The shortest interval for the orDinary logs is 1 min (60 sec.). The crash log has the interval of 1 second (not adjustable).
When crash log initiates, the controller store values 90 minutes before the event and 45 minutes after the event which has triggered the crash log. The controller keeps the past eight crash logs in memory and each crash block contains data for 8192 seconds (131072 data samples). The eight crash blocks are stored with a time stamp, ID no and alarm no for the trigger alarm.

EC 531 is continuously saving raw analog input data every second.

Following signals are saved:

1. DC supply voltage
2. mA input 1 (default as level sensor)
3. mA input 2
4. mA input 3
5. mA input 4
6. AI 5 - pt100 / PTC P1
7. AI 6 - pt100 / PTC P2
8. AI 7 - pt100 / Leak P1
9. AI 8 - pt100 / Leak P2

Fieldbus data if motor drives or power monitors are attached:

10. Motor current P1

11. Motor current P2

12. Frequency P1

13. Frequency P2

14. Power P1

15. Power P2

16. Mains voltage

The last 23 hours of data and up to eight crash blocks are stored and can be retrieved to a PC with the AquaProg tool.

3.8 Communication

There are five ports for communication. One USB and two RS 232, of these two RS 232 there is only one which can be connected to a modem. One Ethernet and one port for RS 485 to surrounDing units like VFD, soft starters and energy meters. The protocols are Modbus RTU or Modbus TCP. If other protocols are needed to an external SCADA system, it could be available if there is an external converter from Modbus to the requested protocol.

Com port (screw terminals 22 – 26)

This port is designed for 3G (CA 523 modem) or 4G modem (CA 524) communication and has protocol Modbus RTU or Modbus TCP. This port also supports CA 521 to send text messages. CA 523 can also send text messages (SMS).

Default this port has Modbus RTU,

Baud rate: 115200	Parity: none
Handshake: off	Protocol ID: 1
Message time out: 2 s	Optional: station name.

On this port it is possible to change the properties; baud rate (300 – 115200), protocol ID (1 – 255) and station ID (1 – 65535), parity (none, odd, even) and handshake (on / off) as well.

Service port (9-pols D-Sub on the front)

This port follows “Com port” in protocol and has always protocol ID:1 there are however possibilities to change the properties of baud rate separate from Com port. This port can be used to download configuration and updating the firmware by using AquaProg.

RS 485 port (terminal 49-51)

All the units in the RS 485 network must be using the same communication parameters; baud rate, parity and stop bits. Compare the setting in the menu of EC 531 and consult the manuals for surrounDing units.

RS 485 network is multi-drop which means that all units are connected in parallel on the same cable. In a RS 485 network every unit must connected in a line and have a unique address or Modbus ID-number. The RS 485 bus shall be terminated with 120 ohms resistor at both cable ends. EC 531 has a built-in jumper for end termination in terminal position 52. The cable must be a shielded twisted pair cable.

The RS 485 bus on EC 531 is galvanic isolated from the power supply. If the surrounDing units also have isolated communication ports, the common should be connected to ground potential in one point.

EC 531 set as Master

If the EC 531 is set to be the master in the RS 485 network, all the surrounDing units have to be set as slaves. When EC 531 act as a Master, the surrounDing units can only be supported VFD’s, Energy meters and Soft starters.

EC 531 set as Slave

When EC 531 is set as a “Slave” on the RS485 port, another master in the system request values from EC 531. The RS485 port act as communication port to a SCADA-system or similar.

NOTE: EC 531 can act as Master or Slave, not both at the same time.

USB port (USB type B in the front)

This port is following the protocol from “Com port” and is only for updating firmware and upload / download configuration by using AquaProg.

RJ45 Ethernet port

EC 531 has support for direct Ethernet communication through the RJ45 TCP / IP-port

In Settings – Communication – Ethernet port

Hardware [ON / OFF] Protocol [Modbus RTU or TCP]

Protocol ID, [1-255] Message timeout (1 sec, default)

Cross reference [ON / OFF] Port number (502 – default AquaProg)

Static / Dynamic IP (Dynamic DHCP – default)

When using only the TCP / IP port for communication, the modem port shall be set to OFF:

Communication – Modem – Modem connected [OFF]

EC 531 has support for senDing SMS simultaneously as Ethernet communications.

Modem port

Only the port connected via the screw terminals (Com port) supports the modem. There are a number of different modems which can be used on EC 531. Standard is a CA 523 (or if using 4G: CA 524) connected to the EC 531 which connects via 3G to AquaWeb or a SCADA system. The communications can be triggered by an event or set to log data values. EC 531 has support for CA 521 modem only for AquaWeb and senDing text messages (SMS). Hayes settings normally works with default.

NOTE! The PIN code on the SIM card can be deleted with a cell phone.

GPRS modem

CA 521 is based on internal TCP / IP stack in Cinterion (former Siemens) GSM / GPRS modules. All data access is via the Hayes commands are defined by Cinterion. Default is that the pump controller connects to the TCP server in Sulzer ABS AquaWeb system. Set PIN code if SIM card is equipped with one (deleted on AquaWeb SIM cards).

The heartbeat interval is set at 10 mins (default), but can be adjusted (lower interval may lead to extra costs). Server TCP port; must be the same as in GPRS server (default 2000 for AquaWeb). Servers IP address; the public / global IP (normally in fire wall / router) address to the GPRS / 3G server must be a static IP address. APN is provided by SIM card supplier. GPRS APN part 1 and GPRS part 2. If APN string is long it can be divided between the two parts. (Default is AquaWeb APN). SMS fallback: 0046708728550 for AquaWeb only.

Settings under Communication – Modem port– Modem type in the EC 531 shall be set to [CA 523 or CA 524 or CA 521].

Set GPRS user name and password if demanded from subscription provider. GPRS event log and heart beat operator scan for error search only. Default 10 minute.

TCP-Server

If you have a SIM card subscription with a fixed IP address, then you can connect the station by GPRS on a local network by using any of the CA-modems. Set the function in GPRS settings to TCP type server (fixed IP) which demands a SIM with fixed IP address from the provider on the station so that an external SCADA can contact remotely.

Settings under Communication – Modem – Modem type and Settings GPRS in EC 531 shall be set to [TCP type: TCP server (fixed IP)] or [TCP type: TCP server + heart beat].

Other types of modem

Profibus gateway and radio modems etc.

Connect CA-modem according to figure 3-8 to the com port on EC 531.

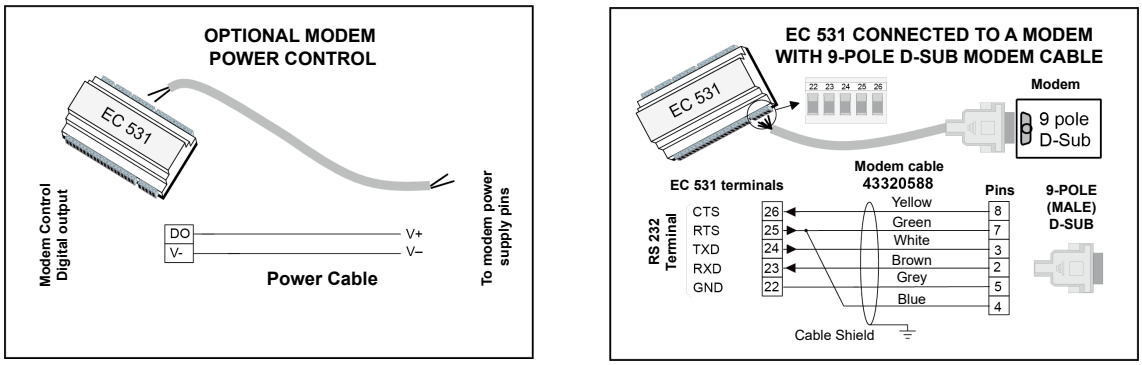


Figure 3-9: Connect EC 531 to 9-pole D-Sub. Cable can be ordered, item no 43320588.

3.9 Cross reference table

Cross reference table can be set-up in AquaProg to optimize the data flow in Modbus to the supervision system. Register 0-254 can be defined to hold preferred data by a cross reference table and can be set for data for any register. See further information in Modbus register manual.

Together with the cross reference table, it is possible to set an individual scale factor for each position in the cross-reference list, e.g running time in seconds can be rescaled to minutes with the factor 60. The scale factor can be between 0-32767, with the factor 0 no rescaling is done.

When reaDing data, the value is divided with corresponDing scale factor. When writing data, the value will be multiplied with corresponDing scale factor. Scale factor is ignored when set to 0. For data in double registers (32 bits), the highest register number should be used together with scale factors. Writing to the highest double register number will also set data in the lower register number if scale factor is set. If scale factor is set to zero, each register is handled individually. Many registers allow negative values (signed 2's complement data). This can cause some systems to treat negative data as large positive numbers (ex. –1 is read as 65535 by the system). To avoid this causing problems there is the possibility to individually set cross reference registers to only positive data. Negative values will give zero readout.

NOTE! Cross reference tables are only available to configure in AquaProg. In the menus of EC 531 you have the possibility to activate or deactivate the table on each port separately.

IO-bits 0-255 can be redirected to any IO number when cross reference table is enabled. IO-bit 0-255 is also available in register 312-327. With cross reference enabled this is convenient in systems that optimize data screens into single messages.

To activate the cross reference table in menu:

Settings – Communication – [any port] – Cross ref; Set to ON [or OFF]

By using AquaProg you can also save and download your cross reference table to any other EC 531 units.

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4. FURTHER EXPLANATIONS OF SOME FUNCTIONS OF ANALOG- AND DIGITAL IN- AND OUTPUT SIGNALS

In this chapter we shall explain some digital in- and outputs.

4.1 Digital in: personnel alarm and local mode

This alarm is for the safety of service personnel. When digital input Local mode is set, a timer starts to elapse (Max time to reset). When timer has reached zero, a digital output can activate a connected buzzer or warning light to remind the service personnel to acknowledge their presence in the station by pressing any key on the controller. If the service personnel doesn't acknowledge the alarm within a certain time (Alarm delay), a callout will be done.

The Local mode input can for example be connected so that service personnel entering a station and turn on an indoor light (or similar) start the function

Required settings:

Setting – System – System alarms – Personnel alarm:

Type of alarm (A- or B-alarm)
Max time to reset: cyclic interval for personnel to acknowledge presence, typically 15-20 minutes
Alarm delay: time between missed acknowledge and alarm call out, typically 120 seconds

Settings – Digital input:

A digital input allocated as Local mode which is trigged by ta signal in the station (e.g. light switch) that indicates the service personnel is in the station.
An active local mode signal will inhibit remote writing to most Modbus registers and IO-bits (USB and DSUB ports excluded). (Toggling of input signal Local mode or pressing key on display will reset alert timer Max time to reset.)

Settings – Digital output:

Output signal Personnel alarm connected to a flashing light or buzzer can be used to get attention from the service personnel, to acknowledge the alert before an alarm goes active. (Toggling of input signal Local mode or pressing key on display will reset alert timer)

4.2 Digital in: block operation

This function enables a digital input to block the pump, mixer or drain pump. When the signal is active the pump / mixer / drain pump stops and blocks. The blocking will be released when the state of the input returns to a normal state.

4.3 Digital out: data register set point

A digital output can be configured with a Data register set point which can be associated with an internal or external analogue signal. By using the registers defined in the Modbus manual and entering them in the function as in the example below, you can achieve this function.

Example We have a sulfuric gas monitoring device connected to an analog input signal. We use Ain:4 for the sulfuric meter. In this case we want a switch on digital output 1 when the concentration of gas is equal to or above 10.0 ppm. We also want the output signal to switch off at 1.0 ppm (a hysteresis of 9 ppm). This digital output 1 controls a fan which evacuates the gas from the station.

3 CA 531 Modbus Register

3.1 Remote/Local status

Register no	Description	Sale factor / unit / note
0	Local Mode	1 = Local

3.2 Analogue inputs/Outputs in engineering units

Register no	Description	Sale factor / unit / note
1	AIN 1. Function/User defined	Function/User defined
2	AIN 2. Function/User defined	Function/User defined
3	AIN 3. Function/User defined	Function/User defined
4	AIN 4. Function/User defined	Function/User defined
5	AIN 5. Function/User defined	Function/User defined
6	AIN 6. Function/User defined	Function/User defined
7	AIN 7. Function/User defined	Function/User defined
8	AIN 8. Function/User defined	Function/User defined

NOTE! ***Only Ain1 to Ain4 are 4-20mA inputs and according to Modbus reference manual (p/n 81307134) it can be seen that AIN4 is register number 4; see figure 4-1 below. We configure the scale factor to 0.1 (i.e. the value in reg.4 is multiplied by 0.1 to get accurate value in engineering units).***

Figure 4-1: Above chart is an extract from the Modbus register manual for EC 531 –Analog inputs / output in engineering units.

The function is configured in the menu of EC 531 by the following:

Under Settings – Digital outputs – Digital output 1 to [Data register setpoint]

In Settings for digital out 1 (DO1), enter 100 for setpoint on and 10 for setpoint off, see image below.

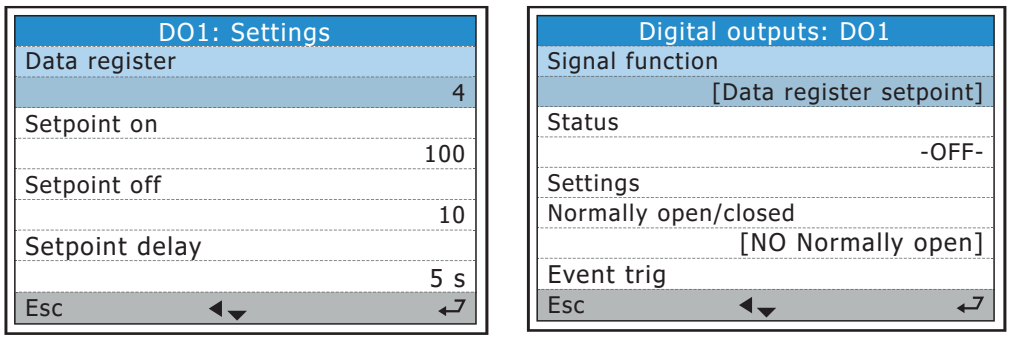

Figure 4-2: In the menus of EC 531

The setpoint ON=100 corresponds to a value of 10 engineering units and setpoint OFF=10 corresponds to 1.

4.4 Digital out: logic IO

One of the options in the functions of Digital out is **Logic IO**. This function is especially useful if you want to trigger an output signal when more than one criteria or events must occur to enable an output signal. There are up to four different criteria that can be used to trigger the output signal.

Those IO bits can be **Logical OR, NOR, And** or **NAND** functions or as a combination of these. The output signal can be set to Normally closed or Normally open (NC / NO).

This IO can be used to get a specific output signal from one or several indicators (up to 4 IO-bits). See table 4-1 below as a example of a output been driven by the state of 3 inputs.

IO-Bit 1 “OR“	IO-Bit 2 “OR“	IO-Bit 3 “AND“	Output
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	1

In this example there are only three IO-bits involved. But there is an option to use up to four IO-bits.

Table 4-1: Logic IO

See the Modbus register manual regarDing the IO-list

4.5 Digital out: auto reset alert

Auto reset alert is active when a digital input is defined as Alarm reset. In the settings for Alarm reset input, there is a time delay value which can be set. This delay is the time the digital output Auto reset alert is active before the actual reset is performed.

Example: The pumps are blocked because one or several alarms.

When pushing Alarm reset button, locally or remotely, which can imply that the pump are about to start and there is a possibility of personnel being exposed to danger. The intention of this output is to give personnel a warning, if connected to buzzer or flashing light, that a reset of all alarms is about to happen and the pumps might start.

4.6 Analog in: outlet pressure

If there is an outlet pressure sensor in the system, it will replace the system curve. Taking into account the backpressure, the level in the pit and the actual head. The signal from this sensor is recalculated into Actual head and used in the equation for the pump capacity calculation. This is a more accurate value for total head. When an outlet sensor is used, the total head parameter can be set to zero.

4.7 Analog out: data register and data register 2’s complement

Data register

16-bit register from 0 to 65535. Only positive values. This type of register doesn’t handle negative values. If there is a risk that the value could become negative, the register contain a very large value.

Data register 2’s complement

16-bit register from -32767 to +32767. This type of register handles negative values.

With the analog output type data register, any analog signal, actual or calculated can be used as a 4-20 mA output signal. By using the registers defined in the Modbus manual and entering them in the function, you can achieve this function.

Example ***We want to have a 4-20mA analog output signal tied to stator temperature L1 on pump 1. We also want the output signal to be 4mA at 0°C and 20mA at 150°C. We assume this temperature value never to be negative or goes below zero.***

According to Modbus reference manual (p/n 81307134) the temperature stator pump 1 is in register 70; see figure 4-3 below. We note as well that the scale factor is 0.1 (i.e. the value in reg.70 is multiplied by 0.1 to get accurate value in engineering units).

70	P1 Temperature Stator L1	0.1°C	(0.1°F) Pt100 Sensor
71	P1 Temperature Stator L2	0.1°C	
72	P1 Temperature Stator L3	0.1°C	
73	P1 Temperature upper bearing	0.1°C	
74	P1 Temperature lower bearing	0.1°C	
75	P1 Motor Temperature 0.1°C		
78+79	P1 Runtime last pump cycle	Seconds	

Figure 4-3: Above chart is an extract from the Modbus manual for EC 531 – Analog inputs / outputs in engineering units

The function is setup in the menu of EC 531 under;

Settings – Analog outputs – AO1: – to [Data register] according to figure 4-4 below.

And also in Settings

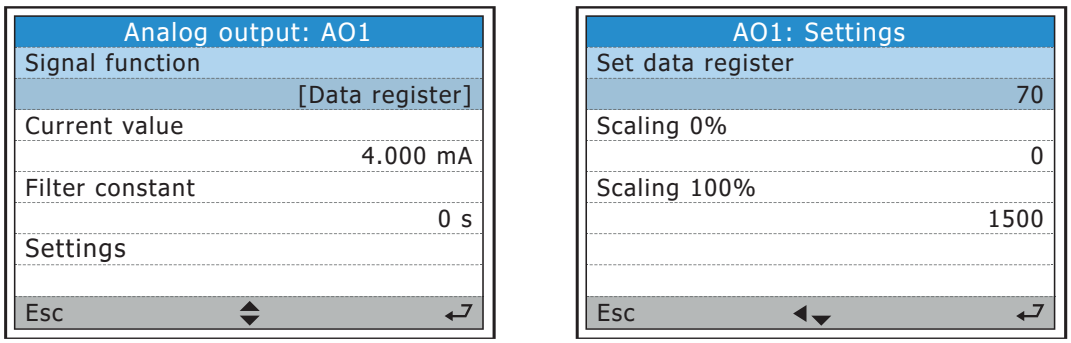

Figure 4-4: In the menu of EC 531

We choose [Data register] because we are sure that the value ais always a positive value. Scaling 100% should correspond to the data value at 20mA, in this case 1500 for 150°C.

Above is an example of how get a Pt 100 Stator temperature, in the range 0°C to 150°C, transmitted as a 4-20 mA signal via Analog output.

5. APPENDIX: TABLES OF GUIDE LINE TO THE MENUS IN EC 531

5.1 Quick status: system menu

Table 5-1 shows the complete view for quick status under the submenu **System**

Table 5-1: Quick status System

Submenu	Setting	Value	Comment
EC 531 version	EC 531 version	0.01 [Unitless]	Status value
	Option	1 [Unitless]	Status value
Supply voltage		0.1 V DC	Status value
PCB temperature		1 °C, 1 °F	Status value
System time		[Text String]	Status value
Power monitor	Current	0.1 A	Status value
	Line current L1	0.1 A	Status value
	Line current L2	0.1 A	Status value
	Line current L3	0.1 A	Status value
	Average LN voltage	0.1 V	Status value
	Line voltage L1	0.1 V	Status value
	Line voltage L2	0.1 V	Status value
	Line voltage L3	0.1 V	Status value
	Average LL voltage	0.1 V	Status value
	L1-L2 voltage	0.1 V	Status value
	L2-L3 voltage	0.1 V	Status value
	L3-L1 voltage	0.1 V	Status value
	Power	0.1 kW	Status value
	Current frequency	0.01 Hz	Status value
	Power factor	0.01 [Unitless]	Status value
Power on time	Total	h.m.s	Setting, System Password
	Today	h.m.s	Setting, System Password
	Repeats for 1-7 days ago	h.m.s	Setting, System Password
Number of power on (boot)	Total	1 [Unitless]	Setting, System Password
	Today	1 [Unitless]	Setting, System Password
	Repeats for 1-7 days ago	1 [Unitless]	Setting, System Password

5.2 Quick status: pump pit

Table 5-2 shows the complete view for quick status under the submenu **Pump pit**

Table 5-2: Quick status Pump pit

Submenu	Submenu	Value	Comment
Pit level		0.01 m, 0.01 ft	Status value
Inflow		0.1 l/s, 1 GPM	Status value
Outflow		0.1 l/s, 1 GPM	Status value
Outlet pressure		0.1 bar, 0.1 PSI	Status value
Overflow level		1 mm, 0.01 in	Status value
Overflow flow		0.1 m^3/h, 1 GPM	Status value
High tariff active		NO, YES	Status value
High level		NO, YES	Status value
Low level		NO, YES	Status value
High-level float		NO, YES	Status value
Low-level float		NO, YES	Status value
High inflow		NO, YES	Status value
Low inflow		NO, YES	Status value
Backup start		NO, YES	Status value
High pressure		NO, YES	Status value

Submenu	Submenu	Value	Comment
Low pressure		NO, YES	Status value
Overflow		NO, YES	Status value
Sensor error	Sensor error	NO, YES	Status value
	Incor. lvl. low float	NO, YES	Status value
	Incor. lvl. high float	NO, YES	Status value
	Level is not changing	NO, YES	Status value
	Pit level	0.01 m, 0.01 ft	Status value
Detailed status	Link to Detailed status see that chapter		

5.3 Quick status: pump 1 and pump 2

Table 5-3 shows the complete view for quick status under the submenu Pump 1 respectively Pump 2

Table 5-3: Quick status Pump 1 respectively Pump 2

Submenu	Submenu	Submenu	Submenu	Setting	Value	Comment
Running time	Total				h.m.s	Setting, System Password
	Today				h.m.s	Setting, System Password
	Repeats for 1-7 days ago				h.m.s	Setting, System Password
Number of starts	Total				1 [Unitless]	Setting, System Password
	Today				1 [Unitless]	Setting, System Password
	Repeats for 1-7 days ago				1 [Unitless]	Setting, System Password
Start level					0.01 m, 0.01 ft	Status value
Stop level					0.01 m, 0.01 ft	Status value
Pump capacity					0.1 l/s, 1 GPM	Status value
Motor current					0.1 A	Status value
Motor power					0.1 kW	Status value
Last pump capacity					0.1 l/s, 1 GPM	Status value
Starts since pump rev.					1 [Unitless]	Status value
Blocked	Blocked				NO, YES	Status value
	Externally blocked	Externally blocked			NO, YES	Status value
		Pump not in auto			NO, YES	Status value
		Remote blocking			NO, YES	Status value
		Outlet pressure			NO, YES	Status value
		Mixer control			NO, YES	Status value
		Phase missing			NO, YES	Status value
		Over voltage			NO, YES	Status value
		Under voltage			NO, YES	Status value

Submenu	Submenu	Submenu	Submenu	Setting	Value	Comment
Blocked	Externally blocked	Unbalance voltage			NO, YES	Status value
	Error blocked	Error blocked			NO, YES	Status value
		Fallen temp. prot.			NO, YES	Status value
		Pump blocking	Pump blocking		NO, YES	Status value
			No run indication		NO, YES	Status value
			Fallen motor protect		NO, YES	Status value
			High motor current		NO, YES	Status value
			Pump fail		NO, YES	Status value
			Vibration		NO, YES	Status value
			Leakage	Generic	NO, YES	Status value
				Oil chamber	NO, YES	Status value
				Motor housing	NO, YES	Status value
				Electr. con. box	NO, YES	Status value
			Temperature	Generic	NO, YES	Status value
				Stator L1	NO, YES	Status value
				Stator L2	NO, YES	Status value
				Stator L3	NO, YES	Status value
				Upper bearing	NO, YES	Status value
				Lower bearing	NO, YES	Status value
		Pump holding	Pump holDing		NO, YES	Status value
			Fallen motor protect		NO, YES	Status value
			Pump fail		NO, YES	Status value
			VFD Com. error		NO, YES	Status value
			VFD Drive error		NO, YES	Status value
			Vibration		NO, YES	Status value
			Over voltage		NO, YES	Status value
			Under voltage		NO, YES	Status value
			Leakage	Generic	NO, YES	Status value
				Oil chamber	NO, YES	Status value
				Motor housing	NO, YES	Status value
				Electr. con. box	NO, YES	Status value
			Temperature	Generic	NO, YES	Status value
				Stator L1	NO, YES	Status value
				Stator L2	NO, YES	Status value
				Stator L3	NO, YES	Status value
				Upper bearing	NO, YES	Status value
				Lower bearing	NO, YES	Status value
Detailed status	Link to detailed status see that chapter					

5.4 Quick status: digital in and digital out

Table 5-4 shows the complete view for quick status under the submenu Digital in and Digital out

Table 5-4: Quick status Digital in and Digital out

Submenu	Setting	Comment
Special Menu	[Graphical representation]	Status value
Special Menu	[Graphical representation]	Status value
Special Menu	[Graphical representation]	Status value
Special Menu	[Graphical representation]	Status value
Special Menu	[Graphical representation]	Status value
Settings	Logical I/O status, Terminal I/O status	Direct Setting

5.5 Quick status: analog in and analog out

Table 5-5 shows the complete view for quick status under the submenu Analog in and Analog out

Table 5-5: Quick status Analog in and Analog out

Submenu	Setting	Value	Comment
AI1		0.001 mA	Status value
AI2		0.001 mA	Status value
AI3		0.001 mA	Status value
AI4		0.001 mA	Status value
AO1		0.001 mA	Status value
AO2		0.001 mA	Status value
AI5 - AI6	Sensor type	Pt100 (temp. sensor), PTC/Bimetal switch	Status value
	One or none of rows below, depending on Port function		
	Current value	0.1 °C, 0.1 °F	Status value
	Current value	-OK-, -Tripped-	Status value
	Current value	[User defined Unit]	Status value
AI7 - AI8	Sensor type	Pt100 (temp. sensor), Leakage	Status value
	One or none of rows below, depending on Port function		
	Current value	0.1 °C, 0.1 °F	Status value
	Current value	[User defined Unit]	Status value
	Current value	-OK-, -Tripped-	Status value

5.6 Detailed status: system

Table 5-6 shows the complete view for detailed status under the submenus System

Table 5-6: Detailed status System

Submenu	Setting	Value	Comment
EC 531 version	EC 531 version	0.01 [Unitless]	Status value
	Option	1 [Unitless]	Status value
Supply voltage		0.1 V DC	Status value
PCB temperature		1 ºC, 1 ºF	Status value
System time		[Text String]	Status value
Power monitor	Current	0.1 A	Status value
	Line current L1	0.1 A	Status value
	Line current L2	0.1 A	Status value
	Line current L3	0.1 A	Status value
	Average LN voltage	0.1 V	Status value
	Line voltage L1	0.1 V	Status value
	Line voltage L2	0.1 V	Status value
	Line voltage L3	0.1 V	Status value
	Average LL voltage	0.1 V	Status value
	L1-L2 voltage	0.1 V	Status value
	L2-L3 voltage	0.1 V	Status value
	L3-L1 voltage	0.1 V	Status value
	Power	0.1 kW	Status value
	Current frequency	0.01 Hz	Status value
	Power factor	0.01 [Unitless]	Status value
Power on time	Total	h.m.s	Setting, System Password
	Today	h.m.s	Setting, System Password
	Repeats for 1-7 days ago	h.m.s	Setting, System Password
Number of power on (boot)	Total	1 [Unitless]	Setting, System Password
	Today	1 [Unitless]	Setting, System Password
	Repeats for 1-7 days ago	1 [Unitless]	Setting, System Password

5.7 Detailed status: pump pit

Table 5-7 shows the complete view for detailed status under the submenus Pump pit

Table 5-7: Detailed status Pump pit

Submenu	Submenu	Setting	Value	Comment
Pit level			0.01 m, 0.01 ft	Status value
Pit volume			1 l, 1 gal	Status value
Pumped volume	Total		0.1 m^3, 1 gal	Setting, System Password
	Today		0.1 m^3, 1 gal	Setting, System Password
	Repeats for 1-7 days ago		0.1 m^3, 1 gal	Setting, System Password
Energy consumption	Total		0.1 kWh	Setting, System Password
	Today		0.1 kWh	Setting, System Password
	Repeats for 1-7 days ago		0.1 kWh	Setting, System Password
Pit efficiency	Average		0.001 kWh/m^3, 1 kWh/Mgal	Setting, System Password
	Today		0.001 kWh/m^3, 1 kWh/Mgal	Setting, System Password
	Repeats for 1-7 days ago		0.001 kWh/m^3, 1 kWh/Mgal	Setting, System Password
Both pumps run #	Total		1 [Unitless]	Setting, System Password
	Today		1 [Unitless]	Setting, System Password
	Repeats for 1-7 days ago		1 [Unitless]	Setting, System Password
Both pumps run time	Total		h.m.s	Setting, System Password
	Today		h.m.s	Setting, System Password
	Repeats for 1-7 days ago		h.m.s	Setting, System Password
Pit overflow	Overflow		NO, YES	Status value
	Overflow level		1 mm, 0.01 in	Status value
	Overflow flow		0.1 l/s, 1 GPM	Status value
	Overflow time	Total	h.m.s	Setting, System Password
		Today	h.m.s	Setting, System Password
		Repeats for 1-7 days ago	h.m.s	Setting, System Password
	Overflow volume	Total	0.1 m^3, 1 gal	Setting, System Password
		Today	0.1 m^3, 1 gal	Setting, System Password
		Repeats for 1-7 days ago	0.1 m^3, 1 gal	Setting, System Password
	No. of overflows	Total	1 [Unitless]	Setting, System Password
		Today	1 [Unitless]	Setting, System Password
		Repeats for 1-7 days ago	1 [Unitless]	Setting, System Password
Drain pump	Drain pump float		OFF, ON	Status value
	Terminal I/O status		OFF, ON	Status value
	Run indication		NO, YES	Status value
	Fallen motor protect		NO, YES	Status value
	High temperature		NO, YES	Status value
	Leakage		NO, YES	Status value
	Externally blocked		NO, YES	Status value
	Running time	Total	h.m.s	Setting, System Password
		Today	h.m.s	Setting, System Password
		Repeats for 1-7 days ago	h.m.s	Setting, System Password
Drain pump	Number of starts	Total	1 [Unitless]	Setting, System Password
		Today	1 [Unitless]	Setting, System Password
		Repeats for 1-7 days ago	1 [Unitless]	Setting, System Password

Submenu	Submenu	Setting	Value	Comment
Mixer	Terminal I/O status		OFF, ON	Status value
	Run indication		NO, YES	Status value
	Fallen motor protect		NO, YES	Status value
	High temperature		NO, YES	Status value
	Leakage		NO, YES	Status value
	Externally blocked		NO, YES	Status value
	Running time	Total	h.m.s	Setting, System Password
		Today	h.m.s	Setting, System Password
		Repeats for 1-7 days ago	h.m.s	Setting, System Password
	Number of starts	Total	1 [Unitless]	Setting, System Password
		Today	1 [Unitless]	Setting, System Password
		Repeats for 1-7 days ago	1 [Unitless]	Setting, System Password
Cleaner	Terminal I/O status		OFF, ON	Status value

5.8 Detailed status: pump 1 and pump 2

Table 5-8 shows the complete view for detailed status under the submenus Pump 1 and Pump 2

Table 5-8: Detailed status Pump 1 and Pump 2

Submenu	Submenu	Setting	Value	Comment
Tag name			[Text String]	Status value
Pump control			OFF, ON	Status value
Run indication			OFF, Ready to run, Running, Error run, Blocked, Error blocked	Status value
State of M-0-A switch			MANUAL, Pump not in auto, AUTO	Status value
Pump fail			NO, YES	Status value
Pump exercising			NO, YES	Status value
Reverse			NO, YES	Status value
Reverse attempt cnt			1 [Unitless]	Status value
Reverse status			-OK-, Timer blocked, Alarm blocked	Status value
Leakage	Leakage		NO, YES	Status value
	Generic		NO, YES	Status value
	Oil chamber		NO, YES	Status value
	Motor housing		NO, YES	Status value
	Electr. con. box		NO, YES	Status value
Temperature	Temperature		NO, YES	Status value
	Generic		0.1 ºC, 0.1 ºF	Status value
	Stator L1		0.1 ºC, 0.1 ºF	Status value
	Stator L2		0.1 ºC, 0.1 ºF	Status value
	Stator L3		0.1 ºC, 0.1 ºF	Status value
	Upper bearing		0.1 ºC, 0.1 ºF	Status value
	Lower bearing		0.1 ºC, 0.1 ºF	Status value
Vibration			0.1 mm/s2, 0.01 in/h	Status value

Submenu	Submenu	Setting	Value	Comment
Best efficiency point	Filtered effic. index		1 [Unitless]	Status value
	Last raw effic. index		1 [Unitless]	Status value
	Drive start ramp		1 s	Status value
	Energy efficiency		0.0001 kWh/m³, 0.0001 kWh/Mgal	Status value
	BEP frequency		0.01 Hz	Setting, System Password
	BEP last step direction		-Decrease-, -Increase-, Retune	Setting, System Password
	BEP step		0.01 Hz	Setting, System Password
	BEP override	Pump at max freq.	NO, YES	Status value
		Pump start counter	NO, YES	Status value
		All pumps running	NO, YES	Status value
		High level alarm	NO, YES	Status value
Logs	Running time	Total	h.m.s	Setting, System Password
		Today	h.m.s	Setting, System Password
		Repeats for 1-7 days ago	h.m.s	Setting, System Password
	Number of starts	Total	1 [Unitless]	Setting, System Password
		Today	1 [Unitless]	Setting, System Password
		Repeats for 1-7 days ago	1 [Unitless]	Setting, System Password
	Energy consumption	Total	0.1 kWh	Setting, System Password
Logs	Energy consumption	Today	0.1 kWh	Setting, System Password
		Repeats for 1-7 days ago	0.1 kWh	Setting, System Password
	Pump efficiency	Average	0.001 kWh/m3, 1 kWh/ Mgal	Setting, System Password
		Today	0.001 kWh/m3, 1 kWh/ Mgal	Setting, System Password
		Repeats for 1-7 days ago	0.001 kWh/m3, 1 kWh/ Mgal	Setting, System Password
	Pumped volume	Total	1 l, 0.1 gal	Setting, System Password
		Today	1 l, 0.1 gal	Setting, System Password
		Repeats for 1-7 days ago	1 l, 0.1 gal	Setting, System Password
	Pump capacity	Reference head	0.01 m, 0.01 ft	Status value
		Today	0.1 l/s, 1 GPM	Setting, System Password
		Repeats for 1-7 days ago	0.1 l/s, 1 GPM	Setting, System Password
Pwr.mon.	Link to associated Field bus Modules Status, see that chapter			
VFDrive	Link to associated Field bus Modules Status, see that chapter			

5.9 Detailed status: PID regulator

Table 5-9 shows the complete view for detailed status under the submenus PID regulator

Table 5-9: Detailed status PID regulator

Submenu	Submenu	Setting	Value	Comment
Current setpoint			0.01 m, 0.01 ft	Status value
Process value			0.01 m, 0.01 ft	Status value
Output signal			0.1%	Status value
Setpoint flags			Intern, Extern	Status value
Output flags			AUTO, MANUAL, Blocked	Status value
Pulse channels				

Submenu	Submenu	Setting	Value	Comment
Pulse ch. 1-4	Function		Precipitation, Energy, Flow	Status value
	One or none of lines below, depending on other settings			
	Current value		0.1 l/s/ha, 0.01 in/h	Status value
	Current value		0.1 kW	Status value
	Current value		0.1 m^3/h, 1 GPM	Status value
	One or none of lines below, depending on other settings			
	Accumulated values	Total	0.1 mm, 0.01 in	Setting, System Password
		Today	0.1 mm, 0.01 in	Setting, System Password
		Repeats for 1-7 days ago	0.1 mm, 0.01 in	Setting, System Password
	Accumulated values	Total	0.1 kWh	Setting, System Password
		Today	0.1 kWh	Setting, System Password
		Repeats for 1-7 days ago	0.1 kWh	Setting, System Password
	Accumulated values	Total	0.1 m^3, 0.1 gal	Setting, System Password
		Today	0.1 m^3, 0.1 gal	Setting, System Password
		Repeats for 1-7 days ago	0.1 m^3, 0.1 gal	Setting, System Password

5.10 Detailed status: analog inputs

Table 5-10 shows the complete view for detailed status under the submenus Analog inputs

Table 5-10: Detailed status Analog inputs

Submenu	Setting	Value	Comment
AI1 - AI4	Signal function	OFF, Pit level, Motor current, Outlet pressure, Vibrations, Xylem MiniCas Sim, Outflow meter, Motor temperature, Free choice	Status value
	One or none of lines below, depending on Port function		
	AD raw value	1 [Unitless]	Status value
	Current value	0.01 m, 0.01 ft	Status value
	Current value	0.1 A	Status value
	Current value	0.1 bar, 0.1 PSI	Status value
	Current value	0.1 mm/s2, 0.01 in/h	Status value
	Current value	-Overheated-, -OFF-, -Leakage-	Status value
	Current value	0.1 m^3/h, 1 GPM	Status value
	Current value	0.1 ºC, 0.1 ºF	Status value
	Current value	[User defined Unit]	Status value
	One or none of lines below, depending on Port function		
	Object	Pump 1, Pump 2	Status value
	One or none of lines below, depending on Port function		
	Measure point	OFF, Generic, Stator L1, Stator L2, Stator L3, Upper bearing, Lower bearing	Status value
	Measure point	Generic, Stator L1, Stator L2, Stator L3, Upper bearing, Lower bearing	Status value
	One or none of lines below, depending on Port function		
	Measure point	OFF, Generic, Oil chamber, Motor housing, Electr. con. box	Status value

Submenu	Setting	Value	Comment
AI5 - AI6	Signal function	OFF, Motor temperature, Free choice	Status value
	One or none of lines below, depending on Port function		
	Measure point	Generic, Stator L1, Stator L2, Stator L3, Upper bearing, Lower bearing	Status value
	One or none of lines below, depending on Port function		
	Object	Pump 1, Pump 2	Status value
	Sensor type	Pt100 (temp. sensor), PTC/Bimetal switch	Status value
	One or none of lines below, depending on Port function		
	Current value	0.1 ºC, 0.1 ºF	Status value
	Current value	-OK-, -Tripped-	Status value
	Current value	[User defined Unit]	Status value
AI7 - AI8	Signal function	OFF, Motor temperature, Free choice, Leakage	Status value
	One or none of lines below, depending on Port function		
	Measure point	Generic, Stator L1, Stator L2, Stator L3, Upper bearing, Lower bearing	Status value
	Measure point	Generic, Oil chamber, Motor housing, Electr. con. box	Status value
	One or none of lines below, depending on Port function		
	Object	Pump 1, Pump 2	Status value
	Sensor type	Pt100 (temp. sensor), Leakage	Status value
	One or none of lines below, depending on Port function		
	Current value	0.1 ºC, 0.1 ºF	Status value
	Current value	-OK-, -Tripped-	Status value
	Current value	[User defined Unit]	Status value

5.11 Detailed status: analog outputs

Table 5-11 shows the complete view for detailed status under the submenus Analog outputs

Table 5-10: Detailed status Analog outputs

Submenu	Setting	Value	Comment
AO1 - AO2	Signal function	OFF, Pit level, Pit inflow, Pit outflow, Pit overflow, Pulse channel 1, Pulse channel 2, Pulse channel 3, Pulse channel 4, PID Ctrl output, Data register, Data register 2 compl., Set freq. P1, Set freq. P2	Status value
	Current value	0.001 mA	Status value

5.12 Detailed status: digital inputs

Table 5-12 shows the complete view for detailed status under the submenus Digital inputs

Table 5-12: Detailed status Digital inputs

Submenu	Setting	Value	Comment
DI1 - DI14	Signal function	OFF, Run indication, Manual start, Set manual, Set auto, Start float, Pump failure, Motor protector, High motor temp. pump, Leakage pump, Stop float, Low level float, Overflow sensor, High level float, Start float drain pump, Local mode, Alarm reset, Power fail, DI pulse channel 1-4, Block PID controller, Alarm input, Block operation, Leakage mixer-drain pump, High temp. mixer-drain p.	Status value
	Status	-OFF-, -ON-	Status value
	One or none of lines below, depending on Port function		
	Object	Pump 1, Pump 2	Status value
	Object	Pump pit, Pump 1, Pump 2	Status value
DI1 - DI14	Object	Pulse channel 1, Pulse channel 2, Pulse channel 3, Pulse channel 4	Status value
	Object	Pump 1, Pump 2, Mixer, Drain pump	Status value
	Object	Mixer, Drain pump	Status value
	One or none of lines below, depending on Port function		
	Measure point	Generic, Stator L1, Stator L2, Stator L3, Upper bearing, Lower bearing	Status value
	Measure point	Generic, Oil chamber, Motor housing, Electr. con. box	Status value
	Normally open/closed	NO Normally open, NC Normally closed	Status value

5.13 Detailed status: digital outputs

Table 5-13 shows the complete view for detailed status under the submenus Digital outputs

Table 5-13: Detailed status Digital outputs

Submenu	Setting	Value	Comment
DO1 - DO8	Signal function	OFF, Pump control, Reset motor protector, Pump fail, Not enough pumps avail., One pump fail, Mixer control, Drain pump control, Cleaner control, Modem control, Remote control, Personnel alarm, High level, Alarm alert, Not ackn. alarm, Active alarm, Pump reversing, Logic IO, Data register setpoint	Status value
	Status	-OFF-, -ON-	Status value
	One or none of lines below, depending on Port function		
	Object	Pump 1, Pump 2, Mixer, Drain pump, All	Status value
	Object	B-Alarm, A-Alarm, All alarms	Status value
	Object	Pump 1, Pump 2	Status value

5.14: Detailed status: communication

Table 5-14 shows the complete view for detailed status under the submenus Communication

Table 5-14: Detailed status Communication

Submenu	Submenu	Setting	Value	Comment
USB port	Port status		[Graphical representation]	Status value
	Protocol ID		1 [Unitless]	Status value
	Application protocol		Dummy string, Modbus slave, Modbus master	Status value
	Protocol type		Modbus RTU, Modbus TCP	Status value
	No. OK messages		1 [Unitless]	Status value
	No. Error messages		1 [Unitless]	Status value
	No. Checksum errors		1 [Unitless]	Status value
Service port (D-Sub)	Port status		[Graphical representation]	Status value
	Baud rate		None, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200	Status value
	Parity		None, Odd, Even, Mark	Status value
	Protocol ID		1 [Unitless]	Status value
	Application protocol		Dummy string, Modbus slave, Modbus master	Status value
	Protocol type		Modbus RTU, Modbus TCP	Status value
	No. OK messages		1 [Unitless]	Status value
Service port (D-Sub)	No. Error messages		1 [Unitless]	Status value
	No. Checksum errors		1 [Unitless]	Status value
	No. Overflows		1 [Unitless]	Status value
	No. Parity errors		1 [Unitless]	Status value
	No. Framing errors		1 [Unitless]	Status value
	No. Break		1 [Unitless]	Status value
Modem port	Port status		[Graphical representation]	Status value
	Baud rate		None, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200	Status value
	Parity		None, Odd, Even, Mark	Status value
	Protocol ID		1 [Unitless]	Status value
	Application protocol		GPRS Hayes enable, Transparent	Status value
	Protocol type		Modbus RTU, Modbus TCP	Status value
	No. OK messages		1 [Unitless]	Status value
	No. Error messages		1 [Unitless]	Status value
	No. Checksum errors		1 [Unitless]	Status value
	No. Overflows		1 [Unitless]	Status value
	No. Parity errors		1 [Unitless]	Status value
	No. Framing errors		1 [Unitless]	Status value
	No. Break		1 [Unitless]	Status value
RS485 port	Port status		[Graphical representation]	Status value
	Baud rate		None, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200	Status value
	Parity		None, Odd, Even, Mark	Status value
	Protocol ID		1 [Unitless]	Status value
	Application protocol		Dummy string, Modbus slave, Modbus master	Status value
	Protocol type		Modbus RTU, Modbus TCP	Status value
	No. OK messages		1 [Unitless]	Status value
	No. Error messages		1 [Unitless]	Status value
	No. Checksum errors		1 [Unitless]	Status value
	No. Overflows		1 [Unitless]	Status value

Submenu	Submenu	Setting	Value	Comment
RS485 port	No. Parity errors		1 [Unitless]	Status value
	No. Framing errors		1 [Unitless]	Status value
	No. Break		1 [Unitless]	Status value
Ethernet port (TCP/IP)	Port status		[Graphical representation]	Status value
	Protocol ID		1 [Unitless]	Status value
	Application protocol		Dummy string, Modbus slave, Modbus master	Status value
	Protocol type		Modbus RTU, Modbus TCP	Status value
	One or none of lines below, depending on other settings			
	Set static IP	IP address	[Text String]	Status value
		Net Mask	[Text String]	Status value
		Gateway	[Text String]	Status value
		Port number	1 [Unitless]	Status value
	Show dynamic IP	IP address	[Text String]	Status value
		Net Mask	[Text String]	Status value
		Gateway	[Text String]	Status value
		Port number	1 [Unitless]	Status value
Ethernet port (TCP/IP)	No. OK messages		1 [Unitless]	Status value
Ethernet port (TCP/IP)	No. Error messages		1 [Unitless]	Status value
	No. Checksum errors		1 [Unitless]	Status value
GPRS status	Port status		[Graphical representation]	Status value
	Signal 0-31 (99=NA)		1 [Unitless]	Status value
	Local IP address		[Text String]	Status value
	Connect status		-Disconnected-, -Reconnecting-, -Connected-, Force reconnect, -TCP Server waiting-	Setting, Operator Password
	Protocol ID		1 [Unitless]	Status value
	Application protocol		Dummy string, Modbus slave, Modbus master	Status value
	Protocol type		Modbus RTU, Modbus TCP	Status value
	Status counters	Connect counter	1 [Unitless]	Status value
		No. OK messages	1 [Unitless]	Status value
		No. Error messages	1 [Unitless]	Status value
		No. Checksum errors	1 [Unitless]	Status value

5.15 Detailed status: field bus modules (RS 485)

Table 5-15 shows the complete view for detailed status under the submenus Field bus modules (RS 485)

Table 5-1: Detailed status Field bus modules (RS 485)

Submenu	Submenu	Setting	Value	Comment
Main pwr. mon.	PM Connected		-Disconnected-, -Connected-	Status value
	PM Com. error		-OK-, -Error-	Status value
	Status	Current	0.1 A	Status value
		Line current L1	0.1 A	Status value
		Line current L2	0.1 A	Status value
		Line current L3	0.1 A	Status value
		Average LN voltage	0.1 V	Status value
		Line voltage L1	0.1 V	Status value
		Line voltage L2	0.1 V	Status value
		Line voltage L3	0.1 V	Status value
		Average LL voltage	0.1 V	Status value
		L1-L2 voltage	0.1 V	Status value
		L2-L3 voltage	0.1 V	Status value
		L3-L1 voltage	0.1 V	Status value
		Power	0.1 kW	Status value
		Current frequency	0.01 Hz	Status value
		Power factor	0.01 [Unitless]	Status value
Pwr.mon.1 Pwr. mon.2	PM Connected		-Disconnected-, -Connected-	Status value
	PM Com. error		-OK-, -Error-	Status value
	Status	Current	0.1 A	Status value
		Line current L1	0.1 A	Status value
		Line current L2	0.1 A	Status value
		Line current L3	0.1 A	Status value
		Average LN voltage	0.1 V	Status value
		Line voltage L1	0.1 V	Status value
		Line voltage L2	0.1 V	Status value
		Line voltage L3	0.1 V	Status value
		Average LL voltage	0.1 V	Status value
		L1-L2 voltage	0.1 V	Status value
		L2-L3 voltage	0.1 V	Status value
Pwr.mon.1 Pwr. mon.2	Status	L3-L1 voltage	0.1 V	Status value
		Power	0.1 kW	Status value
		Current frequency	0.01 Hz	Status value
		Power factor	0.01 [Unitless]	Status value
VFDrive 1 VFDrive 2	VFD Connected		-Disconnected-, -Connected-	Status value
	VFD Drive error		-OK-, -Error-	Status value
	VFD Com. error		-OK-, -Error-	Status value
	Drive status	Drive status	OFF, Running, Disabled, Fault, Tune in	Status value
		Current frequency	0.01 Hz	Status value
		Rotation speed	1 rpm	Status value
		Motor voltage	0.1 V	Status value
VFDrive 1 VFDrive 2	Drive status	Motor power	0.1 kW	Status value
		Current	0.1 A	Status value
		Torque Nm	1 Nm, 1 lbf.ft	Status value
		Torque %	0.1%	Status value

5.16 Settings: alarm legend

Table 5-16 shows the general settings for Digital- and Analog alarms

Table 5-16: General settings for Digital- and Analog alarms

Submenu	Setting	Value	Comment
Digital Alarm	Alarm type	Inactive, B-Alarm, A-Alarm	Setting, System Password
	Alarm delay	1 s	Setting, System Password
	Trigger crash log	NO, YES	Setting, System Password
Analog Alarm	Alarm type	Inactive, B-Alarm, A-Alarm	Setting, System Password
	Alarm delay	1 s	Setting, System Password
	Alarm limit	[Unit]	Setting, System Password
	Hysteresis	[Unit]	Setting, System Password
	Trigger crash log	NO, YES	Setting, System Password

5.17 Settings: system

Table 5-17 shows the complete list of System settings

Table 5-17: complete list of system settings, under the menu item Setting – System

Submenu	Setting	Value	Comment
Select language		English, French, German, Spanish, Danish, Dutch, Italic, Norwegian, Polish, Portuguese (Brazil), Swedish, Turkish	Setting, Operator Password
Station ID		1 [Unitless]	Setting, System Password
Date format		YYYY.MM.DD, DD.MM.YYYY, MM.DD.YYYY	Setting, System Password
Set date		[Text String]	Setting, Operator Password
Set time		[Text String]	Setting, Operator Password
Select units		Metric units, US units	Setting, System Password
Main nominal voltage		1 V	Setting, System Password
Main nominal frequency		1 Hz	Setting, System Password
Ackn. all alarms w. reg 333		NO, YES	Setting, System Password
System Alarms	Power fail		Digital Alarm, see legend
	High PCB temp. EC 531	Recommended: 70°C (158°F)	Analog Alarm, see legend
	Low supply voltage		Analog Alarm, see legend
System Alarms	Personnel alarm		Analog Alarm, see legend
Change passcode	Operator	1 [Unitless]	Setting, Operator Password
	System	1 [Unitless]	Setting, System Password
History/alarm reset	All history log	Cancel, Reset	Setting, System Password
	All alarms	Cancel, Reset	Setting, System Password
Graphical display	Backlight timeout	1 min	Setting, System Password
	Pump 1	OFF, ON	Setting, System Password
	Pump 2	OFF, ON	Setting, System Password
	Mixer	OFF, ON	Setting, System Password
	Start/stop levels	OFF, ON	Setting, System Password
	Scaling 100%	0.01 m, 0.01 ft	Setting, System Password

5.18 Settings: pump pit

Table 5-18 shows the complete list of Pump pit settings

Table 5-18: complete list of pump pit settings, under the menu item Setting – Pump pit

Submenu	Submenu	Setting	Value	Comment
Station flow	Meas. parameters	Calculate inflow	OFF, ON	Setting, System Password
		Pit shape	Rectangular, Conical	Setting, System Password
		Inflow calc. interval	1 s	Setting, System Password
		Flow comp-en. 2 pumps	1%	Setting, System Password
	Pit area	Level 0	0.01 m, 0.01 ft	Setting, System Password
		Area 0	0.01 m2, 0.01 ft2	Setting, System Password
		Level …	0.01 m, 0.01 ft	Setting, System Password
		Area …	0.01 m2, 0.01 ft2	Setting, System Password
		Level 9	0.01 m, 0.01 ft	Setting, System Password
		Area 9	0.01 m2, 0.01 ft2	Setting, System Password
Overflow	Overflow detect		OFF, Overflow sensor, Level limit	Setting, System Password
	Overflow cal-culation		Exp. and constant, Lock on inflow	Setting, System Password
	High level limit		0.001 m, 0.001 ft	Setting, System Password
Overflow	Exponent 1		0.0001 [Unitless]	Setting, System Password
	Constant 1		0.0001 [Unitless]	Setting, System Password
	Exponent 2		0.0001 [Unitless]	Setting, System Password
	Constant 2		0.0001 [Unitless]	Setting, System Password
Pit alarms	High level			Analog Alarm, see legend
	Low level			Analog Alarm, see legend
	High-level float			Digital Alarm, see legend
		Block alarm high float	Never block, 1 pump running, 2 pumps running	Setting, System Password
	Low-level float			Digital Alarm, see legend
	High inflow			Analog Alarm, see legend
	Low inflow			Analog Alarm, see legend
	Backup start			Digital Alarm, see legend
	Remote blocking			Digital Alarm, see legend
	High pressure			Analog Alarm, see legend
	Low pressure			Analog Alarm, see legend
	Overflow alarm			Digital Alarm, see legend
	Pressure blocking			Digital Alarm, see legend
	Sensor error			Digital Alarm, see legend
	All pumps blocked			Digital Alarm, see legend

Submenu	Submenu	Setting	Value	Comment
Pit alarms	Drain pump running			Digital Alarm, see legend
	Leakage mixer			Digital Alarm, see legend
	High temp. mixer			Digital Alarm, see legend
	Leakage drain pump			Digital Alarm, see legend
	High temp. drain pump			Digital Alarm, see legend
	No run ind. drain pump			Digital Alarm, see legend
	Mprot. drain pump			Digital Alarm, see legend
	No run ind. mixer			Digital Alarm, see legend
	Motor pro-tect. mixer			Digital Alarm, see legend
	Mprot. rst err drain/mixer			Digital Alarm, see legend
Cleaning control	Flush at		At pump start, At pump stop	Setting, System Password
	Running time		1 s	Setting, System Password
	Start count interval		1 [Unitless]	Setting, System Password
Mixer control	Stop pump during mix		NO, YES	Setting, System Password
	Mixer time		1 s	Setting, System Password
	Start count interval		1 [Unitless]	Setting, System Password
	Timer interval		hh.mm	Setting, System Password
	Max level		0.01 m, 0.01 ft	Setting, System Password
	Min level		0.01 m, 0.01 ft	Setting, System Password
	Select run indication		OFF, Digital inputs	Setting, System Password
Drain pump control	Start delay		1 s	Setting, System Password
	Stop delay		1 s	Setting, System Password
	Select run indication		OFF, Digital inputs	Setting, System Password
Motor prot. auto reset	Pulse time		1 s	Setting, System Password
	Delay time		1 s	Setting, System Password
	Max No. Attempts		0, 1, 2, 3	Setting, System Password
Level-sen-sor check	At high-level float		OFF, ON	Setting, System Password
	Level at high float		0.01 m, 0.01 ft	Setting, System Password
	Max deviation +/-		0.01 m, 0.01 ft	Setting, System Password
	At low-level float		OFF, ON	Setting, System Password
	Level at low float		0.01 m, 0.01 ft	Setting, System Password
	Max deviation +/-		0.01 m, 0.01 ft	Setting, System Password
	Level change check		OFF, ON	Setting, System Password
	Level change time		1 s	Setting, System Password
	Min level change +/-		0.01 m, 0.01 ft	Setting, System Password

Submenu	Submenu	Setting	Value	Comment
Tariff control	Tariff control		OFF, ON	Setting, System Password
	Lead time		1 min	Setting, System Password
	Pump down level		0.01 m, 0.01 ft	Setting, System Password
	Peak Monday	Peak time 1 ON	hh.mm	Setting, System Password
		Peak time 1 OFF	hh.mm	Setting, System Password
		Peak time 2 ON	hh.mm	Setting, System Password
		Peak time 2 OFF	hh.mm	Setting, System Password
	Peak Tuesday			Menu selection, Identical to above.
	Peak Wednesday			Menu selection, Identical to above.
	Peak Thursday			Menu selection, Identical to above.
	Peak Friday			Menu selection, Identical to above.
Tariff control	Peak Saturday			Menu selection, Identical to above.
	Peak Sunday			Menu selection, Identical to above.
Level above sea	Set level		0.01 m, 0.01 ft	Setting, System Password

5.19 Settings: pump 1 and pump 2

Table 5-19 shows the complete list of Pump 1 and Pump 2 settings

Table 5-19: complete list of pump 1 and pump 2 settings, under the menu item Setting – Pump 1 or Pump 2

Submenu	Submenu	Setting	Value	Comment
Copy setup from other pump			NO, YES	Setting, System Password
Pump control	Type of pump control		Pump disabled, On/Off control, VFD manual speed, VFD PID control, VFD Best effic. point	Setting, System Password
	Select run indication		Any discrete source, Output signal, Digital inputs, Motor current, Field bus modules (RS485)	Setting, System Password
	Current threshold (if apl.)		0.1 A	Setting, System Password
	Pwr.mon.	Link to associated Field bus Modules Setting, see that chapter		
	VFDrive	Link to associated Field bus Modules Setting, see that chapter		
Start/stop levels	Start level		0.01 m, 0.01 ft	Setting, Operator Password
	Stop level		0.01 m, 0.01 ft	Setting, Operator Password
Start/stop levels	Random start range+-		0.01 m, 0.01 ft	Setting, Operator Password
	Start level h. tariff		0.01 m, 0.01 ft	Setting, Operator Password
	Stop level h. tariff		0.01 m, 0.01 ft	Setting, Operator Password
	Random start range+-		0.01 m, 0.01 ft	Setting, Operator Password
	Alternat. stop level		OFF, ON	Setting, Operator Password
Time settings	Threshold-on delay		1 s	Setting, System Password
	Threshold-off delay		1 s	Setting, System Password
	Max cont. Runtime		hh.mm	Setting, System Password

Submenu	Submenu	Setting	Value	Comment
Pump curve (QH)	Point 1 head (max)		0.01 m, 0.01 ft	Setting, System Password
	Point 1 flow (min)		0.1 l/s, 1 GPM	Setting, System Password
	Point 2 head (mid)		0.01 m, 0.01 ft	Setting, System Password
	Point 2 flow (mid)		0.1 l/s, 1 GPM	Setting, System Password
	Point 3 head (min)		0.01 m, 0.01 ft	Setting, System Password
	Point 3 flow (max)		0.1 l/s, 1 GPM	Setting, System Password
	Total head		0.01 m, 0.01 ft	Setting, System Password
Pump alarms	No run indication			Digital Alarm, see legend
	Fallen motor protect			Digital Alarm, see legend
	Motor prot. reset err			Digital Alarm, see legend
	Pump not in auto			Digital Alarm, see legend
	Pump error			Digital Alarm, see legend
	Max cont. Runtime			Digital Alarm, see legend
	Alarm blocked			Digital Alarm, see legend
	Max reverse attempts			Digital Alarm, see legend
	Low pump capacity	Alarm		Analog Alarm, see legend
		Warning		Analog Alarm, see legend
		Auto-set low cap. threshold	Inactive, Trigger auto-set, Auto-set running	Setting, System Password
		Auto-set calc. counter	1 [Unitless]	Setting, System Password
	Vibration			Analog Alarm, see legend
	Leakage	Generic		Digital Alarm, see legend
		Oil chamber		Digital Alarm, see legend
		Motor housing		Digital Alarm, see legend
		Electr. con. box		Digital Alarm, see legend
Pump alarms	High temperature	Generic		Analog Alarm, see legend
		Stator L1		Analog Alarm, see legend
		Stator L2		Analog Alarm, see legend
		Stator L3		Analog Alarm, see legend
		Upper bearing		Analog Alarm, see legend
		Lower bearing		Analog Alarm, see legend
	High motor current			Analog Alarm, see legend
	Low motor current			Analog Alarm, see legend
Block pump on alarm	High temperature	Generic	NO, YES	Setting, System Password
		Stator L1	NO, YES	Setting, System Password
		Stator L2	NO, YES	Setting, System Password
		Stator L3	NO, YES	Setting, System Password
		Upper bearing	NO, YES	Setting, System Password
		Lower bearing	NO, YES	Setting, System Password
Block pump on alarm	Leakage	Generic	NO, YES	Setting, System Password
		Oil chamber	NO, YES	Setting, System Password
		Motor housing	NO, YES	Setting, System Password
		Electr. con. box	NO, YES	Setting, System Password
	High motor current		NO, YES	Setting, System Password
	Fallen motor protect		NO, YES	Setting, System Password
	No run indication		NO, YES	Setting, System Password
	Pump error		NO, YES	Setting, System Password
	Vibration		NO, YES	Setting, System Password

Submenu	Submenu	Setting	Value	Comment
Hold pump on alarm	Temperature	Generic	NO, YES	Setting, System Password
		Stator L1	NO, YES	Setting, System Password
		Stator L2	NO, YES	Setting, System Password
		Stator L3	NO, YES	Setting, System Password
		Upper bearing	NO, YES	Setting, System Password
		Lower bearing	NO, YES	Setting, System Password
	Leakage	Generic	NO, YES	Setting, System Password
		Oil chamber	NO, YES	Setting, System Password
		Motor housing	NO, YES	Setting, System Password
		Electr. con. box	NO, YES	Setting, System Password
	Vibration		NO, YES	Setting, System Password
Best efficiency point	Start at max, every n start		1 [Unitless]	Setting, System Password
	Max freq. run time		1 s	Setting, System Password
	Max freq. if all pump run		NO, YES	Setting, System Password
	All pumps max freq. delay		1 s	Setting, System Password
	Max freq. on hi lvl alarm		NO, YES	Setting, System Password
Tag name			[Text String]	Setting, System Password

5.20 Settings: common P1 – P2

Table 5-20 shows the complete list of Common P1-P2 settings

Table 5-20: complete list of common P1-P2 settings, under the menu item Setting – Common P1-P2

Submenu	Submenu	Setting	Value	Comment
Log pump events			NO, YES	Setting, System Password
Pump exercising	Exercise P1		NO, YES	Setting, System Password
	Exercise P2		NO, YES	Setting, System Password
	Max standstill time		hh.mm	Setting, System Password
	Running time		1 s	Setting, System Password
	Start if level >		0.01 m, 0.01 ft	Setting, System Password
	Start if level <		0.01 m, 0.01 ft	Setting, System Password
Pump reversing	Reversing P1		NO, YES	Setting, System Password
	Reversing P2		NO, YES	Setting, System Password
	Start rev. delay		1 s	Setting, System Password
	Rev. run time		1 s	Setting, System Password
	Max No. Attempts		0, 1, 2, 3	Setting, System Password
	Max attempts reset time		1 min	Setting, System Password
	Stop second pump		NO, YES	Setting, System Password
	Pump relay when rev.		OFF, ON	Setting, System Password
	Rev. on pump fail		NO, YES	Setting, System Password
	Rev. on fallen m.prot.		NO, YES	Setting, System Password
	Rev. on overcurrent		NO, YES	Setting, System Password
	Rev. on low p.cap.		NO, YES	Setting, System Password
	After No. starts		NO, YES	Setting, System Password
	Pump 1		1 [Unitless]	Setting, System Password
	Pump 2		1 [Unitless]	Setting, System Password
Max No. pumps running	Max No. pumps running		1, 2	Setting, System Password
Min relay interval	Min time		1 s	Setting, System Password

Submenu	Submenu	Setting	Value	Comment
Alternation	Alt. function		OFF, Normal, Asymmetrical	Setting, System Password
	One or none of lines below, depending on other settings			
	Alternation after		Each pump stop, Both pumps stopped	Setting, System Password
	P1 run time ratio		1%	Setting, System Password
	One or none of lines below, depending on other settings			
	After cont. Runtime		hh.mm	Setting, System Password
Pump blocking	Remote blocking	Remote blocking	OFF, ON	Setting, System Password
		Block timeout	1 s	Setting, System Password
		Active	NO, YES	Setting, No Password
	Low-level float	Low-level float	OFF, ON	Setting, System Password
	Pressure blocking	Pressure blocking	OFF, ON	Setting, System Password
		Block delay	1 s	Setting, System Password
		Block pressure	0.1 bar, 0.1 PSI	Setting, System Password
		Block timeout	1 s	Setting, System Password
	Power	Phase missing	NO, YES	Setting, System Password
		Over voltage	NO, YES	Setting, System Password
Pump blocking	Power	Under voltage	NO, YES	Setting, System Password
		Unbalance voltage	NO, YES	Setting, System Password
	Manual rst on hi p temp		NO, YES	Setting, System Password
	Pwr mon. block off delay		1 s	Setting, System Password
Calc. pump capacity	Function		OFF, ON	Setting, System Password
	Min level p.cap.calc.		0.01 m, 0.01 ft	Setting, System Password
	Start delay		1 s	Setting, System Password
	Calculation time		1 s	Setting, System Password
	Stop delay		1 s	Setting, System Password
	Static head		0.01 m, 0.01 ft	Setting, System Password
	Press. sens. inlet offset		0.01 m, 0.01 ft	Setting, System Password
	Max level p.cap calc		0.01 m, 0.01 ft	Setting, System Password
	No. pump starts to alarm		1 [Unitless]	Setting, System Password
	Auto set warning thresh. @		1%	Setting, System Password
	Auto set alarm thresh. @		1%	Setting, System Password
	Station flow			
Alternat. stop level	After No. starts		1 [Unitless]	Setting, System Password
	Stop level		0.01 m, 0.01 ft	Setting, System Password
	Stop delay		1 s	Setting, System Password
Start on fast change	Start on fast change		OFF, ON	Setting, System Password
	Start level change		0.01 m, 0.01 ft	Setting, System Password
	Per		1 min	Setting, System Password
	Min No. pumps running		0, 1, 2	Setting, System Password
	Max No. pumps running		0, 1, 2	Setting, System Password
	Stop on fast change		OFF, ON	Setting, System Password
	Stop level change		0.01 m, 0.01 ft	Setting, System Password
	Per		1 min	Setting, System Password
	Min No. pumps running		0, 1, 2	Setting, System Password
	Max No. pumps running		0, 1, 2	Setting, System Password
Backup running	Pump 1 backup start		OFF, ON	Setting, System Password
	Pump 2 backup start		OFF, ON	Setting, System Password
	Running time		1 s	Setting, System Password

5.21 Settings: PID regulator

Table 5-21 shows the complete list of settings of the PID regulator

Table 5-21: complete list of settings of the PID regulator, under the menu item Setting – PID regulator

Setting	Value	Comment
Setpoint	0.01 m, 0.01 ft	Setting, System Password
Setpoint high tariff	0.01 m, 0.01 ft	Setting, System Password
Extern setpoint input	OFF, AI1, AI2, AI3, AI4	Setting, System Password
Max setpoint	0.01 m, 0.01 ft	Setting, System Password
Min setpoint	0.01 m, 0.01 ft	Setting, System Password
Start setpoint	0.01 m, 0.01 ft	Setting, System Password
Max output	0.1%	Setting, System Password
Min output	0.1%	Setting, System Password
Block output	0.1%	Setting, System Password
Zero dev. output	0.1%	Setting, System Password
Start output	0.1%	Setting, System Password
Max output change	0.1%	Setting, System Password
Direct/Reverse effect	Reverse, Direct	Setting, System Password
Setpoint tracking	NO, YES	Setting, System Password
Output when blocked	Freeze output, Setup block signal	Setting, System Password
Setpoint when start	Last, Setup start, Extern	Setting, System Password
Output state when start	Last state, AUTO, MANUAL, Internally blocked	Setting, System Password
P-Band	0.001 [Unitless]	Setting, System Password
I-Time	0.01 s	Setting, System Password
D-Time	0.01 s	Setting, System Password
Min speed	0.1%	Setting, System Password
Locked speed pumping out	0.1%	Setting, System Password
Lock speed delay	1 s	Setting, System Password

5.22 Settings: pulse channels

Table 5-22 shows the complete list of Settings of the Pulse channels

Table 5-22: complete list of settings of the pulse channels, under the menu item Setting – Pulse channels

Submenu	Setting	Value	Comment
Pulse ch. 1-4	Function	Precipitation, Energy, Flow	Setting, System Password
	One or none of lines below, depending on other settings		
	1 Pulse	0.0001 mm, 0.0001 in	Setting, System Password
	1 Pulse	0.0001 kWh	Setting, System Password
	1 Pulse	0.0001 m^3, 0.0001 gal	Setting, System Password
	One or none of lines below, depending on other settings		
	Set high alarm		Analog Alarm, see legend
	One or none of lines below, depending on other settings		
	Set low alarm		Analog Alarm, see legend

5.23 Settings: analog logging

Table 5-23 shows the complete list of settings of the Analog loggings

Table 5-23: complete list of settings of the analog logging, under the menu item Setting – Analog logging

Submenu	Setting	Value	Comment
Log channel 1-16	Log signal	OFF, Level pit, Inflow pit, Outflow pit, Overflow level, Overflow flow, Outlet pressure, Motor current, Pump capacity, Power factor, Temperature motor, Temp. stator wiring L1, Temp. stator wiring L2, Temp. stator wiring L3, Temp. upper bearing, Temp. lower bearing, Vibration, Main voltage, Main frequency, Free choice AI1-AI8, Power supply, Pulse channel 1-4, PID controller output, Data register, Data register 2 compl., Set frequency, Actual frequency, Motor power, Motor voltage, Torque, Outflow meter, Total head, PCB temperature EC 531, BEP frequency, BEP efficiency	Setting, System Password
	Log function	Closed, Actual value, Average value, Min value, Max value	Setting, System Password
	Log interval	1 min	Setting, System Password
	One or none of lines below, depending on other settings		
	Analog input number (1-8)	1 [Unitless]	Setting, System Password
	Object	Pulse channel 1, Pulse channel 2, Pulse channel 3, Pulse channel 4	Setting, System Password
	Data register number	1 [Unitless]	Setting, System Password
	Data register number	1 [Unitless]	Setting, System Password
	Object	Pump 1, Pump 2	Setting, System Password

5.24 Settings: analog inputs

Table 5-24 shows the complete list of settings of the Analog inputs

Table 5-24: complete list of settings of the analog inputs, under the menu item Setting – Analog inputs

Submenu	Submenu	Setting	Value	Comment
AI1 - AI4	Signal function		OFF, Pit level, Motor current, Outlet pressure, Vibrations, Xylem MiniCas Sim, Outflow meter, Motor temperature, Free choice	Setting, System Password
	One or none of lines below, depending on Port function			
	Leakage		OFF, Generic, Oil chamber, Motor housing, Electr. con. box	Setting, System Password
	One or none of lines below, depending on Port function			
AI1 - AI4	Temperature		OFF, Generic, Stator L1, Stator L2, Stator L3, Upper bearing, Lower bearing	Setting, System Password
	Measure point		Generic, Stator L1, Stator L2, Stator L3, Upper bearing, Lower bearing	Setting, System Password
	One or none of lines below, depending on Port function			
	Object		Pump 1, Pump 2	Setting, System Password
	One or none of lines below, depending on Port function			
	Settings	Scaling 0%	0.01 m, 0.01 ft	Setting, System Password
		Scaling 100%	0.01 m, 0.01 ft	Setting, System Password
		Filter constant	1 s	Setting, System Password
		Zero offset	0.01 m, 0.01 ft	Setting, System Password
		Dead band	0.1%	Setting, System Password
		Set sensor/cable alarm		Digital Alarm, see legend
	Settings	Scaling 0%	0.1 A	Setting, System Password
		Scaling 100%	0.1 A	Setting, System Password
		Filter constant	1 s	Setting, System Password
		Zero offset	0.1 A	Setting, System Password
		Dead band	0.1%	Setting, System Password
		Set sensor/cable alarm		Digital Alarm, see legend
	Settings	Scaling 0%	0.1 bar, 0.1 PSI	Setting, System Password
		Scaling 100%	0.1 bar, 0.1 PSI	Setting, System Password
		Filter constant	1 s	Setting, System Password
		Zero offset	0.1 bar, 0.1 PSI	Setting, System Password
		Dead band	0.1%	Setting, System Password
		Set sensor/cable alarm		Digital Alarm, see legend
	Settings	Scaling 0%	0.1 mm/s2, 0.01 in/h	Setting, System Password
		Scaling 100%	0.1 mm/s2, 0.01 in/h	Setting, System Password
		Filter constant	1 s	Setting, System Password
		Zero offset	0.1 mm/s2, 0.01 in/h	Setting, System Password
		Dead band	0.1%	Setting, System Password

Submenu	Submenu	Setting	Value	Comment
AI1 - AI4	Settings	Set sensor/cable alarm		Digital Alarm, see legend
	Settings	Scaling 0%	0.001 mA	Setting, System Password
		Scaling 100%	0.001 mA	Setting, System Password
		Filter constant	1 s	Setting, System Password
		Zero offset	0.001 mA	Setting, System Password
		Dead band	0.1%	Setting, System Password
		Set sensor/cable alarm		Digital Alarm, see legend
	Settings	Scaling 0%	0.1 m^3/h, 1 GPM	Setting, System Password
		Scaling 100%	0.1 m^3/h, 1 GPM	Setting, System Password
		Filter constant	1 s	Setting, System Password
		Zero offset	0.1 m^3/h, 1 GPM	Setting, System Password
		Dead band	0.1%	Setting, System Password
		Set sensor/cable alarm		Digital Alarm, see legend
	Settings	Scaling 0%	0.1 °C, 0.1 °F	Setting, System Password
		Scaling 100%	0.1 °C, 0.1 °F	Setting, System Password
		Filter constant	1 s	Setting, System Password
		Zero offset	0.1 °C, 0.1 °F	Setting, System Password
		Dead band	0.1%	Setting, System Password
		Set sensor/cable alarm		Digital Alarm, see legend
	Settings	Designation	[Text String]	Setting, System Password
		No. of decimals	1 [Unitless]	Setting, System Password
		Select units	[Text String]	Setting, System Password
		Scaling 0%	[User defined Unit]	Setting, System Password
		Scaling 100%	[User defined Unit]	Setting, System Password
		Filter constant	1 s	Setting, System Password
		Zero offset	[User defined Unit]	Setting, System Password
		Dead band	0.1%	Setting, System Password
		Set high alarm		Analog Alarm, see legend
		Set low alarm		Analog Alarm, see legend
		Set sensor/cable alarm		Digital Alarm, see legend
	One or none of lines below, depending on Port function			
	AD raw value		1 [Unitless]	Status value
	Current value		0.01 m, 0.01 ft	Status value
	Current value		0.1 A	Status value
	Current value		0.1 bar, 0.1 PSI	Status value
	Current value		0.1 mm/s2, 0.01 in/h	Status value
	Current value		-Overheated-, -OFF-, -Leakage-	Status value
	Current value		0.1 m^3/h, 1 GPM	Status value
	Current value		0.1 °C, 0.1 °F	Status value
	Current value		[User defined Unit]	Status value
AI5 - AI6	Signal function		OFF, Motor temperature, Free choice	Setting, System Password
	One or none of lines below, depending on Port function			

Submenu	Submenu	Setting	Value	Comment
AI5 - AI6	Measure point		Generic, Stator L1, Stator L2, Stator L3, Upper bearing, Lower bearing	Setting, System Password
	Sensor type		Pt100 (temp. sensor), PTC/Bimetal switch	Setting, System Password
	One or none of lines below, depending on Port function			
	Object		Pump 1, Pump 2	Setting, System Password
	One or none of lines below, depending on Port function			
	AI config. settings	Designation	[Text String]	Setting, System Password
		Select units	[Text String]	Setting, System Password
		Filter constant	1 s	Setting, System Password
		Zero offset	[User defined Unit]	Setting, System Password
		Set high alarm		Analog Alarm, see legend
		Set low alarm		Analog Alarm, see legend
		Set sensor/cable alarm		Digital Alarm, see legend
	AI config. settings	Designation	[Text String]	Setting, System Password
		No. of decimals	1 [Unitless]	Setting, System Password
		Select units	[Text String]	Setting, System Password
		Set high alarm		Analog Alarm, see legend
		Set low alarm		Analog Alarm, see legend
	One or none of lines below, depending on Port function			
	Settings	Filter constant	1 s	Setting, System Password
		Zero offset	0.1 ºC, 0.1 ºF	Setting, System Password
		Set sensor/cable alarm		Digital Alarm, see legend
	AI config. settings	Designation	[Text String]	Setting, System Password
		Select units	[Text String]	Setting, System Password
		Filter constant	1 s	Setting, System Password
		Zero offset	[User defined Unit]	Setting, System Password
		Set high alarm		Analog Alarm, see legend
		Set low alarm		Analog Alarm, see legend
		Set sensor/cable alarm		Digital Alarm, see legend
	One or none of lines below, depending on Port function			
	Current value		0.1 ºC, 0.1 ºF	Status value
	Current value		-OK-, -Tripped-	Status value
	Current value		[User defined Unit]	Status value
AI7 - AI8	Signal function		OFF, Motor temperature, Free choice, Leakage	Setting, System Password
	One or none of lines below, depending on Port function			
	Measure point		Generic, Stator L1, Stator L2, Stator L3, Upper bearing, Lower bearing	Setting, System Password
	Sensor type		Pt100 (temp. sensor), Leakage	Setting, System Password
	Measure point		Generic, Oil chamber, Motor housing, Electr. con. box	Setting, System Password
	One or none of lines below, depending on Port function			
AI7 - AI8	Object		Pump 1, Pump 2	Setting, System Password
	One or none of lines below, depending on Port function			

Submenu	Submenu	Setting	Value	Comment
AI7 - AI8	Settings	Filter constant	1 s	Setting, System Password
		Zero offset	0.1 °C, 0.1 °F	Setting, System Password
		Set sensor/cable alarm		Digital Alarm, see legend
	One or none of lines below, depending on Port function			
	AI config. settings	Designation	[Text String]	Setting, System Password
		Select units	[Text String]	Setting, System Password
		Filter constant	1 s	Setting, System Password
		Zero offset	[User defined Unit]	Setting, System Password
		Set high alarm		Analog Alarm, see legend
		Set low alarm		Analog Alarm, see legend
		Set sensor/cable alarm		Digital Alarm, see legend
	AI config. settings	Designation	[Text String]	Setting, System Password
		No. of decimals	1 [Unitless]	Setting, System Password
		Select units	[Text String]	Setting, System Password
		Set high alarm		Analog Alarm, see legend
		Set low alarm		Analog Alarm, see legend
	One or none of lines below, depending on Port function			
	Current value		0.1 °C, 0.1 °F	Status value
	Current value		[User defined Unit]	Status value
	Current value		-OK-, -Tripped-	Status value

5.25 Settings: analog outputs

Table 5-25 shows the complete list of settings of the Analog outputs

Table 5-25: complete list of settings of the analog outputs, under the menu item Setting – Analog outputs

Submenu	Submenu	Setting	Value	Comment
AO1 - AO2	Signal function		OFF, Pit level, Pit inflow, Pit outflow, Pit overflow, Pulse channel 1, Pulse channel 2, Pulse channel 3, Pulse channel 4, PID Ctrl output, Data register, Data register 2 compl., Set freq. P1, Set freq. P2	Setting, System Password
	Current value		0.001 mA	Status value
	Filter constant		1 s	Setting, System Password
	One or none of lines below, depending on Port function			
	Settings	Scaling 0%	0.01 m, 0.01 ft	Setting, System Password
		Scaling 100%	0.01 m, 0.01 ft	Setting, System Password
	Settings	Scaling 0%	0.1 l/s, 1 GPM	Setting, System Password
		Scaling 100%	0.1 l/s, 1 GPM	Setting, System Password
	Settings	Scaling 0%	0.1 m^3/h, 1 GPM	Setting, System Password
		Scaling 100%	0.1 m^3/h, 1 GPM	Setting, System Password
	One or none of lines below, depending on other settings			

Submenu	Submenu	Setting	Value	Comment
AO1 - AO2	Settings	Scaling 0%	0.1 l/s/ha, 0.1 in/h	Setting, System Password
		Scaling 100%	0.1 l/s/ha, 0.1 in/h	Setting, System Password
	Settings	Scaling 0%	0.1 kW	Setting, System Password
		Scaling 100%	0.1 kW	Setting, System Password
	Settings	Scaling 0%	0.1 m^3/h, 1 GPM	Setting, System Password
		Scaling 100%	0.1 m^3/h, 1 GPM	Setting, System Password
	Settings	Set data register	1 [Unitless]	Setting, System Password
		Scaling 0%	1 [Unitless]	Setting, System Password
		Scaling 100%	1 [Unitless]	Setting, System Password
	Settings	Set data register	1 [Unitless]	Setting, System Password
		Scaling 0%	1 [Unitless]	Setting, System Password
		Scaling 100%	1 [Unitless]	Setting, System Password
	Settings	Scaling 0%	0.01 Hz	Setting, System Password
		Scaling 100%	0.01 Hz	Setting, System Password

5.26 Settings: digital inputs

Table 5-26 shows the complete list of settings of the Digital inputs

Table 5-26: complete list of settings of the digital inputs, under the menu item Setting – Digital inputs

Submenu	Submenu	Setting	Value	Comment
DI1 - DI14	Signal function		OFF, Run indication, Manual start, Set manual, Set auto, Start float, Pump failure, Motor protector, High motor temp. pump, Leakage pump, Stop float, Low level float, Overflow sensor, High level float, Start float drain pump, Local mode, Alarm reset, Power fail, DI pulse channel 1-4, Block PID controller, Alarm input, Block operation, Leakage mixer-drain pump, High temp. mixer-drain p.	Setting, System Password
	Status		-OFF-, -ON-	Status value
	One or none of lines below, depending on Port function			
	Measure point		Generic, Stator L1, Stator L2, Stator L3, Upper bearing, Lower bearing	Setting, System Password
	Measure point		Generic, Oil chamber, Motor housing, Electr. con. box	Setting, System Password
	One or none of lines below, depending on Port function			
	Object		Pump 1, Pump 2	Setting, System Password
	Object		Pump pit, Pump 1, Pump 2	Setting, System Password
	Object		Pulse channel 1, Pulse channel 2, Pulse channel 3, Pulse channel 4	Setting, System Password
DI1 - DI14	Alarm settings			Digital Alarm, see legend
		Alarm text	[Text String]	Setting, System Password
	Object		Pump 1, Pump 2, Mixer, Drain pump	Setting, System Password
	Object		Mixer, Drain pump	Setting, No Password
	Normally open/closed		NO Normally open, NC Normally closed	Setting, System Password
	Event Trigger		OFF, ON	Setting, System Password

5.27 Settings: digital outputs

Table 5-27 shows the complete list of settings of the Digital outputs

Table 5-27: complete list of settings of the digital outputs, under the menu item Setting – Digital outputs

Submenu	Submenu	Setting	Value	Comment
DO1 - DO8	Signal function		OFF, Pump control, Reset motor protector, Pump fail, Not enough pumps avail., One pump fail, Mixer control, Drain pump control, Cleaner control, Modem control, Remote control, Personnel alarm, High level, Alarm alert, Not ackn. alarm, Active alarm, Pump reversing, Logic IO, Data register setpoint, External alarm alert	Setting, System Password
	Status		-OFF-, -ON-	Status value
	One or none of lines below, depending on Port function			
	Object		Pump 1, Pump 2, Mixer, Drain pump, All	Setting, System Password
	Settings	Object	B-Alarm, A-Alarm, All alarms	Setting, System Password
		On time	1 s	Setting, System Password
		Pause time	1 s	Setting, System Password
	Object		B-Alarm, A-Alarm, All alarms	Setting, System Password
	Object		Pump 1, Pump 2	Setting, System Password
	Settings	IO signal 1	OFF, True OR, Inverse OR, True AND, Inverse AND	Setting, System Password
		IO number 1	1 [Unitless]	Setting, System Password
		IO signal 2	OFF, True OR, Inverse OR, True AND, Inverse AND	Setting, System Password
		IO number 2	1 [Unitless]	Setting, System Password
		IO signal 3	OFF, True OR, Inverse OR, True AND, Inverse AND	Setting, System Password
		IO number 3	1 [Unitless]	Setting, System Password
		IO signal 4	OFF, True OR, Inverse OR, True AND, Inverse AND	Setting, System Password
		IO number 4	1 [Unitless]	Setting, System Password
DO1 - DO8	Settings	Data register	1 [Unitless]	Setting, System Password
		Setpoint on	1 [Unitless]	Setting, System Password
		Setpoint off	1 [Unitless]	Setting, System Password
		Setpoint delay	1 s	Setting, System Password
	Normally open/closed		NO Normally open, NC Normally closed	Setting, System Password
	Event Trigger		OFF, ON	Setting, System Password

5.28 Settings: communication

Table 5-28 shows the complete list of settings of the Communication

Table 5-29: complete list of settings of the communication, under the menu item Setting – Communication

Submenu	Submenu	Setting	Value	Comment
USB port	Protocol type		Modbus RTU, Modbus TCP	Setting, System Password
	Message timeout		1 s	Setting, System Password
	Cross reference		OFF, ON	Setting, System Password
Service port (D-Sub)	Baud rate		None, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200	Setting, System Password
	Parity		None, Odd, Even, Mark	Setting, System Password
	Message timeout		1 s	Setting, System Password
	Cross reference		OFF, ON	Setting, System Password
Modem port	Baud rate		None, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200	Setting, System Password
	Parity		None, Odd, Even, Mark	Setting, System Password
	Station ID		1 [Unitless]	Setting, System Password
	Modem type		OFF, CA 521, CA 523, CA 524, Generic SMS	Setting, System Password
	Heart beat timeout		1 min	Setting, System Password
	Application protocol		GPRS Hayes enable, Transparent	Setting, System Password
	One or none of lines below, depending on other settings			
	Settings Modbus	Protocol type	Modbus RTU, Modbus TCP	Setting, System Password
		Protocol ID	1 [Unitless]	Setting, System Password
		Message timeout	1 s	Setting, System Password
		Cross reference	OFF, ON	Setting, System Password
	Settings GPRS	TCP type	Aquaweb client, TCP server (fixed IP), TCP server + heart beat	Setting, System Password
		Server IP address	[Text String]	Setting, System Password
		Server TCP port number	1 [Unitless]	Setting, System Password
		GPRS APN part 1	[Text String]	Setting, System Password
		GPRS APN part 2	[Text String]	Setting, System Password
		GPRS User name	[Text String]	Setting, System Password
		GPRS Password	[Text String]	Setting, System Password
	Settings GPRS	Protocol type	Modbus RTU, Modbus TCP	Setting, System Password
		Protocol ID	1 [Unitless]	Setting, System Password
		Message timeout	1 s	Setting, System Password
		Cross reference	OFF, ON	Setting, System Password
	Settings Modbus	Protocol type	Modbus RTU, Modbus TCP	Setting, System Password
		Protocol ID	1 [Unitless]	Setting, System Password
		Message timeout	1 s	Setting, System Password
		Cross reference	OFF, ON	Setting, System Password
	One or none of lines below, depending on other settings			
	Settings SMS	SMS alarm enable	Disabled, A-ON, A-ON/OFF, A+B-ON, A+B-ON/OFF	Setting, System Password
		Second SMS number	Backup only, Send always	Setting, System Password
		First SMS number	[Text String]	Setting, System Password
		Second SMS number	[Text String]	Setting, System Password

Submenu	Submenu	Setting	Value	Comment
RS485 port	Baud rate		None, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200	Setting, System Password
	Parity		None, Odd, Even, Mark	Setting, System Password
	Application protocol		Modbus slave, Modbus master	Setting, System Password
	Protocol type		Modbus RTU, Modbus TCP	Setting, System Password
	Protocol ID		1 [Unitless]	Setting, System Password
	Message timeout		1 s	Setting, System Password
	Cross reference		OFF, ON	Setting, System Password
Ethernet port (TCP/IP)	Hardware		OFF, ON	Setting, System Password
	Protocol type		Modbus RTU, Modbus TCP	Setting, System Password
	Protocol ID		1 [Unitless]	Setting, System Password
	Message timeout		1 s	Setting, System Password
	Cross reference		OFF, ON	Setting, System Password
	Port number		1 [Unitless]	Setting, System Password
	Static/Dynamic IP		Static IP, Dynamic IP (DHCP)	Setting, System Password
	One or none of lines below, depending on other settings			
	Set static IP	IP address	[Text String]	Setting, System Password
		Net Mask	[Text String]	Setting, System Password
		Gateway	[Text String]	Setting, System Password
	Show dynamic IP	IP address	[Text String]	Status value
		Net Mask	[Text String]	Status value
		Gateway	[Text String]	Status value
		Port number	1 [Unitless]	Status value

5.29 Settings: field bus modules (RS 485)

Table 5-29 shows the complete list of settings of the Field bus modules (RS 485)

Table 5-29: complete list of settings of the field bus modules (RS 485), under the menu item Setting – Field bus modules (RS 485)

Submenu	Submenu	Setting	Value	Comment
Poll interval			1 s	Setting, System Password
Main pwr. mon.	Slave ID		1 [Unitless]	Setting, System Password
	Manufacturer		None, Accuenergy, Schneider, Lumel	Setting, System Password
	One or none of lines below, depending on manufacturer settings			
	Model		None	Setting, System Password
	Model		None, Acuvim II	Setting, System Password
	Model		None, PM 710, PM 5110	Setting, System Password
	Model		None, ND 10	Setting, System Password
	Alarm settings	Phase missing		Digital Alarm, see legend
		PM Com. error		Digital Alarm, see legend
		Over voltage		Analog Alarm, see legend
		Under voltage		Analog Alarm, see legend
		Unbalance voltage		Analog Alarm, see legend
		High frequency		Analog Alarm, see legend
		Low frequency		Analog Alarm, see legend
	Use P1 PM for main pwr data		NO, YES	Setting, System Password

Submenu	Submenu	Setting	Value	Comment
Pwr.mon.1 Pwr.mon.2	Slave ID		1 [Unitless]	Setting, System Password
	Manufacturer		None, Accuenergy, Schneider, Lumel	Setting, System Password
	One or none of lines below, depending on manufacturer settings			
	Model		None	Setting, System Password
	Model*	(*Accuenergy)	None, Acuvim II	Setting, System Password
	Model*	(*Schneider)	None, PM 710, PM 5110	Setting, System Password
	Model*	(*Lumel)	None, ND 10	Setting, System Password
	Alarm com. error			Digital Alarm, see legend
VFDrive 1, VFDrive 2	Slave ID		1 [Unitless]	Setting, System Password
	Manufacturer		None, Invertek, Schneider, Danfoss, ABB, Emotron, NFO drives, Vacon, YASKAWA	Setting, System Password
	One or none of lines below, depending on manufacturer settings			
	Model		None	Setting, System Password
	Model*	(*Invertek)	None, Optidrive	Setting, System Password
	Model*	(*Schneider)	None, ATV 61, ATS 48, ATV 600 series, ATV 12	Setting, System Password
	Model*	(*Danfoss)	None, FC 200, MCD 200, MCD 500	Setting, System Password
	Model*	(*ABB)	None, ACQ 810, ACS 580, ACS 550	Setting, System Password
	Model*	(*Emotron)	None, TSA Softstarter, FDU 2	Setting, System Password
	Model*	(*NFO)	None, Sinus	Setting, System Password
	Model*	(*Vacon)	None, Vacon 100	Setting, System Password
	Model*	(*YASKAWA)	None, P1000 <= 11KW, P1000 > 11KW	Setting, System Password
	Modbus control		Monitor, & Control on/ off, and Manual speed, and Auto speed	Setting, System Password
	Ackn. alarm reset drive		NO, YES	Setting, System Password
VFDrive 1, VFDrive 2	Max set frequency VFD		0.1 Hz	Setting, System Password
	Min set frequency VFD		0.1 Hz	Setting, System Password
	Pump cap at min freq.		0.1%	Setting, System Password
	Set manual frequency		0.1 Hz	Setting, System Password
	Set reverse frequency		0.1 Hz	Setting, System Password
	Control frequency		0.01 Hz	Setting, System Password
	Alarm com. error			Digital Alarm, see legend

5.30 Settings: select language

Table 5.30-1 shows the complete list of settings in select language

Table 5-30: complete list of settings of the language, under the menu item Setting – Select language

Setting	Value	Comment
System language	English, French, German, Spanish, Danish, Dutch, Italic, Norwegian, Polish, Portuguese (Brazil), Swedish, Turkish	Setting, No Password

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