Installation & Operation Manual

Elite CU362

ELITE

Safety Instructions

Read this manual carefully to learn how to safely install and operate your pump. Throughout this manual there are a number of SAFETY HAZARDS that must be read and adhered to in order to prevent possible personal injury and/or damage to the equipment.

Three keywords, “DANGER” ,“WARNING”, and “CAUTION”, are used to indicate the potential severity of the hazard, and are preceded by a SAFETY ALERT SYMBOL. Failure to follow the safety-related instructions may result in a safety hazard.

DANGER Indicates an imminently hazardous situation which, if not avoided, WILL result in serious injury or death.

WARNING Indicates a potentially hazardous situation which, if not avoided,

Could result in serious injury or death.

CAUTION Indicates a potentially hazardous situation which, if not avoided,

May result in minor or moderate injury.

THOROUGHLY REVIEW ALL INSTRUCTIONS AND WARNINGS PRIOR TO PERFORMING ANY WORK ON THIS PUMP.

Introduction:

Because panel installations are seldom identical, this manual cannot possibly provide detailed instructions and precautions for each specific application. Therefore, it is the responsibility and the duty of all personnel involved in the installation, operation and maintenance of the equipment to ensure that applications not addressed in this manual are performed only after establishing that neither operator safety nor panel integrity are compromised by the installation.

Pre-Installation Check:

Open all cartons and inspect for shipping damage. Report any damage to your supplier or shipping carrier immediately. Always verify that the panel nameplate Voltage, Phase, and HP ratings as well as Amps rating on panel match your pumps and power supply. Warranty does not cover damage caused by connecting panels to an incorrect power source (i.e., voltage and phase).

Installation:

Electrical connections are to be made by a qualified electrician in accordance with the National Electrical Code (NEC) or the Canadian Electrical Code, as well all national, state and local codes. Code questions should be directed to your local electrical inspector. Failure to follow electrical codes and OSHA safety standards may result in personal injury or equipment damage. Failure to follow manufacturer’s installation instructions may result in electrical shock, fire hazard, personal injury or death, damaged equipment, provide unsatisfactory performance, and may void the manufacturer’s warranty.

Motor must have a properly sized starter with a properly sized heater to provide overload and under voltage protection unless motor meets following two conditions: single phase and motor horsepower is 1HP or less. Motors that satisfy these two conditions have built-in thermal overload protection.

Operating personnel should be trained in the operation of the pump and any associated system.

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Sequence of Operations - Floats

Four Float Operation:

The system shall be configured for (4) four tilt type, normally open float switch operation. The bottom float will provide the “Pump(s) OFF” level. The Second Float shall provide the “Lead ON” level. The Third float shall provide the “Lag ON” level. The Top float shall provide the “High Level Alarm”.

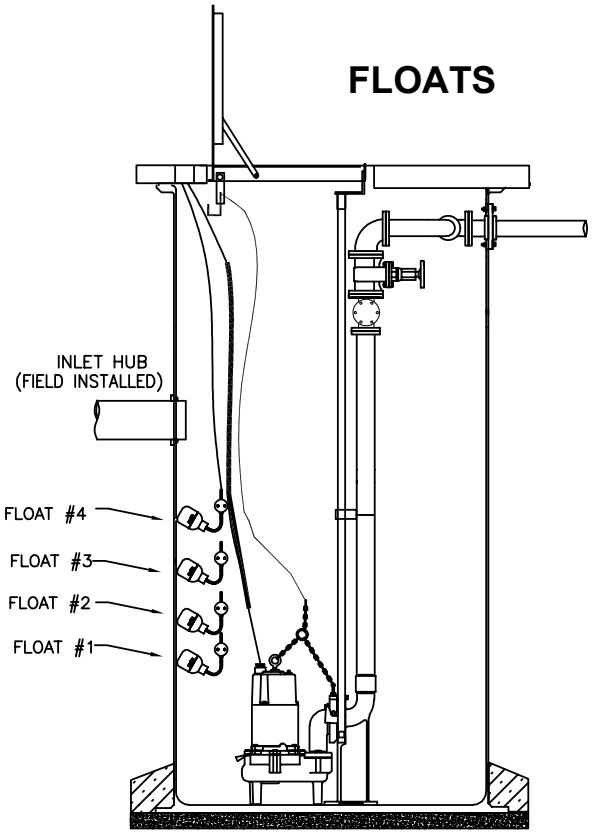
Three Float Operation:

The system shall be configured for (3) three tilt type, normally open float switch operation. The bottom Float will provide the “Pump(s) OFF” level. The Second Float shall provide the “Lead ON”level. The Top Float shall provide the “High LevelAlarm”.

Two Float Operation:

The system shall be configured for (2) two wide angle tilt type, normally open Float switch operation. Wide angle Floats provide both pump start and stop indication. The Lead Pump Float switch shall provide On/Off input to the Grundfos CU362 for the Lead Pump call-to-run.

a) Automatic pump run operation. For a complete automatic run operation see *Grundfos CU362 manual 7.0 Operation, 7.1 Overview*



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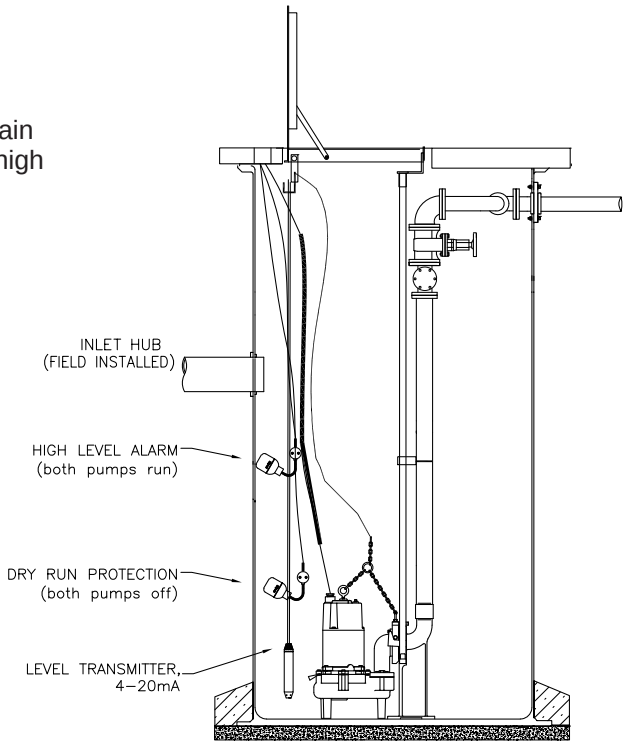
Sequence of Operations - Analog

Analog Signal Operation:

The system shall be configured for (1) one 4-20mA continuous read-out signal and (2) narrow angle type float switch operation. The 4-20mA signal will control each pump start, stop and level alarm indication. With the Lead Pump selector in "AUTO" after each pumping cycle the Grundfos CU362 shall alternate the lead pump. Should the level in the wet well rise to the actuation point of the High Level alarm, the following will occur:

1. Both Pumps will be started
2. General Alarm Red LED Beacon will illuminate
3. Alarm Buzzer will sound
4. Touchscreen will indicate "High Level Alarm"
5. General Alarm Auxiliary contact for the BAS will close

The alarm buzzer can be silenced by pushing the silence button on the exterior door, however, both pumps will continue to run, the alarm beacon will remain on and the auxiliary alarm contact will remain closed until the level in the wet well pumps down and the lag pump/high level alarm set points reset.



Back-Up Two Float Operation:

The system shall be configured for (2) two tilt type float switch for back-up operation should the transducer fail. The narrow angle floats provide both high level alarm indication and dry run pump protection. The Dry Run Float shall provide the "Pump(s) Off" input to the Grundfos CU362. Should the level in the wet well fall to the actuation point of the dry run float, both pumps will be stopped. The High Level Float switch provides both "Pump(s) On" and "High Level Alarm" indication. Should the the level in the wet well rise to the actuation point of the High Level Alarm float, the following will occur:

1. Both Pumps will be started
2. General Alarm Red LED Beacon will illuminate
3. Alarm Buzzer will sound
4. Touchscreen will flash "High Level Alarm"
5. General Alarm Auxiliary contact for the BAS will close

The alarm buzzer can be silenced by pushing the silence button on the exterior door; however, both pumps will continue to run, the alarm beacon will remain on and the auxiliary alarm contacts will remain closed until the level in the wet well fall to the Dry Run float and the high level alarm float resets.

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System Alarms

Water-In-Oil, option "W":

Requires Grundfos IO113 module. Refer to Grundfos IO113 manual.

Seal Failure Alarm, option "S":

The system shall be configured with a seal fail relay relay that utilizes moisture sensing probes. During a pump seal failure alarm condition the following will occur:

1. General Alarm Red LED Beacon will illuminate
2. Touchscreen will flash "Sea Fail Pump #1" or "Seal Fail Pump #2"
3. General Alarm Auxiliary contact for the BAS will close

The pumps will continue to run regardless of the Seal Failure alarm. The alarm beacon will remain on and the general alarm contact will remain closed until the seal failure condition has been corrected and cleared. See Grundfos CU362 manual, section 7.4 Resetting Alarms. To view alarms, see section 8.1 CU362 Manual.

Moisture Switch Alarm, option "M":

The system shall be configured for a contact, normally closed. The moisture switch alarm utilizes a contact to confirm if there is moisture present. During a pump moisture switch alarm condition the following will occur:

1. General Alarm Red LED Beacon will illuminate
2. Alarm Buzzer will sound
3. Touchscreen will flash "Moisture Alarm Pump #1" or "Moisture Alarm Pump #2"
4. General Alarm Auxiliary contact for the BAS will close

The pumps will continue to run regardless of the Moisture Switch alarm. The alarm beacon will remain on and the general alarm contact will remain closed until the moisture switch alarm condition has been corrected and cleared. See Grundfos CU362 manual, section 7.4 Resetting Alarms. To view alarms, see section 8.1 CU362 Manual.

High Temperature Alarm, option "H":

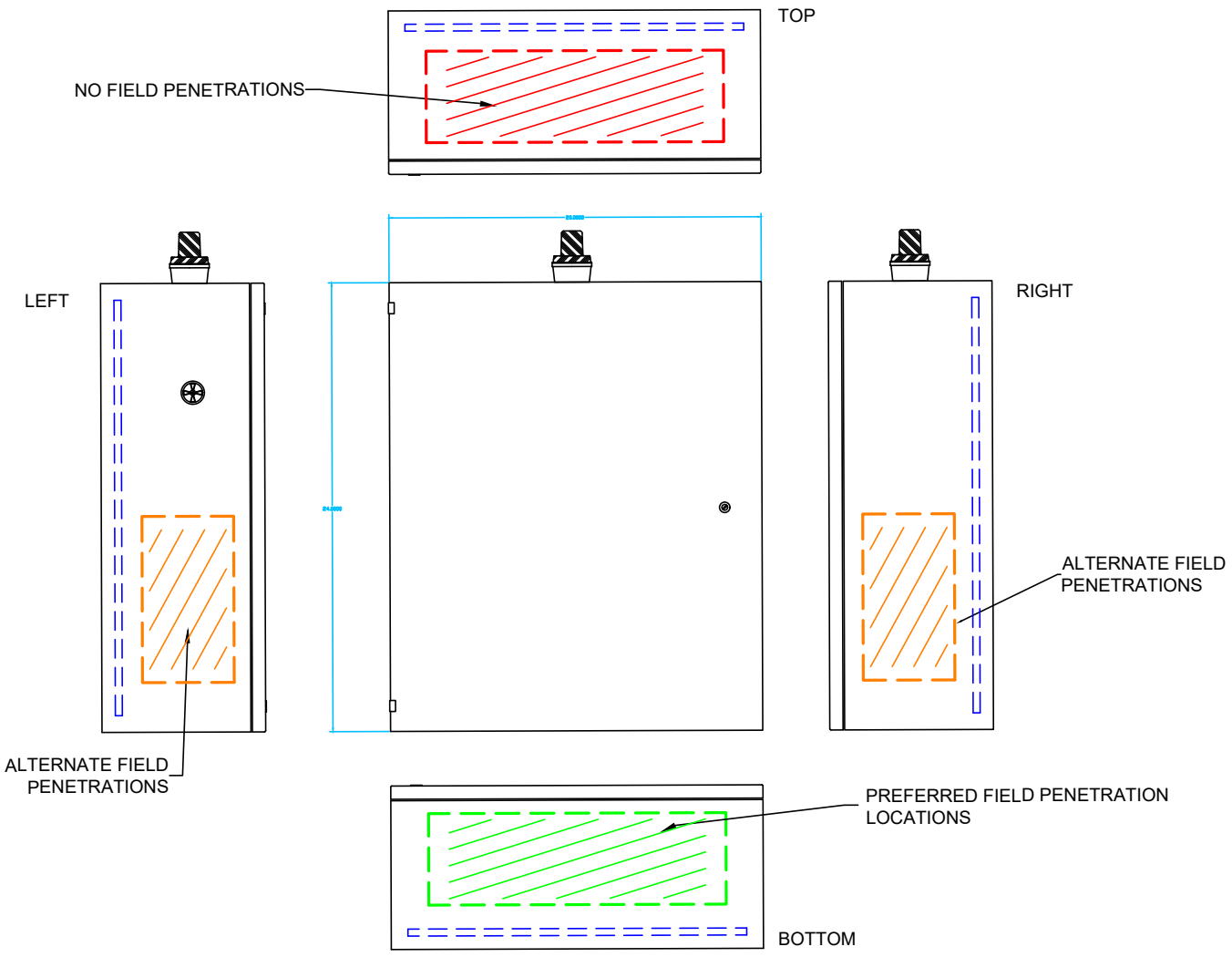
The system shall be configured for a contact, normally closed. The high temperature condition alarm utilizes a contact to confirm if there is a high temperature condition. During a high temp alarm condition the following will occur:

1. The affected pump will be disabled
2. The unaffected pump will be made Lead pump
3. General Alarm Red LED Beacon will illuminate
4. Alarm Buzzer will sound
5. Touchscreen will flash "High Temp Pump #1" or "High Temp Pump #2"
6. General Alarm Auxiliary contact for the BAS will close

The alarm buzzer can be silenced by pushing the silence button on the exterior door, however; the affected pump(s) will remain disabled, the alarm beacon will remain on and the general alarm contact will remain closed until the high temp alarm condition has been corrected and cleared. See Grundfos CU362 manual, section 7.4 Resetting Alarms. To view alarms, see section 8.1 CU362 Manual.

Field Penetration

*** URGENT ***
ANY FIELD PENETRATIONS IN LOCATIONS OTHER THEN FACTORY AUTHORIZED AREAS WILL ***VOID MANUFACTURERS WARRANTY*** OF ALL INTERNAL COMPONENTS.



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Dedicated Controls

Software description

Installation and operating instructions

Original installation and operating instructions.

CONTENTS

Warning

Prior to installation, read these installation and operating instructions. Installation and operation must comply with local regulations and accepted codes of good practice.

1. Symbols used in this document

Warning

If these safety instructions are not observed, it may result in personal injury.

Caution ***If these safety instructions are not observed, it may result in malfunction or damage to the equipment.***

Note ***Notes or instructions that make the job easier and ensure safe operation.***

2. Scope of these instructions

These installation and operating instructions apply to Grundfos wastewater pits with a Grundfos Dedicated Controls system. The Dedicated Controls system is designed to drain a wastewater pit with up to six pumps.

Note ***The Dedicated Controls system cannot be used to fill a tank or reservoir.***

The subcomponents in the control cabinet are only described in these instructions when they are important for the operation of the Dedicated Controls system.

This document describes the following:

- general use of the CU 362 operator display
- each of the main menus in the display
- functions in each of the menus.

Further documentation supplied with Dedicated Controls:

- installation and operating instructions for Dedicated Controls
- safety instructions for Dedicated Controls
- quick guide for Dedicated Controls
- Dedicated Controls support CD-ROM:
  - this software description
  - additional instructions (CU 362, IO 351B, IO 11X, CIM 2XX, etc.)
  - functional profiles
  - PC Tools.

3. Section overview

This section is intended as a link guide to the rest of the sections in this document.

4. CU 362 operator display

The displays shown in the following sections are to be regarded as examples.

Note

The display shown may differ from the current display on the CU 362 as the display depends on the installed components and the actual configuration of the system.

4.1 Buttons and indicator lights

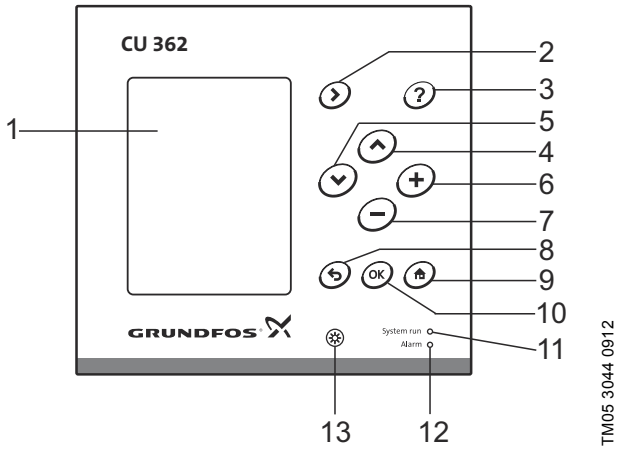


Fig. 1 CU 362 operator display

Pos.	Button/ indicator light	Description
1		LCD display.
2		Changes to next column in menu structure.
3		Changes to help text.
4		Goes up in lists.
5		Goes down in lists.
6		Increases the value of a selected parameter.
7		Decreases the value of a selected parameter.
8		Goes one display back.
9		Goes back to menu "Status".
10		Saves a value.
11		Green indicator light (operation).
12		Red indicator light (alarm).
13		Changes the brightness of the display.

Active buttons are backlit.

Arrow right (menu)

Press to go to the next column in the menu structure.
If pressed in the last column, it changes to the first column to the left.

Help

Press to display the relevant help text. All the elements in the display have a selectable help text.

Press to close the help text window.

Up and down

Press or to go up or down in lists.

If a text is marked, press to select the line above. Press to select the line below.

If is pressed on the bottom line of the list, it moves to the top of the list.

If is pressed on the top line of the list, it moves to the bottom of the list.

Plus and minus

Press or to increase or decrease the value of a selected parameter.

Back

Press to return to the previous display in the menu.

Press to cancel a change.

Ok

Use as enter button.

Also use to begin the process of changing a value and to save the change.

Home

Press to return to the system overview display.

Brightness

Press the brightness button to change the display brightness.

Press or to increase or decrease the brightness.

Indicator lights

The CU 362 control panel incorporates two indicator lights.

The green indicator light is on when the power supply has been switched on.

The red indicator light will be on if there is an alarm. The fault can be identified from the alarm list.

4.2 Display layout

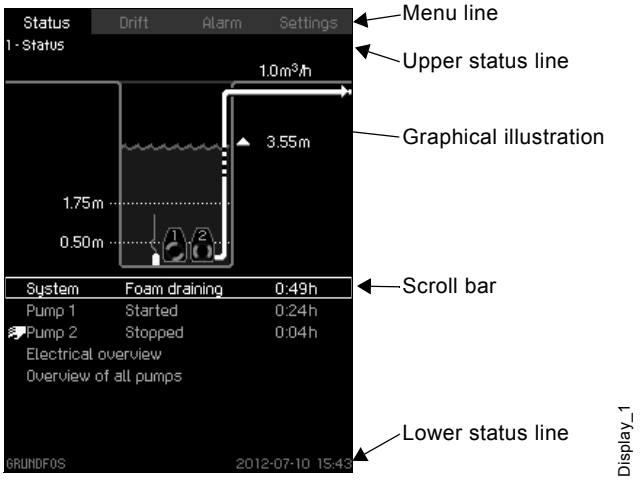


Fig. 2 Example of an application with two pumps

Menu line

The display has four main menus:

Status	Indication of system status
Operation	Daily changes of operating parameters (password option)
Alarm	Alarm log for fault finding purposes
Settings	Change of system configuration (password option)

Each individual display in the menus has a unique number which makes it easy to navigate through the displays.

The first number relates to the main menu (1 = Status, 2 = Operation, 3 = Alarm, 4 = Settings).

The second number relates to submenus.

The third number may relate to a submenu, but it can also relate to a function or actual system status.

For use of the individual menus, see section *5. Main menus*.

Upper status line

The upper status line shows the following:

- position in menu structure (left side)
- status (actual operation, alarm) (right side).

Lower status line

The lower status line shows the following:

- system name (left side)
- date and time (right side).

Graphical illustration

The graphical illustration may show a status, a historical indication or other elements, depending on the position in the menu structure.

The illustration may show the entire system or part of it as well as various settings.

A graphical illustration is always shown with a list describing the graphical elements (see "List").

List

The list contains one or more lines of information grouped to the left and to the right.

Text is shown to the left, values to the right.

Headings and empty lines cannot be selected.

Scroll bar

If the list of elements exceeds the display, move-up and move-down symbols will appear in the scroll bar to the right. Use ⊙ or ⊙ to move up or down in the list.

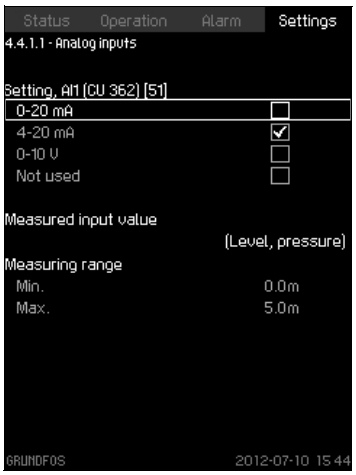
Note ***Focus is marked with a frame.***

4.3 Functions

4.3.1 Change of values

To change a value, proceed as follows:

1. Select the line to be changed.
2. Use ⊕ or ⊖ to change the value (the focus frame is still flashing).
3. Press ⊙ to accept or select the relevant tick box.



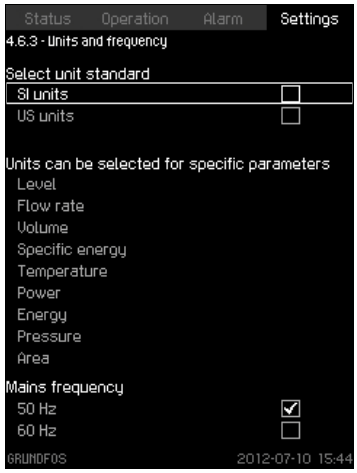
Display_4.4.1.1

Fig. 3 Example of change of values

4.3.2 Help texts

Press ⊙ to display the relevant help text. All the elements in the display have a selectable help text.

Press ⊙ to close the help text window.



Display_4.6.3

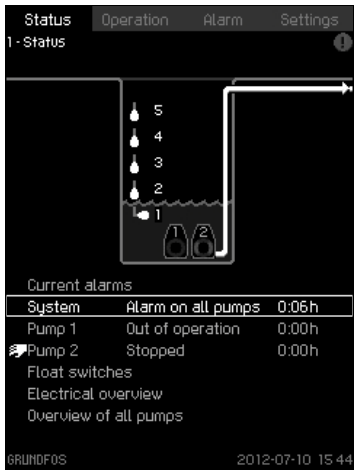
Fig. 4 Example of the help dialogue box

4.3.3 Password

In this display, it is possible to limit the access to menu "Operation" and "Settings" by means of a password.

If the access is limited, it is not possible to view or set any parameters in the menus.

A password must have four digits.



Display_2

Fig. 5 Example of the password dialogue box

5. Main menus

5.1 Using the menus

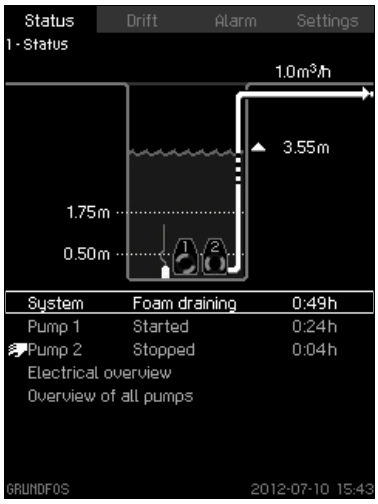
The following sections give a short description of the four main menus ("Status", "Operation", "Alarm" and "Settings").

5.1.1 Status

Menu "Status" gives a quick overview of the system.

"Status" also shows current alarms, indicated by a small bell on the right side of the upper status line and an alarm line in the list. The user can thus skip directly to the alarm display.

See section *6. Status* for a detailed description.



Display_1

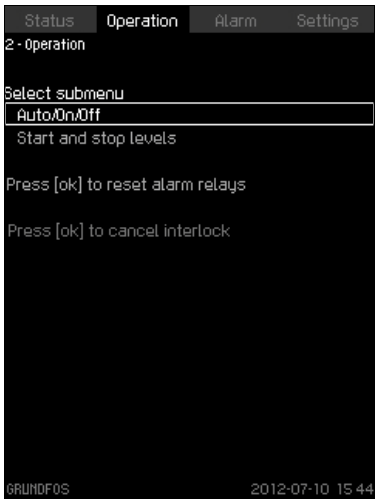
Fig. 6 Example of menu "Status"

5.1.2 Operation

This menu is used for daily settings, such as start/stop and automatic/manual control.

Other settings are entered in menu "Settings".

See section *7. Operation* for a detailed description.



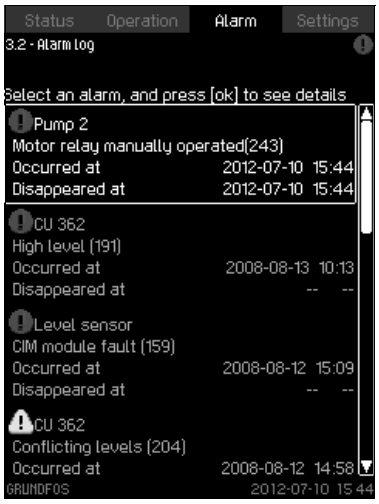
Display_2

Fig. 7 Example of menu "Operation"

5.1.3 Alarm

Menu "Alarm" is used as an alarm log. The alarm log stores a record of up to 24 alarms.

See section *8. Alarm* for a detailed description.



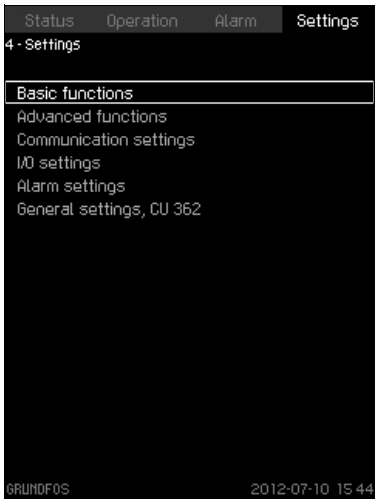
Display_3.2

Fig. 8 Example of menu "Alarm"

5.1.4 Settings

This menu is used for operating parameter settings.

See section *9. Settings* for a detailed description.



Display_4

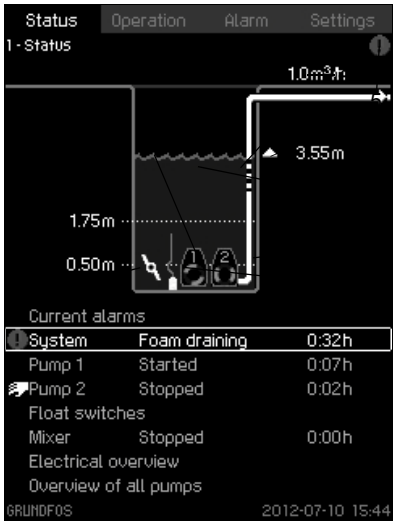
Fig. 9 Example of menu "Settings"

6. Status

This display is the main opening display which gives access to the submenus of menu "Status":

- Current alarms (only visible if an alarm is active).
  – See section *8.1 Current alarms*.
- System.
  – See section *6.1 System*.
- Specific pump (1 to 6).
  – See section *6.2 Specific pump*.
- Float switches.
  – See section *6.4 Float switch status*.
- Mixer.
  – See section *6.5 Mixer*.
- Electrical overview.
  – See section *6.6 Electrical overview*.
- Overview of all pumps.
  – See section *6.2 Specific pump*.

Path: Status >



Display 1

Fig. 10 Status

Note

If the "Start level variation" function is enabled, "Start level 1" will automatically change after each pump cycle (Start level 1 - Stop level 1).

Note

If the buttons on the control panel have not been activated for 15 minutes, the CU 362 will turn off the back light in the display.

Key to display

Pos.	Description
1	Lowest start level: If the water level rises above this level, the first pump will start.
2	Lowest stop level: If the water level falls below this level, both pumps will stop.
3	The display shows that pump 1 is started. The bottom is a dotted/broken line.
4	The actual flow is measured by a flowmeter or with the help of level measurements and pit data. See section *9.1.2 Pit configuration and flow calculation*.
5	Alarm bell: The alarm bell is visible as long as there are active alarms. The red indicator light on the control panel has the same function.
6	The broken line moves up to symbolise flow. The line appears when one or both pumps are running.
7	Shows the water level as falling or rising.
8	This value and the wavy line show the current water level in the pit.
9	Mixer: The propeller rotates if the mixer is operating.
10	The display shows that pump 2 is stopped. The bottom is a thick, unbroken line.
11	Pressure sensor symbol: The sensor is shown at the bottom of the pit and represents a standard pressure sensor.

If an alarm occurs in the system, it is shown as an alarm bell next to the unit that caused the alarm.

When the system registers an alarm or warning, the following will happen:

- An alarm bell is shown on the right of the upper status line.
- The red indicator light on the control panel lights up (only in case of alarm).
- "Current alarms" appears as the first line below the pit graphics.
- The alarm relay operates.
- The indication is maintained as long as the system has an active alarm. An alarm is active until it has been reset, either automatically or manually via "Current alarms" in the status display.
- An alarm cannot be reset until the fault causing the alarm has been corrected.
  Example: An overtemperature alarm cannot be reset until the pump has cooled.

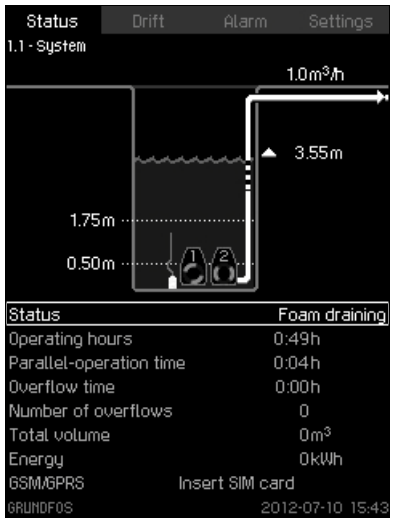
Note

Float switches and mixer will only appear if they are installed in the system.

6.1 System

This display shows the actual operating parameters of the system.

Path: Status > System >



Display_1.1

Fig. 11 System

Operating parameter	Description
Operating hours	Total number of system operating hours.
Parallel-operation time	The accumulated time in which more than one pump have been in operation.
Overflow time	Overflow duration.
Overflow volume	The estimated overflow volume, based on the latest flow calculation.
Number of overflows	The number of registered overflows.
Total volume	The accumulated volume of liquid removed. **Note:** Requires a flowmeter (analog or pulse measurement), or the volume is calculated using an analog sensor if the pit dimensions are known. For more pit configuration details, see section *9.1.2 Pit configuration and flow calculation*.
Energy	Total amount of energy in kWh.
Specific energy	Shows the specific energy, indicating the efficiency of the pump to convert the electrical energy (measured in kWh) to pumped volumes (measured in m^3). The specific energy is indicated in kWh/m^3. To be able to make a satisfactory average measurement, the measuring interval is one hour. **Note:** Requires an energy meter (pulse input or analog input).
GSM/GPRS	GSM/GPRS modem status: Ready Invalid PIN code Invalid PUK code Invalid service centre Insert SIM card SIM card defective Invalid SIM card SIM busy.

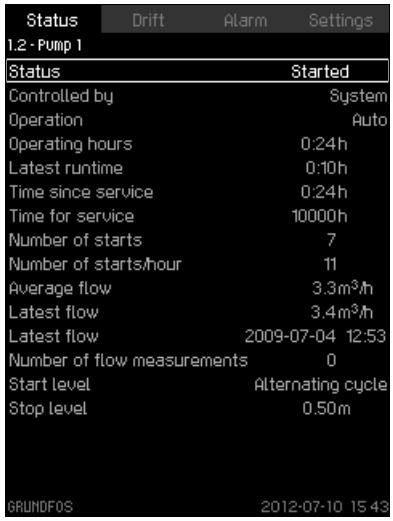
6.2 Specific pump

This display shows the actual operating parameters of pump 1.

Many parameters will show a value only if the relevant sensors and modules are fitted.

Note ***If two pumps are installed in the pit, a display for pump 2 will appear.***

Path: Status > Pump 1 >



Display_1.2

Fig. 12 Pump 1

Operating parameter	Description
Status	Shows if a pump is started or stopped.
Controlled by	CU 362 (system), manually by switch (Auto/On/Off) or via SCADA.
Operation	Shows how the system is being controlled, automatically or manually.
Operating hours	Number of hours the pump has been in operation (can be changed if another pump is installed).
Latest runtime	The pump's latest operating period.
Time since service	The time elapsed since the pump was last serviced (can be reset by Grundfos Service).
Time for service	Time until the next service is due.
Number of starts	Number of pump starts since the pump was installed/connected (can be changed if another pump is installed).
Number of starts/hour	Number of pump starts in the last hour.
Average flow	Requires an analog level sensor or flow sensor. See section *9.1.2 Pit configuration and flow calculation*.
Latest flow	The calculated/measured flow of the last pump that was running.
Number of flow measurements	Requires an analog level sensor. See section *9.1.2 Pit configuration and flow calculation*.
Motor current	The actual average current consumption. 0 A when the pump stops.
Latest current	The current value when the pump stopped. The value updates when the pump is running. Requires a current sensor/ammeter, an MP 204 or a CUE.

Start level	Requires an analog level sensor (not shown with alternating operation).
Stop level	Requires an analog level sensor.
MP 204	When an MP 204 is installed, the following parameters can be read: • MP 204, voltage • MP 204, current • MP 204, current asymmetry • MP 204, cos φ • MP 204, power • MP 204, energy • MP 204, insulation resistance • MP 204, temperature Pt • MP 204, temperature PTC (Active or Not active) • MP 204, temperature Tempcon.
IO 111	When an IO 111 is installed, the following parameters can be read: • IO 111, motor temperature (Pt sensor) • IO 111, water in oil (WIO sensor) • IO 111, insulation resistance • IO 111, moisture in motor (Active or Not active).
CUE or VFD	When either a CUE or VFD is installed, the following parameters can be read: • VFD, output freq. (CU 362 → CUE/VFD) • VFD, economy freq. • VFD, economy level • VFD, state (VFD not controlled, Stopped, Reverse start, Start flushing, Normal, Run flushing, Stop flushing, Specific-energy test) • VFD, voltage • VFD, current • VFD, power • VFD, energy • VFD, torque.

6.3 GSM/GPRS

This display shows the status of the GSM modem.

The display can be used to check the antenna conditions and for fault finding.

SIM card status

Shows the SIM card status message sent to the system.

Signal strength

A graph shows the actual signal strength.

- If the signal strength is unknown, "–" is displayed.
- If there is no signal, "No signal" is displayed.

GPRS state

Shows the GPRS network state.

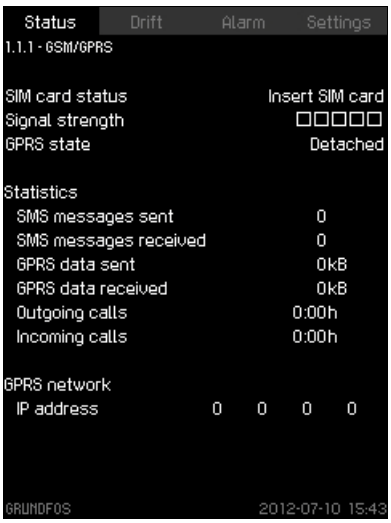
Statistics

Displays the number of sent and received SMS messages and the amount (kB) of sent and received GPRS data.

GPRS network

The current network IP address.

Path: Status > System > GSM/GPRS >



Display_1.1.1

Fig. 13 GSM/GPRS

6.4 Float switch status

This display shows the current positions and functions of the float switches.

The display can be used for function testing and fault finding.

"Off" means that the float switch is hanging downwards.

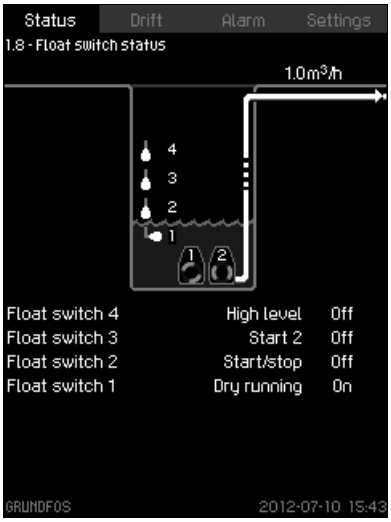
"On" means that the float switch is kept up by the water.

Example

The display shows the current positions and functions of the float switches.

- Float switch 4: High level.
- Float switch 3: Pump 2 starts.
- Float switch 2: Pump 1 starts, and both pumps stop.
- Float switch 1: Dry running.

Path: Status > Float switch status >



Display_1.8

Fig. 14 Float switch status

6.5 Mixer

This display shows the status of the mixer and the mixer counters.

The display can be used for fault finding and service.

Note ***The display will only appear if a mixer is installed.***

Path: Status > Mixer >

Display_1.9

Fig. 15 Mixer

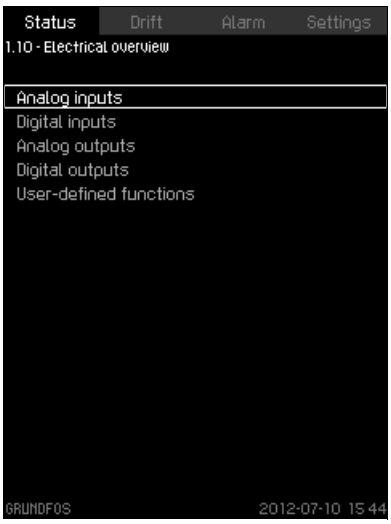
Operating parameter	Description
Status	Shows whether a mixer is started or stopped.
Operating hours	Number of hours the mixer has been in operation (can be changed if another mixer is installed).
Time since service	Time elapsed since the mixer was last serviced (can be reset by Grundfos Service).
Time for service	Time until the next service overhaul is due.
Number of starts	Number of mixer starts since the mixer was installed/connected (can be changed if another mixer is installed).
Number of starts/hour	Number of mixer starts during the last hour.

6.6 Electrical overview

This display shows an overview of the various inputs and outputs.

The submenus in this display are described in the following sections.

Path: Status > Electrical overview >



Display_1.10

Fig. 16 Electrical overview

6.6.1 Analog inputs

This display shows the status of the individual analog inputs.

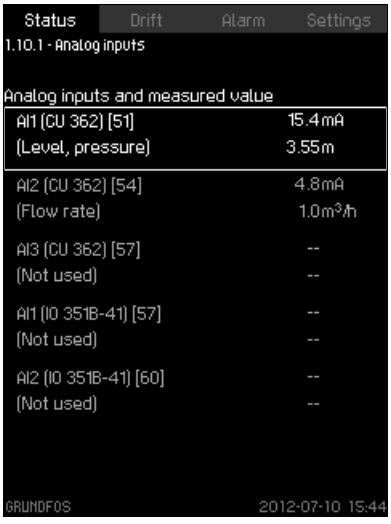
Example

Analog input AI1 (CU 361) [51]:

The AI1 analog input on the CU 362 (designated terminal 51) is set up as a current input.

The measured value of 14.9 mA corresponds to a level and a pressure of 3.40 m.

Path: Status > Electrical overview > Analog inputs >



Display_1.10.1

Fig. 17 Analog inputs

Note

If an ultrasonic sensor is used, this display only shows the "raw" value without offset and not inverted.

6.6.2 Digital inputs

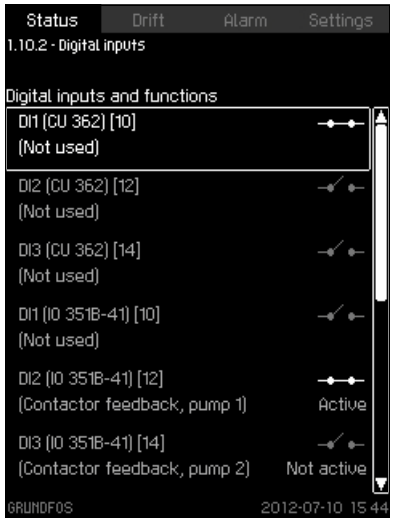
This display shows the status of the individual digital inputs.

Example

Digital input DI2 (IO351B-41) [12]:

The DI2 digital input on the IO 351B (designated terminal 12) is linked to the function "Contactor feedback, pump 1", and the contact is closed.

Path: Status > Electrical overview > Digital inputs >



Display_1.10.2

Fig. 18 Digital inputs

6.6.3 Analog outputs

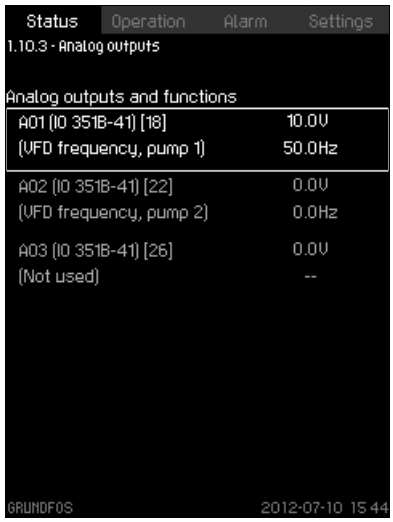
This display shows the status of the individual analog outputs.

Example

Analog output AO1 (IO351B-41) [18]:

The AO1 analog output on the IO 351B (designated terminal 18) is linked to the function "VFD frequency, pump 1", and the analog output signal is 10.0 V equal to 50.0 Hz.

Path: Status > Electrical overview > Analog outputs >



Display_1.10.3

Fig. 19 Analog outputs

6.6.4 Digital outputs

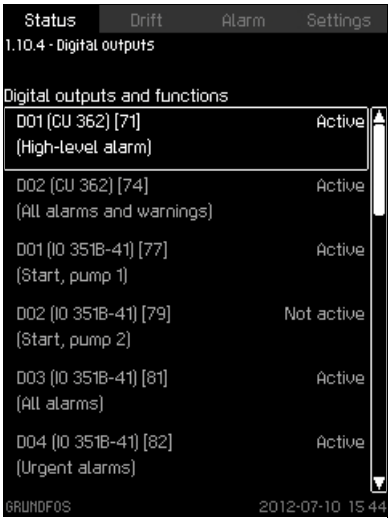
This display shows the status of the individual digital outputs.

Example

Digital output DO1 (CU 361) [71]:

The DO1 digital output on the CU 362 (designated terminal 71) is linked to "High-level alarm", and the relay is active.

Path: Status > Electrical overview > Digital outputs >



Display_1.10.4

Fig. 20 Digital outputs

6.6.5 User-defined functions

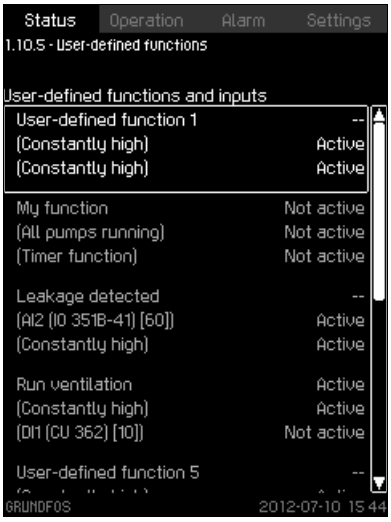
This display shows all functions (up to eight) defined by the user. Each user-defined function is shown with two sources and the selected functions. In the top right corner of each user-defined function, the actual status is shown (Active/Not active).
See section *9.2.8 User-defined functions*.

Example

The user-defined function named "Run ventilation" has been activated by the 1st source, which has been set to "Constantly high". The 2nd source has been set to "DI1 (CU 361) [10]" and is also active. This means that the ventilator is running.

"Run ventilation" is linked to a digital output. See section *6.6.4 Digital outputs*.

Path: Status > Electrical overview > User-defined functions >



Display_1.10.5

Fig. 21 User-defined functions

6.7 Overview of all pumps

This display shows the actual overview of all pumps in the system. The display is a screen saver which is active when the system is running. This display makes it easy to get all operational data without pressing any button.

The data applies to all pumps in the system:

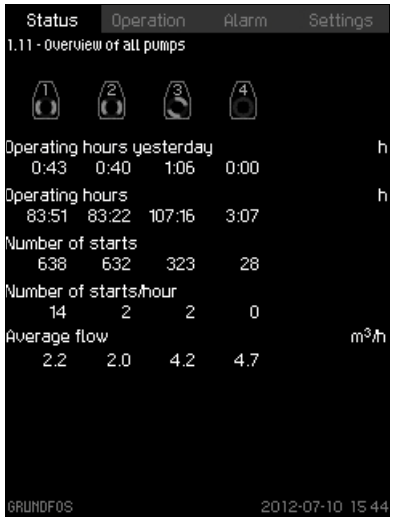
- Pumps running (shown as graphics in the display)
- Pumps stopped (shown as graphics in the display)
- Pumps out of operation (shown as graphics in the display)
- Operating hours yesterday
- Operating hours
- Number of starts
- Number of starts/hour
- Average current (sensor required)
- Average flow (sensor or calculation required)
- Total energy consumption (sensor required).

Example

Pumps 1 and 2 are stopped, pump 3 is running, and pump 4 has been taken out of operation.

Pump 2 has been in operation for 40 minutes yesterday, has been running for 83 hours and 22 minutes in total, has been started 632 times, etc.

Path: Status > Overview of all pumps



Display_1.11

Fig. 22 Overview of all pumps

7. Operation

7.1 Overview

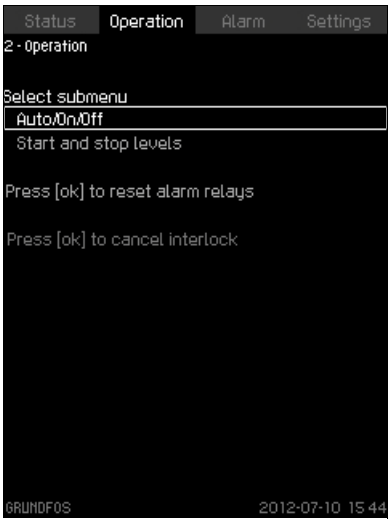
This menu contains the most common pit settings, such as start and stop levels, direct pump control (Auto/On/Off), resetting of alarm relays and cancelling of interlock.

Example

Select submenu:

- Auto/On/Off
- Start and stop levels
- Resetting alarm relays
- Cancelling interlock.

Path: Operation >



Display_2

Fig. 23 Operation

7.2 Auto/On/Off pump control

This display is used to change between operating functions.

"On" and "Off" are used to manually start or stop the pump.

The On/Off function can for example be used for testing of pumps or for forced draining.

Example

Select the function to be changed.

This dialogue box will appear:

"You are about to start or stop the pump.
Do you want to continue?".

Select "Continue" or "Cancel", and press [ok].

Possible settings:

Pump 1

- Auto (the pump is controlled automatically).
- On (the pump is running).
- Off (the pump is stopped).

Pump 2

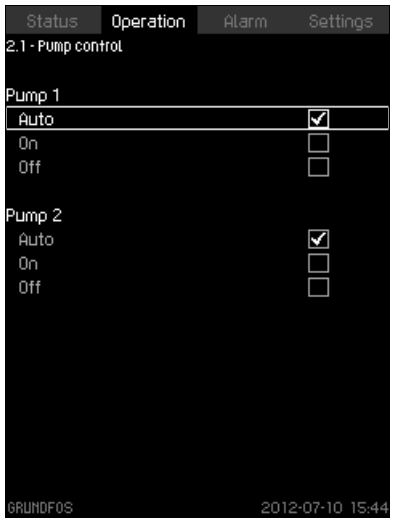
- Auto (the pump is controlled automatically).
- On (the pump is running).
- Off (the pump is stopped).

The Auto/On/Off input on the CU 362 and the IO 351B has the highest priority.

Note

The CU 362 can only start and stop the pumps automatically if the digital inputs on the CU 362 and IO 351B are set to "Auto" or the digital input for Auto/On/Off is not used.

Path: Operation > Pump control >



Display_2.1

Fig. 24 Pump control

Warning

If the pump is set to "On", all pump protection and safety settings will be disabled (except the motor protector).

Warning

If the pump is set to "Off", the float switch and other system functions will be disabled.

7.3 Start and stop levels

This display allows the user to set the stop and start levels for the pumps in the system as well as the overflow level, high level, dry-running level and foam-draining level.

Note

If the "Start level variation" function is enabled, "Start level 1" is shown in this display.
See section 9.2.10 Start level variation.

If alternation has been disabled, the pumps are numbered according to their position. "Start level 1" and "Stop level 1" apply to the pump connected as number 1 in the system.

In connection with alternation, this one-to-one rule does not apply. This means that the lowest level always starts one pump and the next level starts the other pump.

In connection with alternation, the number of operating hours is distributed equally between the two pumps.

The system ensures that the below rules are observed by automatically adjusting the other levels accordingly to meet the rules:

- The alarm level must be higher than the lowest start level and lower than high level.
- The pump start level must always be higher than the stop level of the same pump.
- The dry-running level is always lower than the lowest stop level.

At the overflow level, the water runs over the edge of the pit or into an overflow channel. The overflow level typically lies between the highest start level and the edge of the pit.

If, in addition to the level sensor, the system incorporates a high-level float switch and/or a dry-running float switch, this must be selected. See section *9.1.4 Float switch functions*.

In the pit, the high-level float switch must be physically installed above the level indicated as high level, otherwise "Conflicting levels" and "Level sensor" alarms will be triggered.

The dry-running float switch must be physically installed below the level indicated as dry-running level, otherwise "Conflicting levels" and "Level sensor" alarms will be triggered.

When the high-level float switch is activated, it triggers a high-level alarm. All pumps will start, but the number of starting pumps depends on the number of pumps in each pump group.

For the purpose of emergency operation in the event of a defective sensor, the time from the deactivation of the high-level float switch to the stopping of the pumps can be set. The length of this time is best found by trial and error, as it depends on the actual amount of water the pumps are capable of moving.
See section *9.1.3 Pump delays*.

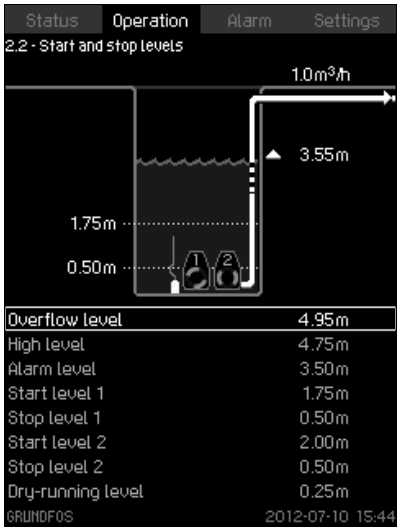
Example

Select the level to be changed, and use ⊕ and ⊖ to select the new value. Press [ok] to save the new value.

The display shows the current settings of the following:

- Overflow level
- High level
- Alarm level
- Start level 1
- Stop level 1
- Start level 2
- Stop level 2
- Dry-running level.

Path: Operation > Start and stop levels >



Display_2.2

Fig. 25 Start and stop levels

Display text	Description
Overflow level	When this level is reached, the water runs over the edge of the pit or into an overflow channel. This level triggers an overflow alarm.
High level	This level indicates high water level. When this level is reached, the system will attempt to start both pumps (the number of pumps can be limited).
Alarm level	An alarm level triggers an alarm, if desired. See section *9.5.1 System alarms*.
Start level 1	This is the lowest start level. At this level, the first pump will start (not necessarily pump 1, it depends on if the pumps have been enabled for alternating operation). See section *9.1.1 Primary settings*.
Stop level 1	This is the lowest stop level. At this level, the first pump will stop. This level can be set between the dry-running level and start level 1.
Start level 2	This is the next start level. This level must always be the same or higher than start level 1.
Stop level 2	This is the next stop level. At this level, the other pump will stop. This level must always be the same or higher than stop level 1.
Dry-running level	When this level is reached, the system will (again) try to stop both pumps. This level triggers an alarm, if desired. See section *9.5.1 System alarms*.

7.4 Resetting alarm relays

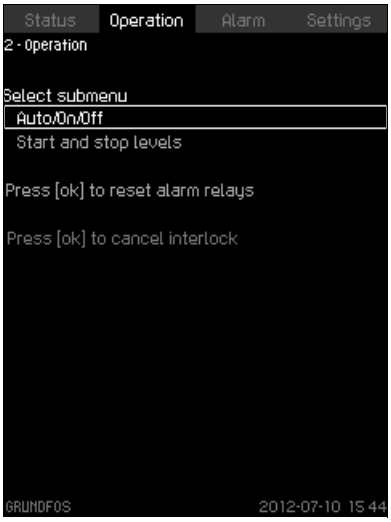
Alarm relays can be reset in this display.

The alarm relays can be reset by pressing the reset button (if installed) or by pressing [ok] in the line "Press [ok] to reset alarm relays".

The interlock function can be cancelled by pressing [ok] when the line is highlighted. When the interlock function is cancelled, the line turns grey. The interlock function is cancelled until a new interlock command is received, either from the SCADA system or from another pit downstream.

Note ***Cancel the interlock function in this display.***

Path: Operation >



Display_2

Fig. 26 Operation

8. Alarm

This display shows an overview of the submenus of menu "Alarm".

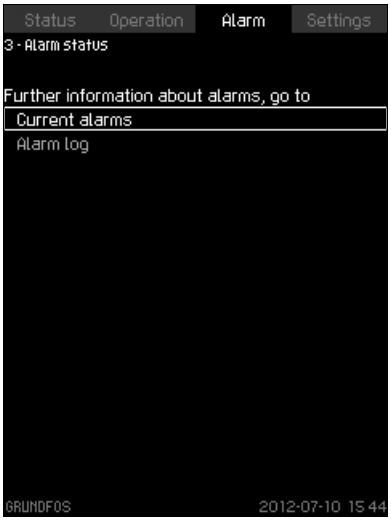
In this menu, it is possible to see current alarms, to reset alarms and to see the alarm log.

A system fault or a monitored component can generate an alarm ⊗ or a warning ⚠ in addition to the fault indication via the alarm/warning relay and the red indicator light on the CU 362.

An alarm can cause a change of the operating mode, e.g. from start to stop.

A warning will be reported, but will not cause the system to stop.

Path: Alarm > Alarm status >



Display_3

Fig. 27 Alarm status

8.1 Current alarms

This display shows all active system warnings and alarms.

An alarm can only be reset when it is no longer active. An alarm can be reset when date and time are given to the right of "Disappeared at". Press [ok] to reset all alarms that have disappeared.

See section *8.2 Alarm log*.

Symbol	Description
⊗	Alarm
⚠	Warning

This menu shows the following:

- Warnings ⚠ caused by faults that still exist.
- Warnings ⚠ caused by faults that have disappeared, but the warning requires manual resetting.
- Alarms ⊗ caused by faults that still exist.
- Alarms ⊗ caused by faults that have disappeared, but the alarm requires manual resetting.

All warnings and alarms with automatic resetting are automatically removed from the menu when the fault has been corrected.

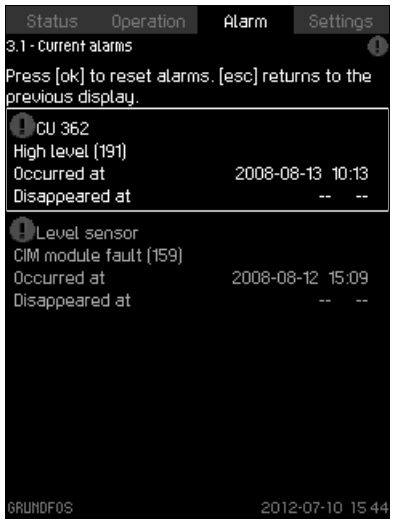
Alarms requiring manual resetting are reset in this display by pressing [ok].

For every warning or alarm, the following is shown:

- Whether it is a warning ⚠ or an alarm ⊗.
- Where the fault occurred: System, Pump 1, Pump 2, etc.
- What the cause of the fault is, and the alarm code in brackets, e.g. High level (191).
- When the fault occurred: Date and time.
- When the fault disappeared: Date and time. If the fault still exists, date and time are shown as --...--.

The latest warning or alarm is shown at the top of the display.

Path: Alarm > Alarm status > Current alarms >



Display_3.1

Fig. 28 Current alarms

8.2 Alarm log

The alarm log can store up to 24 warnings and alarms.

For every warning or alarm, the following is shown:

- Whether it is a warning ⚠ or an alarm ⊗.
- Where the fault occurred: System, Pump 1, Pump 2, etc.
- In the case of an input-related fault, the input will appear.
- What the cause of the fault is, and the alarm code in brackets, e.g. warning: Conflicting levels (204), etc.
- When the fault occurred: Date and time.
- When the fault disappeared: Date and time. If the fault still exists, date and time are shown as --...--.

The latest warning or alarm is shown at the top of the display.

Example

The display shows one warning and three alarms, two of which are still active.

To reset alarms, see section *8.1 Current alarms*.

Note ***An alarm cannot be reset until the fault has been corrected.***

Path: Alarm > Alarm status > Alarm log >

Display_3.2

Fig. 29 Alarm log

8.3 Alarm and warning codes

This is a list of general Grundfos alarm and warning codes.
Not all codes apply to the CU 362.

Code	Description	Code	Description	Code	Description
1	Leakage current	**35**	Gas in pump head, deaerating problem	**76**	Internal communication fault
2	Missing phase	**36**	Discharge valve leakage	**77**	Communication fault, twin-head pump
3	External fault signal	**37**	Suction valve leakage	**78**	Fault, speed plug
4	Too many restarts	**38**	Vent valve defective	**79**	Functional fault, add-on module
5	Regenerative braking	**40**	Undervoltage	**80**	Hardware fault, type 2
6	Mains fault	**41**	Undervoltage transient	**81**	Verification error, data area (RAM)
7	Too many hardware shutdowns	**42**	Cut-in fault (dV/dt)	**82**	Verification error, code area (ROM, FLASH)
8	PWM switching frequency reduced	**45**	Voltage asymmetry	**83**	Verification error, FE parameter area (EEPROM)
9	Phase sequence reversal	**48**	Overload	**84**	Memory access error
10	Communication fault, pump	**49**	Overcurrent (i_line, i_dc, i_mo)	**85**	Verification error, BE parameter area (EEPROM)
11	Water-in-oil fault (motor oil)	**50**	Motor protection function, general shutdown (mpf)	**88**	Sensor fault
12	Time for service (general service information)	**51**	Blocked motor/pump	**89**	Signal fault, (feedback) sensor 1
13	Moisture alarm, analog	**52**	Motor slip high	**90**	Signal fault, speed sensor
14	Electronic DC-link protection activated (ERP)	**53**	Kipped motor	**91**	Signal fault, temperature 1 sensor
15	Communication fault, main system (SCADA)	**54**	Motor protection function, 3 sec. limit	**92**	Calibration fault, (feedback) sensor
16	Other	**55**	Motor current protection activated (MCP)	**93**	Signal fault, sensor 2
17	Performance requirement cannot be met	**56**	Underload	**94**	Limit exceeded, sensor 1
18	Commanded alarm standby (trip)	**57**	Dry running	**95**	Limit exceeded, sensor 2
19	Diaphragm break (dosing pump)	**58**	Low flow	**96**	Setpoint signal outside range
20	Insulation resistance low	**59**	No flow	**97**	Signal fault, setpoint input
21	Too many starts per hour	**64**	Overtemperature	**98**	Signal fault, input for setpoint influence
22	Moisture switch alarm, digital	**65**	Motor temperature 1 (t_m or t_mo or t_mo1)	**99**	Signal fault, input for analog setpoint
23	Smart trim gap alarm	**66**	Temperature, control electronics (t_e)	**104**	Software shutdown
24	Vibration	**67**	Temperature too high, internal frequency converter module (t_m)	**105**	Electronic rectifier protection activated (ERP)
25	Setup conflict	**68**	External temperature/water temperature (t_w)	**106**	Electronic inverter protection activated (EIP)
26	Load continues even if the motor has been switched off	**69**	Thermal relay 1 in motor (e.g. Klixon)	**110**	Skew load, electrical asymmetry
27	External motor protector activated (e.g. MP 204)	**70**	Thermal relay 2 in motor (e.g. thermistor)	**111**	Current asymmetry
28	Battery low	**71**	Motor temperature 2 (Pt100, t_mo2)	**112**	cos φ too high
29	Turbine operation (impellers forced backwards)	**72**	Hardware fault, type 1	**113**	cos φ too low
30	Change bearings (specific service information)	**73**	Hardware shutdown (HSD)	**120**	Auxiliary winding fault (single-phase motors)
31	Change varistor(s) (specific service information)	**74**	Internal supply voltage too high	**121**	Auxiliary winding current too high (single-phase motors)
32	Overvoltage	**75**	Internal supply voltage too low	**122**	Auxiliary winding current too low (single-phase motors)

Code	Description	Code	Description	Code	Description
123	Start capacitor, low (single-phase motors)	**183**	Signal fault, extra temperature sensor	**215**	Soft pressure build-up timeout
124	Run capacitor, low (single-phase motors)	**184**	Signal fault, general-purpose sensor	**216**	Pilot pump alarm
144	Motor temperature 3 (Pt100, t_mo3)	**185**	Unknown sensor type	**217**	Alarm, general-purpose sensor high
145	Bearing temperature high (Pt100), in general or top bearing	**186**	Signal fault, power meter sensor	**218**	Alarm, general-purpose sensor low
146	Bearing temperature high (Pt100), middle bearing	**187**	Signal fault, energy meter	**219**	Pressure relief not adequate
147	Bearing temperature high (Pt100), bottom bearing	**188**	Signal fault, user-defined sensor	**220**	Fault, motor contactor feedback
148	Motor bearing temperature high (Pt100) in drive end (DE)	**189**	Signal fault, level sensor	**221**	Fault, mixer contactor feedback
149	Motor bearing temperature high (Pt100) in non-drive end (NDE)	**190**	Sensor limit 1 exceeded (e.g. alarm level in WW application)	**222**	Time for service, mixer
152	Communication fault, add-on module	**191**	Sensor limit 2 exceeded (e.g. high level in WW application)	**223**	Maximum number of mixer starts per hour exceeded
153	Fault, analog output	**192**	Sensor limit 3 exceeded (e.g. overflow level in WW application)	**224**	Pump fault (due to auxiliary component or general fault)
154	Communication fault, display	**193**	Sensor limit 4 exceeded	**225**	Communication fault, pump module
155	Inrush fault	**194**	Sensor limit 5 exceeded	**226**	Communication fault, I/O module
156	Communication fault, internal frequency converter module	**195**	Sensor limit 6 exceeded	**227**	Combi event
157	Real-time clock out of order	**196**	Operation with reduced efficiency	**228**	Not used
158	Hardware circuit measurement fault	**197**	Operation with reduced pressure	**229**	Not used
159	CIM fault (Communication Interface Module)	**198**	Operation with increased power consumption	**230**	Network alarm
160	GSM modem, SIM card fault	**199**	Process out of range (monitoring/ estimation/calculation/control)	**231**	Ethernet: No IP address from DHCP server
168	Signal fault, pressure sensor	**200**	Application alarm	**232**	Ethernet: Auto-disabled due to misuse
169	Signal fault, flow sensor	**201**	External sensor input high	**233**	Ethernet: IP address conflict
170	Signal fault, water-in-oil (WIO) sensor	**202**	External sensor input low	**236**	Pump 1 fault
171	Signal fault, moisture sensor	**203**	Alarm on all pumps	**237**	Pump 2 fault
172	Signal fault, atmospheric pressure sensor	**204**	Inconsistency between sensors	**238**	Pump 3 fault
173	Signal fault, rotor position sensor (Hall sensor)	**205**	Level float switch sequence inconsistency	**239**	Pump 4 fault
174	Signal fault, rotor origo sensor	**206**	Water shortage, level 1	**240**	Lubricate bearings (specific service information)
175	Signal fault, temperature 2 sensor (t_mo2)	**207**	Water leakage	**241**	Motor phase failure
176	Signal fault, temperature 3 sensor (t_mo3)	**208**	Cavitation	**242**	Automatic motor model recognition failed
177	Signal fault, Smart trim gap sensor	**209**	Non-return valve fault	**243**	Motor relay has been forced (manually operated/commanded)
178	Signal fault, vibration sensor	**210**	Overpressure	**244**	Fault, On/Off/Auto switch
179	Signal fault, bearing temperature sensor (Pt100), general or top bearing	**211**	Underpressure	**245**	Pump continuous runtime too long
180	Signal fault, bearing temperature sensor (Pt100), middle bearing	**212**	Diaphragm tank precharge pressure out of range	**246**	User-defined relay has been forced (manually operated/ commanded)
181	Signal fault, PTC sensor (short-circuited)	**213**	VFD not ready	**247**	Power-on notice (device/system has been switched off)
182	Signal fault, bearing temperature sensor (Pt100), bottom bearing	**214**	Water shortage, level 2	**248**	Fault, battery/UPS

9. Settings

This display shows an overview of the submenus of menu "Settings".

Basic functions

A series of basic functions must be set up in this menu before the system can operate.

See section *9.1 Basic functions*.

Most of these functions have already been set up via the configuration wizard.

Submenus:

- Primary settings
- Pit configuration and flow calculation
- Pump delays
- Float switch function
- Out of operation
- Modules installed.

Example: Number of pumps, control mode, installation name and the wastewater pit settings are just some of the functions that can be set up by the configuration wizard.

Advanced functions

Functions that affect the daily operation of the system are set in this menu.

See section *9.2 Advanced functions*.

Submenus:

- Anti-seizing
- Daily emptying
- Foam draining
- Mixer configuration
- Adjustment of counters
- Resetting alarm log
- Pump groups
- User-defined functions
- Variable-frequency drives
- Start level variation
- Anti-blocking
- Overflow.

Communication settings

The type of communication module supplied with the system is set in this menu.

See section *9.3 Communication settings*.

Submenus:

- Select the communication module installed
- Ethernet
- Fieldbus addresses
- SMS numbers
- SMS schedule
- SMS heartbeat message
- SMS authentication
- GSM and SIM card settings
- SCADA settings
- Interlock settings
- GPRS settings.

If the communication is via GSM/GPRS, the SCADA phone number and SMS must be set up in this menu. Furthermore, the GPRS network coupling info is entered via this menu.

SMS schedules and service periods can also be set up in this menu. If required, the frequency of heartbeat messages can be set in this menu, i.e. how often the system reports it is 'alive'.

Note ***The number of submenus depends on the selected CIM module.***

I/O settings

The individual inputs, outputs and relays are set up in this menu.

See section *9.4 I/O settings*.

Submenus:

- Analog inputs
- Digital inputs
- Analog outputs
- Digital outputs
- Counter inputs
- Alarm relays.

Alarm settings

In this menu, proceed as follows:

1. Select the alarms and warnings to be monitored.
2. Enable the required alarms and warnings.
3. Set the alarm and warning limits, and select SCADA or SMS messaging, if required.

See section *9.5 Alarm settings*.

Submenus:

- System alarms
- Pump alarms
  - Alarms, pump group 1
  - Alarms, pump group 2.
- Mixer alarms
- Combi alarms.

General settings, CU 361

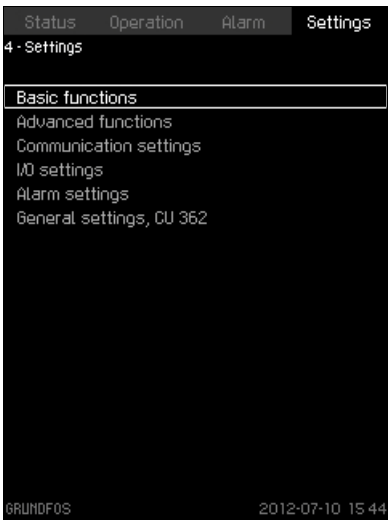
The display language, units, date, time, password, Ethernet address and GENIbus number are set in this menu. The software version is also given in this menu.

See section *9.6 General settings, CU 362*.

Submenus:

- Run configuration wizard again
- Display language
- Units and frequency
- Date and time
- Password
- Ethernet
- Fieldbus addresses
- Software status.

Path: Settings >



Display_4

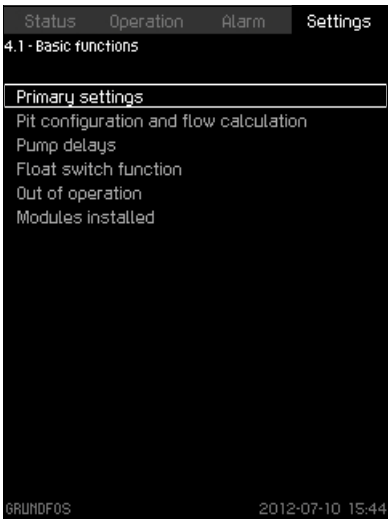
Fig. 30 Settings

9.1 Basic functions

This display shows the options in menu "Basic functions".

A series of basic functions must be set up in this menu before the system can operate.

Path: Settings > Basic functions >



Display_4.1

Fig. 31 Basic functions

9.1.1 Primary settings

The key system functions are set in this display.

Number of pumps

The number of pumps in the system is entered under "Number of pumps".

Level control

Under "Level control", it can be set how the level in the pit should be measured.

Options:

- **Float switches**
  When only float switches are used, the total number of float switches used must be given. Float switch setup details are given in section *Analog sensor with safety float switches*, Display_4.1.4.
- **Pressure sensor**
  When an analog pressure sensor is used, special attention must be given to the sensor setting. See section *9.4.1 Analog inputs*.

Note ***Float switches can be used as safety high-level and dry-running float switches.***

- **Ultrasonic sensor**
  When an ultrasonic sensor is used, special attention must be given to the sensor setting.
  See section *9.4.1 Analog inputs*.
  The user must state if the measuring signal is for water depth or distance from the top of the pump pit to the water level. When the distance to the water level is being measured, the user must enter an "Offset". This offset gives the distance from the ultrasonic sensor to the top of the pit. Furthermore, the "Inverted" function must be selected (it is shown if an ultrasonic sensor is selected).

Backup battery installed

The CU 362 can be supplied with a backup battery.

If fitted, tick "Backup battery installed" to enable the function.

Installation name

Enter the wastewater pit name under "Installation name".

The installation name is used when communicating with the SCADA system or PC tools.

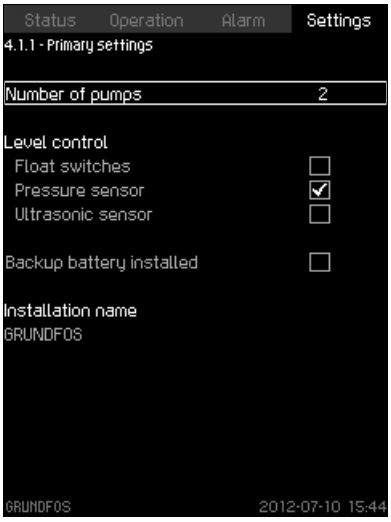
Example

The number of pumps in the system is two. The level is controlled by an analog pressure sensor.

The system does not have a backup battery (UPS) installed.

The installation name is GRUNDFOS.

Path: Settings > Basic functions > Primary settings >



Display_4.1.1

Fig. 32 Primary settings

9.1.2 Pit configuration and flow calculation

In this display, flow calculation can be disabled, and simple flow calculation can be selected.

Simple flow calculation

This display is used to set up "Simple flow calculation".

"Simple flow calculation" must be enabled before the function is active.

For a useful pit display and a correct calculation by means of an ultrasonic sensor, enter the pit depth. Then enter the measurement data to calculate the flow.

When the pumps have stopped, the time it takes to fill the volume is measured, thus calculating the inlet flow. The calculations are based on a constant flow during the pumping time.

The text below refers to fig. 34 on page 25.
The pit volume between the lower measurement level (the height "h_1") and the upper measurement level (the height "h_2") should be stated as accurately as possible to enable the system to calculate the correct flow. A flow calculated in this way has an empirical accuracy of ± 10 %, provided that the inlet flow is constant during the pumping time and that the height/volume values selected provide for a suitable pumping time - pit ratio.

Note ***The accuracy depends on the variation of the inlet flow.***

When pumping down a pit, the time it takes a pump to pump this volume is measured, thus calculating the pump performance of the pump. See fig. 35.

The "Flow min. multiply" and "Flow max. multiply" have been calculated and set from factory. These factors cannot be changed.

The "Flow min. multiply" calculation is described in section *Flow calculation, theory*. Factory setting: 2.

The "Flow max. multiply" calculation is described in section *Flow calculation, theory*. Factory setting 10.

For further information about flow theory, see section *Flow calculation, theory* on page 25.

Example

The pit depth has been set to 5.0 m.

"Simple flow calculation" has been enabled.

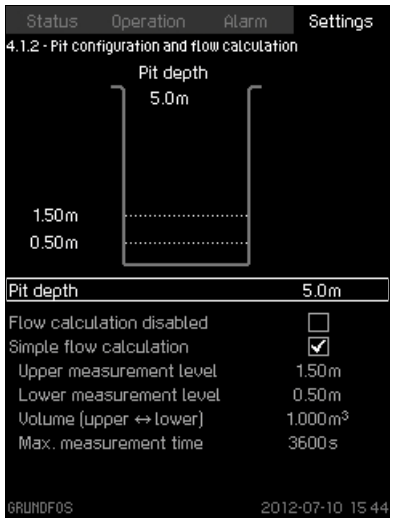
It is important that the right values are entered for the upper and lower measurement levels.

- "Upper measurement level" has been set to 1.50 m (the level must be lower than "Start level 1").
- "Lower measurement level" has been set to 0.50 m (the level must be higher than "Start level 1").

The volume between these two levels has to be calculated manually and entered at "Volume (upper ↔ lower)". The set value is 1.000 m^3.

"Max. measurement time" has been calculated to 3600 seconds. See the table below.

Path: Settings > Basic functions > Pit configuration and flow calculation >



Display_4.1.2

Fig. 33 Pit configuration and flow calculation

Display text	Description
Pit depth	Enter the actual pit depth. If the levels in the display in section *6. Status* overlap, reduce the pit depth in this display; this will increase the distance between the actual start and stop levels displayed. Pit depth settings are only used for the graphical presentation of the pit.
Upper measurement level	Enter the upper measurement level for the flow calculation. The level must be lower than "Start level 1". See fig. 34, page 25.
Lower measurement level	Enter the lower measurement level for the flow calculation. This level must be higher than "Start level 1". See fig. 34, page 25.
Volume (upper ↔ lower)	Enter the pit volume between the lower and upper measurement levels.
Max. measurement time	Enter the maximum permissible time for filling the volume between the lower and the upper measurement levels. This time is found by measuring the time it normally takes to fill the volume between the lower and the upper measurement levels. The time entered should be 1.2 times longer. **Example:** It takes approx. 20 minutes to fill the pit, including 15 minutes for filling the volume between the lower and the upper measurement levels. The time is set to 15 x 60 x 1.2 = 1080 seconds. The time is set in seconds.

A flow calculation is expected to be made in 80-100 % of the pump starts. If a flow calculation is not made in at least 70 % of the pump starts in the actual pit, start by checking the time it takes to fill the volume between the lower and upper measurement levels. If the time measured is longer than the maximum measuring time set, the latter time must be changed. See the example above. If flow calculations are still not made, measure the drain time as well.

Flow calculation, theory

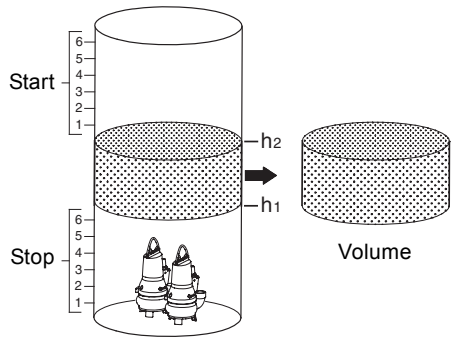


Fig. 34 Example of pit

Note ***Figure 34 shows an ideal pit.***

To obtain the optimum flow calculation, the following situations must be taken into account:

- The pit is not cylindrical.
- The pumps are included in the calculated volume; in that case, the volume of the pumps must be deducted from the calculated volume.
- Any other physical factors in the pit affecting the calculated volume.

The inlet flow is measured when the pumps are stopped and the pit is being filled.

t_2 is the time it takes to fill the pit volume from height h_1 to height h_2.

t_1 is the time it takes for one pump to drain the volume.

See fig. 35.

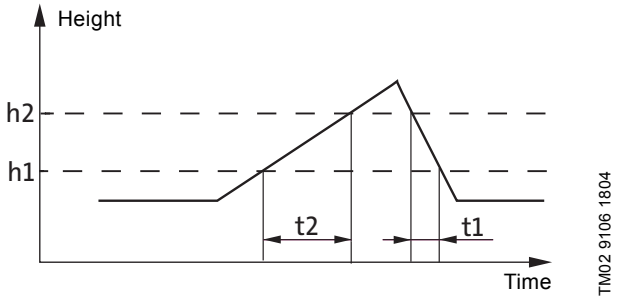


Fig. 35 The pit height in terms of time

The most accurate measurement is achieved if $t_1 \leq t_2 \leq t_1$. See table on the previous page. If t_2 lies outside this range, the calculation is ignored, and the actual pump flow will not be updated.

The inlet flow is expected to be constant in the time period t_1.

If the volume between h_1 and h_2 is called V, the pump flow Q_p is calculated by:

$$Q_p = V \frac{t_1 + t_2}{t_1 \times t_2}$$

Flow calculation for two pump sizes

The following applies to two different pump sizes:

"Flow min. multiply" x $t_{1small} < t_2 <$ "Flow max. multiply" x t_{1large}.

t_{1small} = pumping-down time for a small pump

t_{1large} = pumping-down time for a large pump

t_2 = average filling time (e.g. not right after a large quantity).

9.1.3 Pump delays

Delays and switching times are set in this display.

Max. start-up delay

The start-up delay is the time that elapses from the system is switched on until the first pump is started.

The start-up delay time can vary between 0 sec. and the delay time set by the user. This is done to ensure that the first pump and the system do not start at the same time. If several Dedicated Controls systems share the same power supply, it is best to stagger pump start-ups to avoid overloading the power supply.

Min. switching time

- Start → start delay: A start delay can be used to reduce the starting current surge. In this way an unintentional cutout of the motor protection (excess-current circuit breaker, fuses, etc.) is avoided. This function is only used when two pumps are installed in the pit.
- Stop ← stop delay: A stop delay can be used to reduce the pressure surge generated when a pump is stopped. This function reduces wear of the pump, pipes and valves.
- Start ↔ stop delay: A start/stop delay can be used if the same float switch is used to start and stop the pump. This function creates a hysteresis so that the pumps do not start and stop continuously, which would result in unnecessary wear. The start-stop delay generates a ΔH in the pit which is higher than the start level which depends on the inflow speed and the number of seconds set in this display. The same applies to the stop level > actual stop level. This function ensures longer cooling time for the motor/pump and the electrical components.

After-run delay

The after-run delay is the time it takes for a pump to stop after it has received a sensor stop signal.

After-run delay, high level

To prevent overflow if the level sensor is defective, a float switch can be installed at the top of the pit. If this float switch is activated, both pumps will start. This pumping period is called the "After-run delay, high level". The actual time is best found by trial and error.

If a dry-running float switch is also installed, the pumps can drain the pit down to the dry-running level.

This emergency situation is maintained until the defective sensor has been replaced and the alarm list is updated.

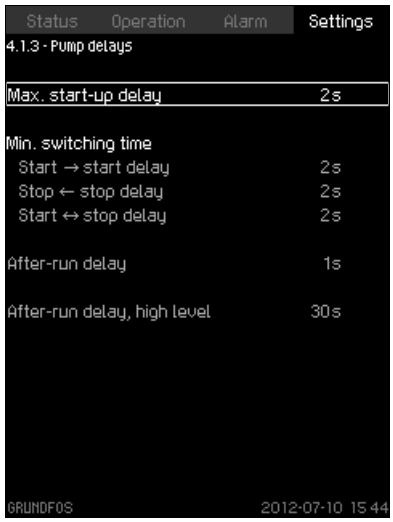
The time is set in seconds.

Note ***The "Conflicting levels" alarm must be activated to show the fault in the alarm list.***

Example

- "Max. start-up delay" has been set to 2 seconds to avoid overloading the power supply.
- "Start → start delay" has been set to 2 seconds which reduces starting current surges.
- "Stop ← stop delay" has been set to 2 seconds. This delay reduces the pressure surge generated when a pump is stopped.
- "Start ↔ stop delay" has been set to 2 seconds. This delay creates a hysteresis so that the pumps do not start and stop continuously.
- "After-run delay" has been set to 1 second. This delay is the time it takes for a pump to stop after it has received a sensor stop signal.
- "After-run delay, high level" has been set to 30 seconds. This delay is used to prevent overflow if the level sensor is defective.

Path: Settings > Basic functions > Pump delays >



Display_4.1.3

Fig. 36 Pump delays

9.1.4 Float switch functions

This menu allows the user to select the functions of the connected float switches.

Each float switch is linked to a function. "Saved" and "New" configurations can be seen in this display.

The individual configurations are defined by Grundfos, and optimised relative to the number of pumps and number of float switches. The individual configuration is shown in a table below the display.

The individual displays show how the connected float switches are intended to affect the system.

Saved functions are shown on the left of the display.

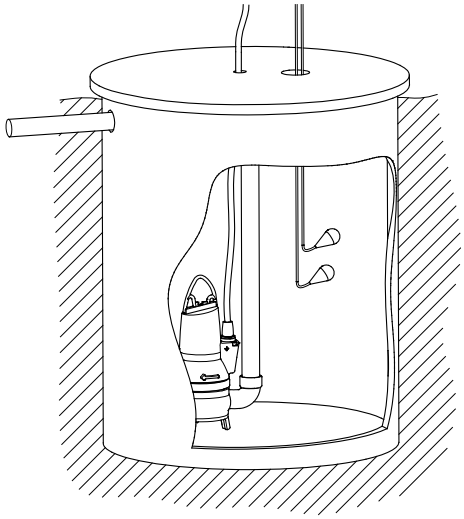
1. Select a configuration to see other options.
2. Tick the box to the right of the configuration by pressing [ok].
3. Select "Overflow switch", if needed.
4. Select switch switch for the input (NO/NC).

Note ***If used, the overflow switch must be connected to terminal DI3 of the CU 362.***

Path: Settings > Basic functions > Float switch function >

Drain function, one pump and two float switches

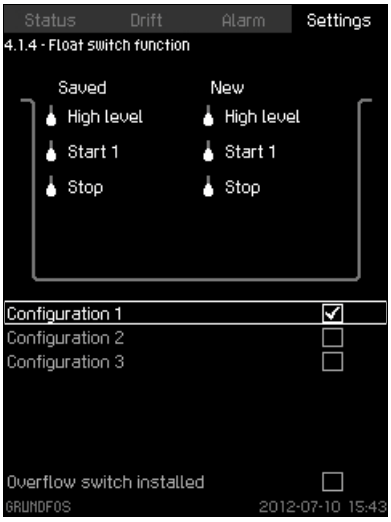
Display_4.1.4



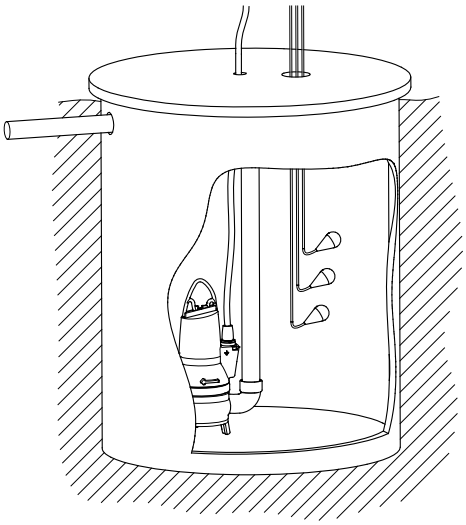
TM02 8114 4703

Float switch	Configuration		
	1	2	3
2	Start	High level	Start/stop
1	Stop	Start/stop	Dry running

Drain function, one pump and three float switches



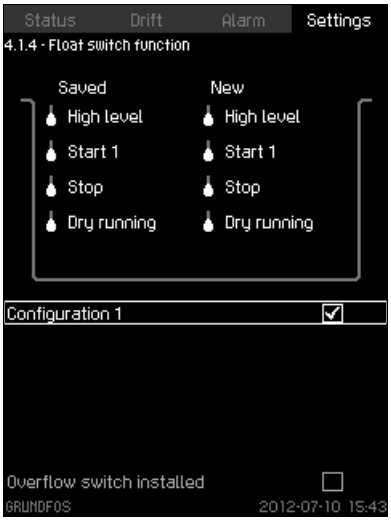
Display_4.1.4



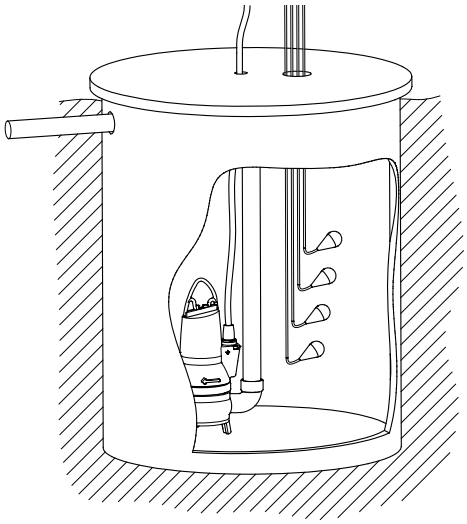
TM02 8115 4703

Float switch	Configuration		
	1	2	3
3	High level	High level	Start
2	Start	Start/stop	Stop
1	Stop	Dry running	Dry running

Drain function, one pump and four float switches



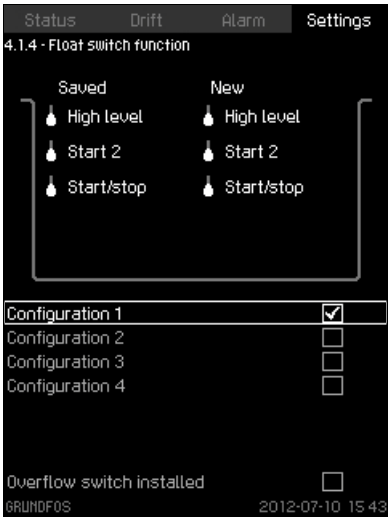
Display_4.1.4



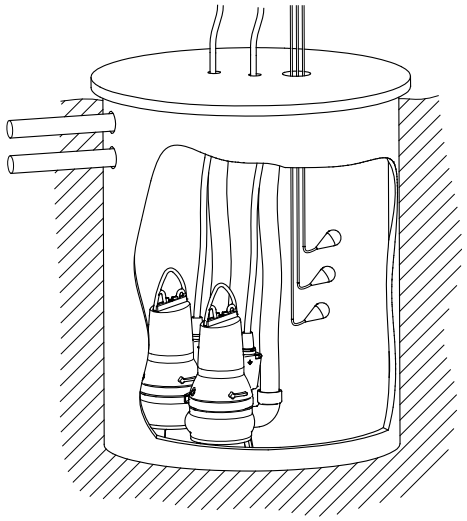
TM02 8115 4703

Float switch	Configuration
	1
4	High level
3	Start
2	Stop
1	Dry running

Drain function, two pumps and three float switches



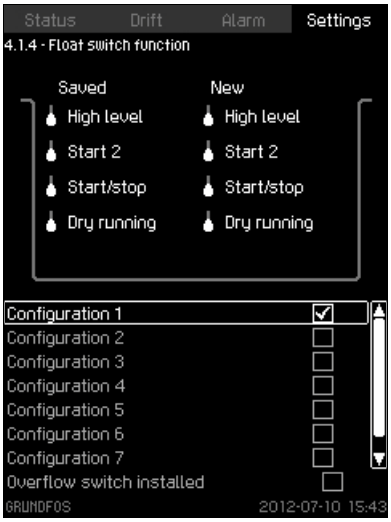
Display_4.1.4



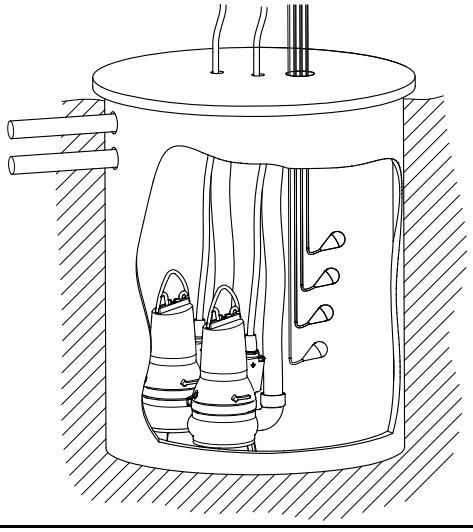
TM02 8299 4903

Float switch	Configuration			
	1	2	3	4
3	High level	Start 2	Start 2	Start 2
2	Start 2	Start 1/stop	Alarm	Start 1
1	Start 1/stop	Dry running	Start 1/stop	Stop

Drain function, two pumps and four float switches



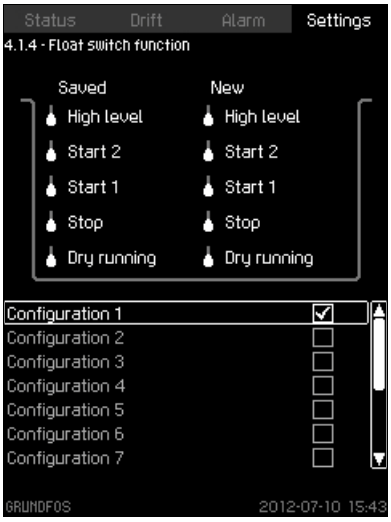
Display_4.1.4



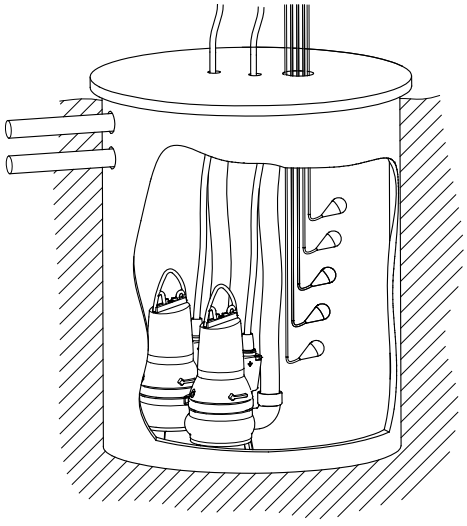
TM02 8300 4903

Float switch	Configuration							
	1	2	3	4	5	6	7	8
4	High level	High level	Start 2	Start 2	Start 2	Start 2	Start 2	Start 2
3	Start 2	Start 2	Alarm	Alarm	Start 1	Start 1	Start 1	Stop 2
2	Start 1/stop	Start 1	Start 1	Start 1/stop	Stop	Stop 2	Stop 1	Start 1/stop
1	Dry running	Stop	Stop	Dry running	Dry running	Stop 1	Stop 2	Dry running

Drain function, two pumps and five float switches



Display_4.1.4



TM02 8300 4903

Float switch	Configuration												
	1	2	3	4	5	6	7	8	9	10	11	12	13
5	High level	High level	High level	Start 2	Start 2	High level	Start 2	Start 2	Start 2	High level	Start 2	High level	Start 2
4	Start 2	Start 2	Start 2	Alarm	Start 1	Start 2	Alarm	Start 1	Stop 2	Start 2	Alarm	Start 2	Alarm
3	Start 1	Alarm	Alarm	Start 1	Stop 2	Start 1	Start 1	Stop 1	Start 1	Start 1	Start 1	Stop 2	Stop 2
2	Stop	Start 1/ stop	Start 1	Stop	Stop 1	Stop 2	Stop 2	Stop 2	Stop 1	Stop 1	Stop 1	Start 1	Start 1
1	Dry running	Dry running	Stop	Dry running	Dry running	Stop 1	Stop 1	Dry running	Dry running	Stop 2	Stop 2	Stop 1	Stop 1

Analog sensor with safety float switches

This display allows the user to set the stop and start levels for the pumps in the system as well as the overflow level, high level, dry-running level and foam-draining level.

Note

If the "Start level variation" function is enabled, "Start level 1" is shown in this display.

See section 9.2.10 Start level variation.

If alternation has been disabled, the pumps are numbered according to their position. "Start level 1" and "Stop level 1" apply to the pump connected as number 1 in the system.

In connection with alternation, this one-to-one rule does not apply. This means that the lowest level always starts one pump and the next level starts the other pump.

In connection with alternation, the number of operating hours is distributed equally between the two pumps.

The system ensures that the below rules are observed by automatically adjusting the other levels accordingly to meet the rules:

- The alarm level must be higher than the lowest start level and lower than high level.
- The pump start level must always be higher than the stop level of the same pump.
- The dry-running level is always lower than the lowest stop level.

At the overflow level, the water runs over the edge of the pit or into an overflow channel. The overflow level typically lies between the highest start level and the edge of the pit.

If, in addition to the level sensor, the system incorporates a high-level float switch and/or a dry-running float switch, this must be selected. See section *9.1.4 Float switch functions*.

In the pit, the high-level float switch must be physically installed above the level indicated as high level, otherwise "Conflicting levels" and "Level sensor" alarms will be triggered.

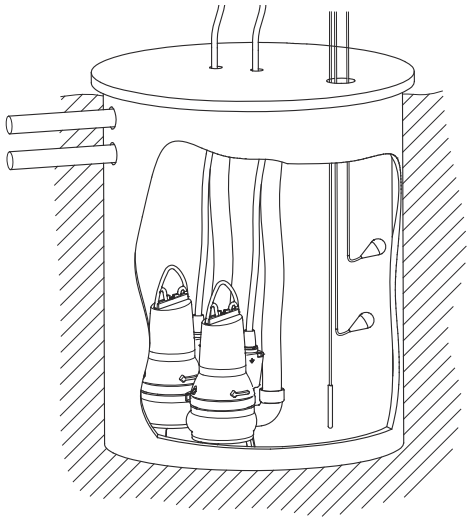
The dry-running float switch must be physically installed below the level indicated as dry-running level, otherwise "Conflicting levels" and "Level sensor" alarms will be triggered.

When the high-level float switch is activated, it triggers a high-level alarm. All pumps will start, but the number of starting pumps depends on the number of pumps in each pump group.

For the purpose of emergency operation in the event of a defective sensor, the time from the deactivation of the high-level float switch to the stopping of the pumps can be set. The length of this time is best found by trial and error, as it depends on the actual amount of water the pumps are capable of moving.
See section *9.1.3 Pump delays*.

Path: Settings > Basic functions > Float switch function >

Display_4.1.4



TM04 2956 3508

Float switch	Configuration			
	1	2	3	4
2	-	-	-	High level
1	-	High level	Dry running	Dry running

9.1.5 Out of operation

This display allows the user to take a pump temporarily out of operation for service overhaul or because of disturbances of operation.

When a pump has been taken out of operation, it is removed from the list of pumps that can be started. The system continues to operate with only one pump.

Example 1

Select the pump to be taken out of operation.

- Pump 1 (out of operation)
- Pump 2 (in operation).

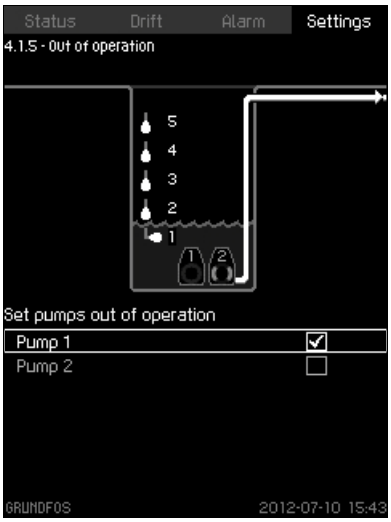
Example 2

Pump 1 is taken out of operation, and alternating operation is enabled. The system continues to operate with only one pump. This pump is now controlled by the start/stop levels for pump 2. This applies no matter which of the pumps is taken out of operation. If alternating operation is disabled, the remaining operating pump will be controlled by its own start/stop levels.

The user can take a faulty or inefficient pump out of operation. Taking a pump out of operation removes the need to send its alarms/warnings to the SCADA system.

Note ***The pumps always have a designated number, whether alternating operation is enabled or disabled.***

Path: Settings > Basic functions > Out of operation >



Display_4.1.5

Fig. 37 Out of operation

9.1.6 Modules installed

This display allows the user to configure the Dedicated Controls system.

The number of IO 351B modules installed in the system must be entered.

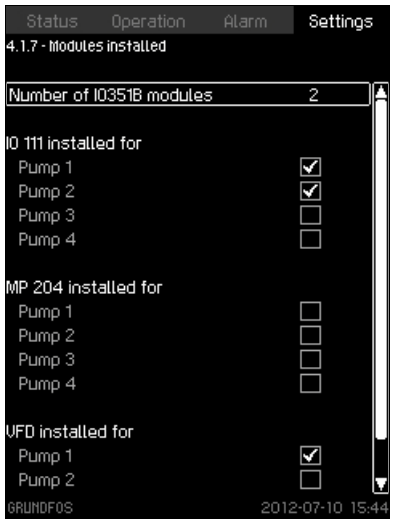
For each pump, tick the box if the mentioned module, motor protector or frequency converter has been installed.

- IO 351B (maximum three modules)
- IO 111
- MP 204
- CUE or VFD.

When a module is selected, the data from the module can be seen in the "Pump x" status display. See section *6.2 Specific pump*. The status values depend on the actual configuration of the system.

Note ***These settings enable the modules selected and functions related to each module.***

Path: Settings > Basic functions > Modules installed >



Display_4.1.7

Fig. 38 Modules installed

IO 111 installed for

Tick "Pump 1" or "Pump 2" to indicate that an IO 111 module has been installed for that pump.

GENIbus number (address)

Pump number	Module		
	IO 111 *	MP 204 **	CUE
1	9 (40)	1	1
2	10 (41)	2	2
3	11 (42)	3	3
4	12 (43)	4	4
5	13 (44)	5	5
6	14 (45)	6	6

Note ***The GENIbus number (address) can be set using the DIP switches on the IO 111 module.***

* The DIP switches on the IO 111 module must be set to bus configuration if the IO 111 module is to be configured by use of a PC Tool. See installation and operating instructions for the IO 111.

** The MP 204 cannot be used together with the CUE.

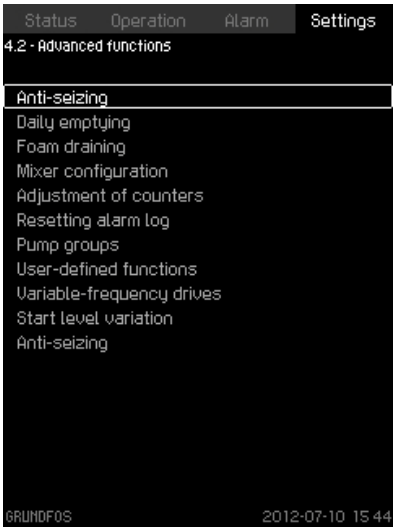
The Grundfos SM 111 module is partly supported, i.e. only alarms are supported. Status values cannot be used or seen on the CU 362.

9.2 Advanced functions

This display shows the options in menu "Advanced functions2.

Functions that affect the daily operation of the system can be set in this menu.

Path: Settings > Advanced functions >



Display_4.2

Fig. 39 Advanced functions

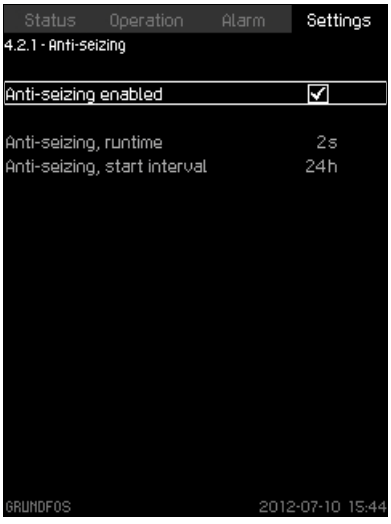
9.2.1 Anti-seizing

Anti-seizing parameters are set in this display.

The anti-seizing function prevents a pump from choking/seizing up as a result of limestone build-up or other deposits. Anti-seizing is used in pits that have had no inlet flow for a long period, or if it is not possible to use alternating operation.

The anti-seizing function ensures that the pumps will start as often as it is set in "Anti-seizing, start interval". The pumps will be operating for the number of seconds indicated by the user.

Path: Settings > Advanced functions > Anti-seizing >



Display_4.2.1

Fig. 40 Anti-seizing

9.2.2 Daily emptying

Daily-emptying parameters are set in this display. "Daily start time" is the start time for daily emptying.

The daily-emptying function is used when there has been no inlet flow into the pumping station for a long period. Daily emptying prevents the water from smelling and prevents sediment building up on the inside of the pit.

If the pit is very large, daily emptying can be set to take place at night as off-peak power often costs less.

Path: Settings > Advanced functions > Daily emptying >

Display_4.2.2

Fig. 41 Daily emptying

9.2.3 Foam draining

Foam-draining parameters are set in this display.

Caution ***The foam-draining function can only be used if the pumps are suitable for dry running.***

The foam-draining function ensures that the water is drained right down to the pump inlet level. The foam is then drained to stop it from sticking onto the pit walls.

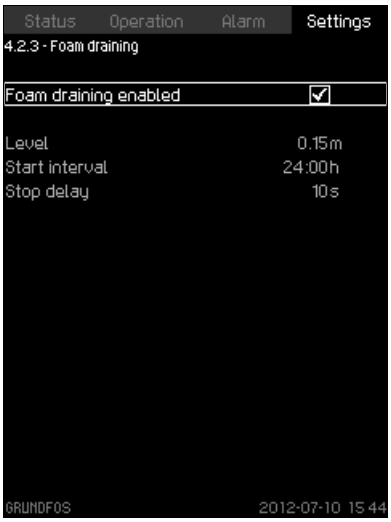
Foam draining will be activated with the next pump start once the "Start interval" period has ended.

Enable/disable foam draining.

Foam draining

- Level (level at which the pump stops).
- Start interval (start interval for foam draining).
- Stop delay (time delay before the pump stops).

Path: Settings > Advanced functions > Foam draining >



Display_4.2.3

Fig. 42 Foam draining

9.2.4 Mixer configuration

The mixer parameters are set in this display.

The mixer stirs the liquid in the pit to prevent sediment from settling on the pit sides or bottom.

If the function "Pump groups" has been enabled, the mixer start and stop levels must be between the start and stop levels of pump group 1.

Mixer enabled

Tick the box in this field if a mixer is installed in the pit.

Start level 1↔Start level, mixer

The mixer starts at "Start level 1" minus a configurable distance.

Example: When "Start level 1" is 1.75 m, and "Start level, mixer" is 0.05 m, the mixer will start at 1.70 m.

This ensures that the mixer has operated before the pump starts.

Stop level, mixer

The stop level must be selected so that the mixer is submerged during operation.

Start ratio, mixer

It must be set how often the mixer is to operate before the first pump is started.

Max. runtime, mixer

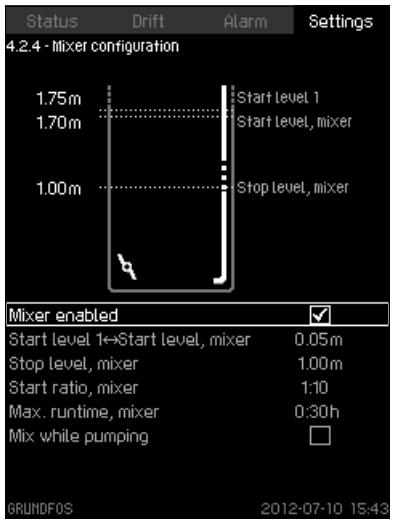
The mixer will stop at the end of its set operating period (minutes or hours).

Mix while pumping

Tick the box in this field if the mixer is to operate when a pump operates. The mixer will stop when "Stop level, mixer" or "Max. runtime, mixer" is reached.

If the box is not ticked, the mixer will start at "Start level, mixer" and stop again when the first pump starts.

Path: Settings > Advanced functions > Mixer configuration >



Display_4.2.4

Fig. 43 Mixer configuration

9.2.5 Adjustment of counters

Counter values are set in this display. This is important for pump replacement.

Select from list:

System

- Operating hours
- Parallel-operation time
- Overflow time
- Overflow volume
- Number of overflows
- Total volume
- Energy
- User-defined counter.

Pump 1 or Pump 2

- Operating hours
- Time since service
- Number of starts
- Average flow.

Mixer

Appears only if the mixer is enabled. See section *9.2.4 Mixer configuration*.

- Operating hours
- Time since service
- Number of starts.

GSM/GPRS (with inserted SIM card)

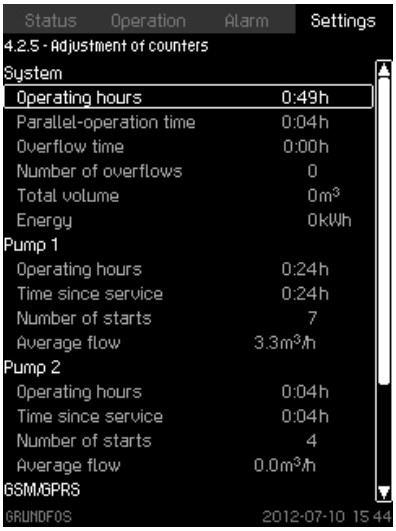
- SMS messages sent
- SMS messages received
- GPRS data sent
- GPRS data received
- Outgoing calls
- Incoming calls.

Example

A pump is taken out of operation when it has reached a total of 350 operating hours and a total of 700 starts. This is recorded in the service log.

The pump is replaced by a reconditioned pump with a total of 250 operating hours and 800 starts. Enter these values, and the system will automatically continue counting the hours and starts from this point.

Path: Settings > Advanced functions > Adjustment of counters >



Display_4.2.5

Fig. 44 Adjustment of counters

9.2.6 Resetting alarm log

In this display, the alarm log can be reset and it can be seen when it was last reset.

Reset the alarm log, or see when it was last reset.

Path: Settings > Advanced functions > Resetting alarm log >

Display_4.2.6

Fig. 45 Resetting alarm log

9.2.7 Pump groups

This display allows the user to select pump group properties.

The pumps can be split in two pump groups. The user has to define the first pump in pump group 2. If pump 3 has been defined as first pump, pumps 4, 5 and 6 also belong to pump group 2.

Group settings

Alternation enabled

An alternating cycle can be enabled or disabled under "Alternation enabled". The alternation function distributes the operating hours equally between the two pumps. Service or replacement of a single pump or both pumps can thus be planned. The risk of pumps choking/seizing up as a result of limestone build-up or other deposits can be avoided.

Max. number of started pumps

Maximum number of pumps allowed to run at the same time. Even if the water level still rises, the max. number of started pumps will not be exceeded.

Min. number of started pumps

Minimum number of pumps that have to run at the same time. This means that a certain water level must be reached before the pumps are started. If one of the pumps is in alarm mode, the rest of the pumps are stopped.

Common settings

Alternation between groups

If this function is enabled, a pump from the other pump group will start when the water level has again reached start level 1 after a pump-down.

Max. started pumps, total

Total number of pumps in both pump groups allowed to run at the same time. This function has higher priority than "Max. number of started pumps".

Min. started pumps, total

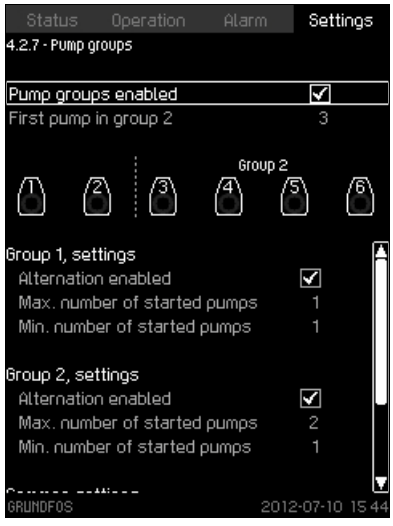
Total number of pumps in both pump groups that have to run at the same time. This means that a certain water level must be reached before the pumps are started.

Groups may run together

If this function is enabled, both pump groups may be running at the same time. The start level for each pump must be reached before the pump is started.

See *Example 1*, page 36, and *Example 2*, page 37.

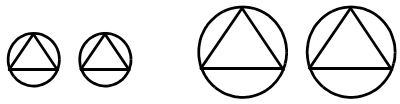
Path: Settings > Advanced functions > Pump groups >



Display_4.2.7

Fig. 46 Pump groups

Example 1



Group 1:
4 kW
100 m^3/h

Group 2:
15 kW
600 m^3/h

Action	Level [cm]
Start 4	160
Start 3	150
Start 2	110
Start 1	100
Stop 4	50
Stop 3	50
Stop 2	50
Stop 1	50

Group 1		Group 2		Common settings	
Alternation enabled	Yes	Alternation enabled	Yes	Alternation enabled	No
Max. number of started pumps	2	Max. number of started pumps	2	Max. started pumps, total	2
Min. number of started pumps	1	Min. number of started pumps	1	Min. started pumps, total	1
				Groups may run together	No

System reaction to inflow changes

Inflow	Action
Normal (Start 1)	Both pumps in group 1 operate normally and alternately. See field 1 in fig. 47.
Higher inflow (Start 2)	Both pumps in group 1 are in operation. See field 2 in fig. 47.
Higher inflow (Start 3)	Both group 1 pumps are stopped, and one group 2 pump is started (changeover). See field 3 in fig. 47.
Higher inflow (Start 4)	Both group 2 pumps are started. See field 4 in fig. 47.

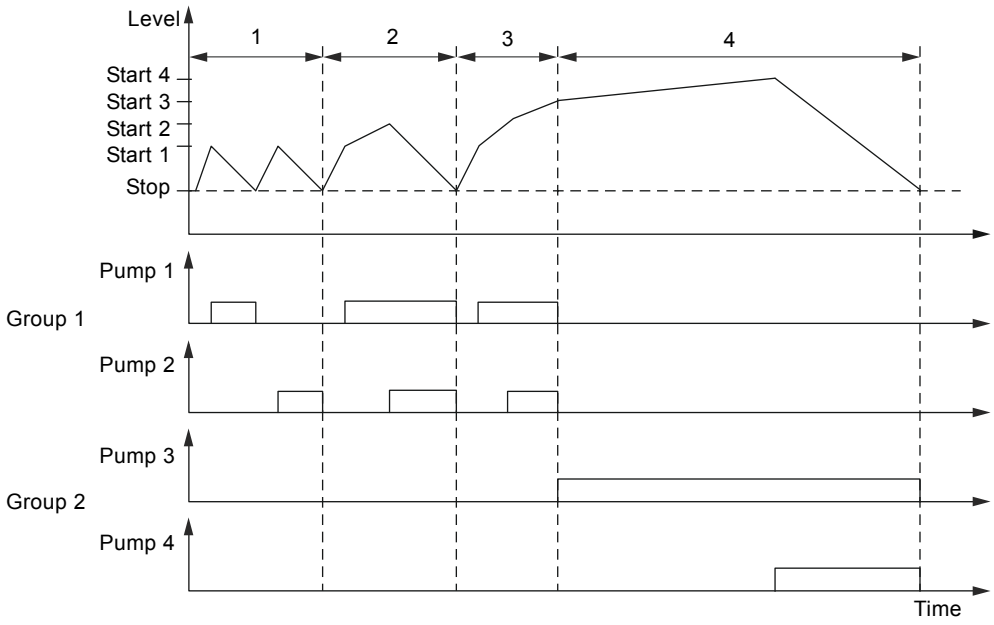


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Fig. 47 Example of alternation

If the alarm level is reached, the user may choose to send an alarm SMS.

Note

Set up alternation and groups before setting up levels, as alternation and groups will affect the use of levels.

Example 2

Group 1:
Pump 1 controlled by VFD
Pump 2

Group 2:
Pump 3 controlled by VFD
Pump 4

Action	Level [cm]
Start 4	125
Start 3	105
Start 2	120
Start 1	100
Stop 4	50
Stop 3	50
Stop 2	50
Stop 1	50

Group 1		Group 2		Common settings	
Alternation enabled	No	Alternation enabled	No	Alternation enabled	Yes
Max. number of started pumps	2	Max. number of started pumps	2	Max. started pumps, total	4
Min. number of started pumps	1	Min. number of started pumps	1	Min. started pumps, total	1
				Groups may run together	Yes

System reaction to inflow changes

Inflow	Action
Normal (Start 1)	Pumps 1 and 3 operate normally and alternately. See field 1 in fig. 48.
Higher inflow (Start 2)	Both pumps in one group are in operation. See field 2 in fig. 48.
Higher inflow (Start 3)	Both pumps in one group are in operation, and a pump from the other group is started. See field 3 in fig. 48.
Higher inflow (Start 4)	Both pumps in groups 1 and 2 are in operation.

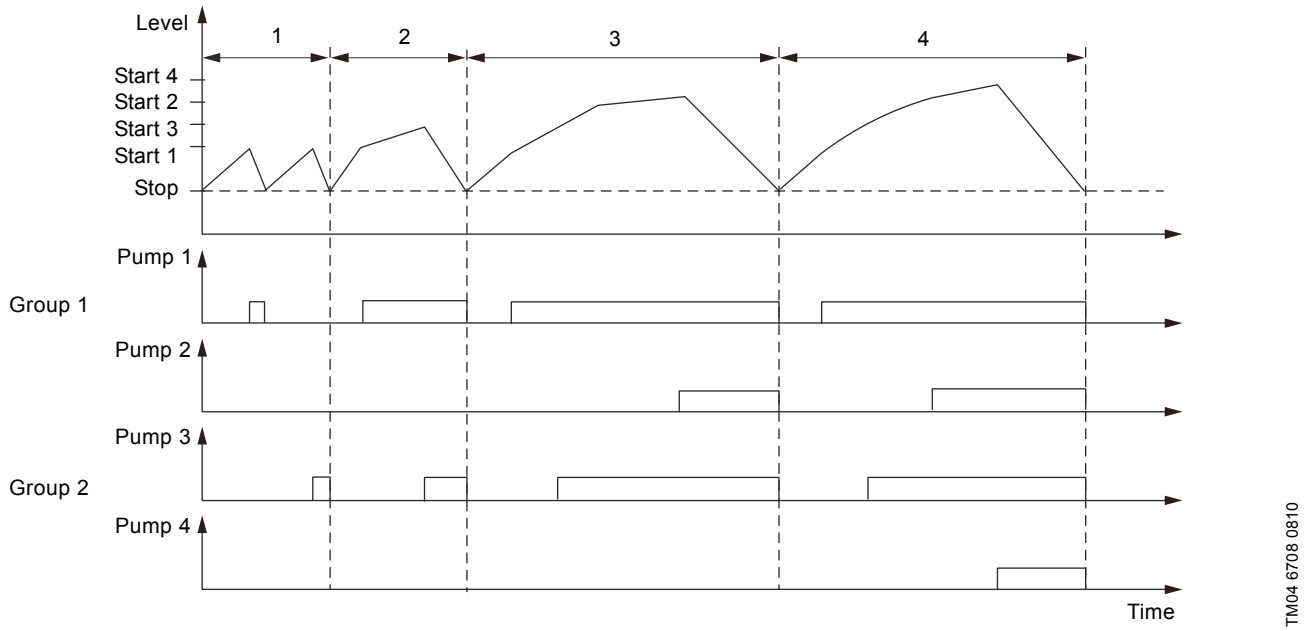


Fig. 48 Example of alternation

If the alarm level is reached, the user may choose to send an alarm SMS.

9.2.8 User-defined functions

This display allows the user to define eight different functions.

"User-defined functions" allow the user to define simple functions which trigger one of the remaining digital outputs (DO).

A user-defined function can be renamed, e.g. "Water on floor".

Each user-defined function is based on two sources named "1st source" and "2nd source". See fig. 49.

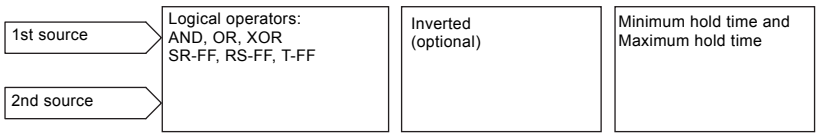


Fig. 49 User-defined function

The source can be controlled by one of the following:

- Analog input
- Digital input
- Internal CU 361 states
- Combi alarm
- User-defined function
- Timer function
- Constant value.

It is possible to select a source from all analog and digital inputs on the CU 362 control unit and the IO 351B and IO 111 modules.

As appears from fig. 50, "Timer function" and "Constant value" are input signals themselves. The signal cannot be inverted or set on hold by use of the function "Minimum hold time" or "Maximum hold time". When the input signal has been selected to be an analog input, a limit must be set for status high (1).

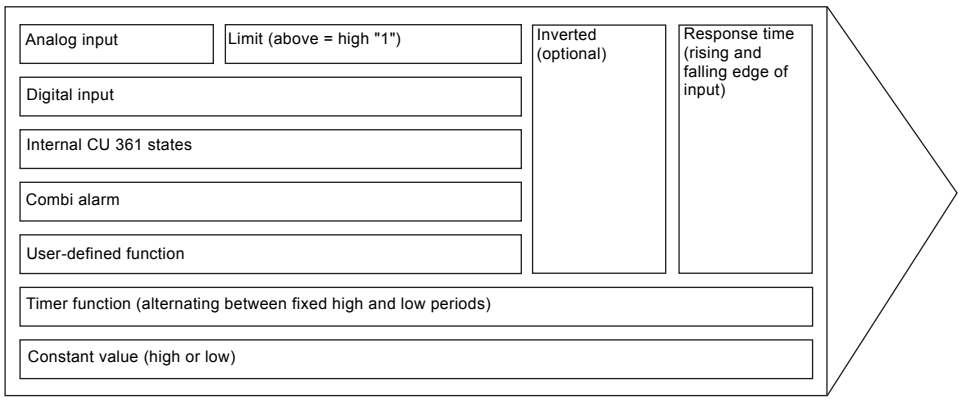


Fig. 50 Block diagram of source input

In this display, the user-defined functions can be selected and afterwards set up as desired by the user.

An input signal for each source has to be selected.

Path: Settings > Advanced functions > User-defined functions >

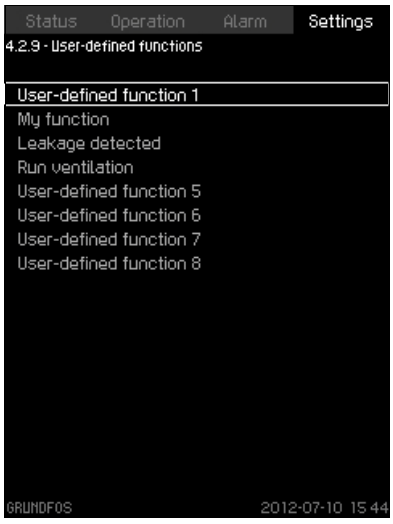


Fig. 51 User-defined functions

User-defined function

In this display, the user-defined function is selected.

"User-defined functions" must be enabled or disabled.

Before the user-defined function becomes active, the input signal of 1st and 2nd sources and a logical operator must be selected.

The output signal of a user-defined function can also be inverted, and it is possible to set a "Minimum hold time" and a "Maximum hold time". A hold time is used to hold the output signal for a certain time (status high/low) in seconds set by the user.

Note ***A user-defined function can be used as input signal into another user-defined function.***

Example

"User-def. function 2" is enabled.

"1st source" has been set to "All pumps running".
"2nd source" has been set to "Timer function".
See section *Setting up source* on page 39.

The logical operator has been set to "AND" which means that both "1st source" and "2nd source" have to be high (1) before the output signal changes status to high (1). The output signal triggers a digital output (DO). See section *Logical operator* on page 40 and section *12. Logical operators*.

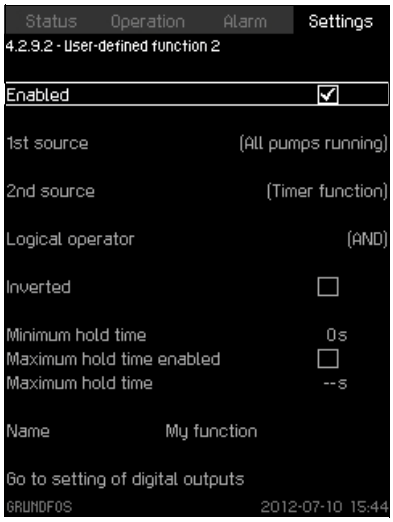
The output signal is not inverted.

"Minimum hold time" has been set to 0 second (disabled).
"Maximum hold time" is also disabled.

The function name has been set to "My function".

It is possible to go directly to menu "Digital inputs" and select the digital output to be controlled by the user-defined function "My function". See section *9.4.4 Digital outputs*.

Path: Settings > Advanced functions > User-defined functions > User-def. function 2 >



Display_4.2.9.2

Fig. 52 User-def. function 2

Setting up source

In this display, the sources are set up by selecting the input signal.

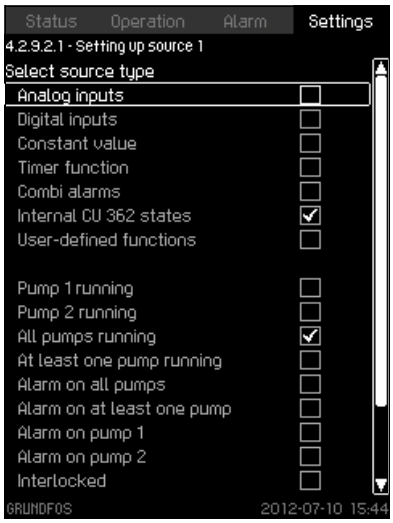
Both "1st source" and "2nd source" have to be set up before the function can be used in the system. The input signal can be inverted and must be combined with a response time. "Response time" is a delay which ensures that the input signal has status high (1) for a certain time in seconds set by the user.

Example

This display is used to set up the 1st source of "User-def. function 2".

The 1st source has been set to "Internal CU 361 states".
The internal state has been set to "All pumps running".

Path: Settings > Advanced functions > User-defined functions > User-def. function 2 > Setting up source 1 >



Display_4.2.9.2.1

Fig. 53 Setting up source 1

Logical operator

This display is used to select the logical operator for the user-defined functions.

"1st source" and "2nd source" (virtual digital input signals) are always linked to a logical operator.

Note ***"Timer function" and "Constant value" should not be used as input signals to a logical operator.***

The selection of logical operator depends on the desired function.

Logical operators:

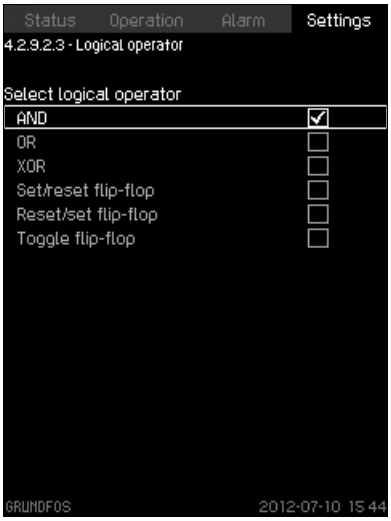
- AND
- OR
- XOR
- Set/reset flip-flop (SR-FF)
- Reset/set flip-flop (RS-FF)
- Toggle flip-flop (T-FF).

See section *12. Logical operators*.

Example

The selected logical operator is an "AND" function. The "AND" function is used when both sources have to be high before the output signal changes status to high.

Path: Settings > Advanced functions > User-defined functions > User-def. function 2 > Logical operator >



Display_4.2.9.2.3

Fig. 54 Logical operator

Example 1

The user-defined function can be used to control an external pump located in an overflow pit.

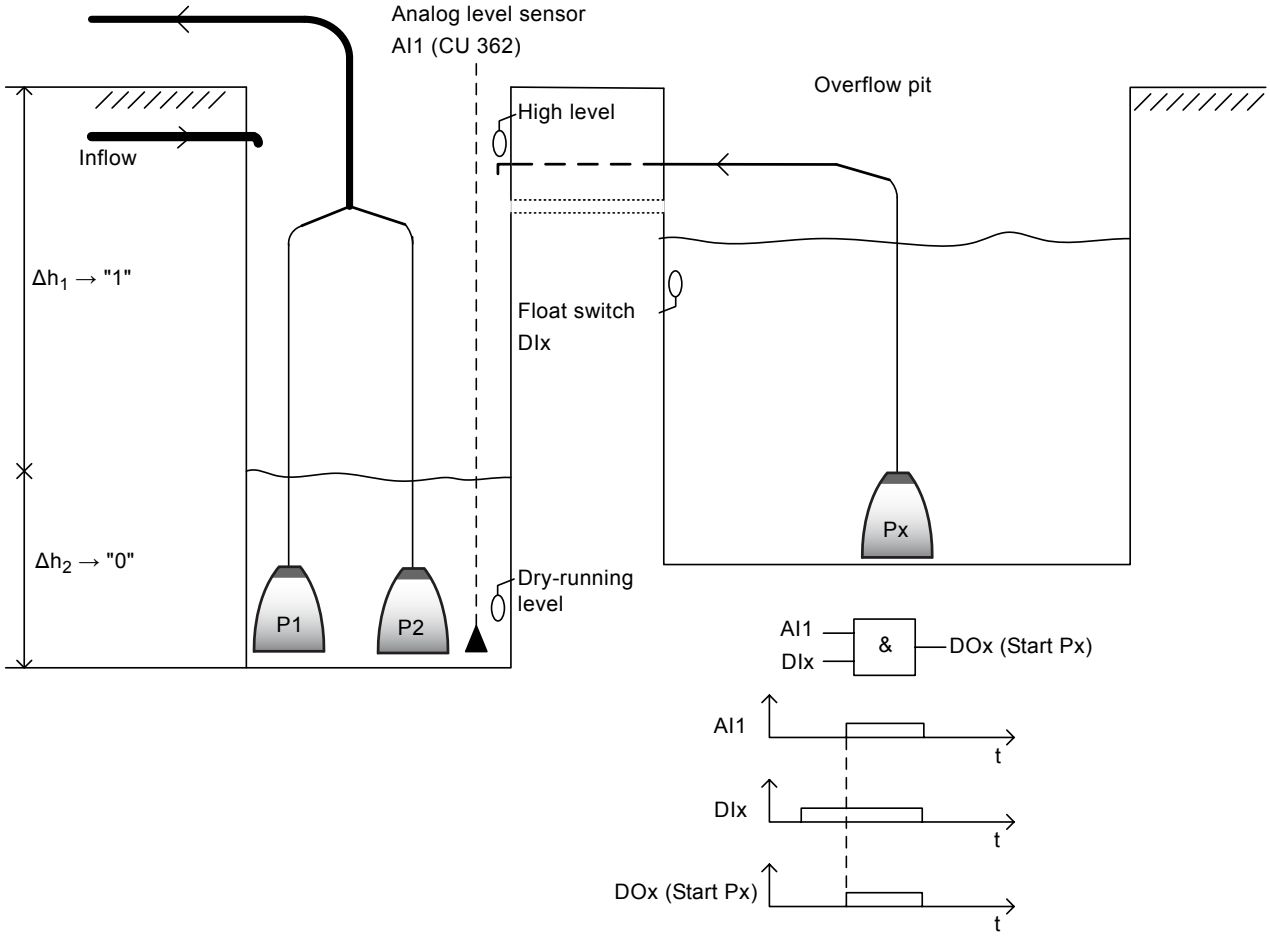


Fig. 55 Example of two-pit control

Configuration

Logical operator	AND element
1st source	• AI1 (CU 362), Level, pressure. • Water level higher than 2.5 m ("1"). • Input signal, Inverted. This means that the input signal is lower than 2.5 m ("1").
2nd source	• DIx (float switch in overflow pit).

An "AND" operator has been selected. This means that both input signals must be "1" before the output signal changes status to "1".

After an overflow situation has occurred, and the overflow pit has been filled, the water must be pumped back into the wastewater pit. The pump in the overflow pit must not be started until the overflow situation is under control again. The water level in the wastewater pit must be lower than 2.5 m before the 1st source changes status to "1". The 2nd source already has status "1" triggered by the float switch in the overflow pit. Have in mind that the 1st source has been inverted.

The pump in the overflow pit is started, and the water is pumped back into the wastewater pit. The pump in the overflow pit is either stopped by the float switch in the overflow pit or by a too high water level in the wastewater pit.

Example 2

The user-defined functions can also be configured by using the Grundfos PC Tool WW Controls.

Configuration

To configure a user-defined function, proceed as follows.

1. Select "Edit and view settings".
2. Select "User-defined functions".
3. Select the user-defined function to be configured.
4. Configure the two sources and give the user-defined function a name.

Note ***The user-defined function must be enabled before the function can be used.***

See fig. 56.

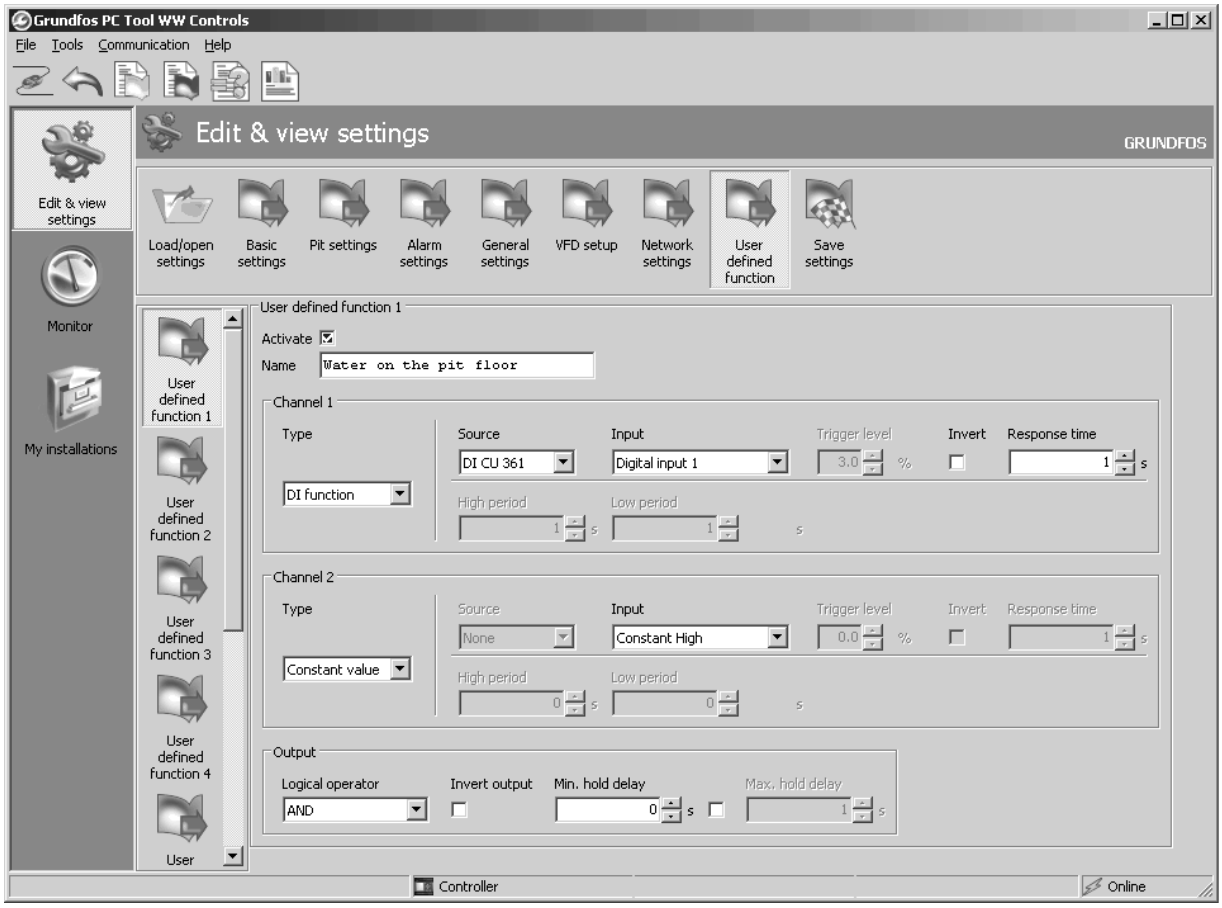


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Fig. 56 Water on the pit floor

9.2.9 Variable-frequency drives (VFD)

This display is used to set up the variable-frequency drives, hereafter named VFD. VFD has to be selected for each pump in submenu "Modules installed" submenu before the VFD settings can be made.

The desired control mode must be selected. Each of the following control modes is described in the following sections:

- Fixed frequency
- Linear control
- Minimum control
- PID control.

All control modes support flush settings. Flush settings must be selected and enabled manually.

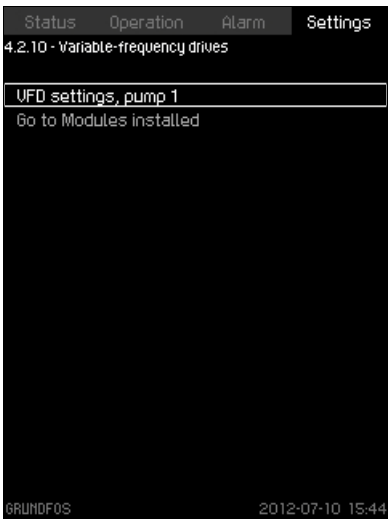
- Reverse start
- Start flushing
- Run flushing
- Stop flushing.

For further information about flush settings, see section *Flush settings* on page 48.

The VFD to be set up must be selected. Only pumps controlled by a VFD are shown in this display.

Submenu "Modules installed" can be accessed from this display.

Path: Settings > Advanced functions > Variable-frequency drives >



Display_4.2.10

Fig. 57 Setting up VFD

Fixed frequency

"Fixed frequency" is used when a constant frequency lower than 50 Hz is required. The desired frequency must be entered in the line "Fixed frequency".

The parameters can be changed via the following:

- PC Tool WW Controls
- SCADA system
- CU 362 operator display.

If flush settings have to be made, see section *Flush settings* on page 48.

If the function "Max. speed if other is running" is enabled, the pump will ramp up until "Max. frequency" is reached when another pump is running.

VFD interface:

Select how the VFD is to be controlled:

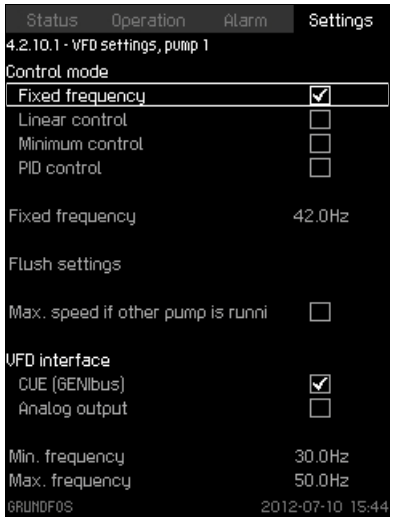
- CUE (GENIbus).
  See installation and operating instructions for Dedicated Controls.
- Analog output (0-10 V).
  See section *9.4.3 Analog outputs*.

"Min. frequency" has been set to 30 Hz as default.

"Max. frequency" has been set to 50 hz as default.

These parameters are the limits for the fixed frequency. This means that the frequency cannot be set higher than 50 Hz or lower than 30 Hz.

Path: Settings > Advanced functions > Variable-frequency drives > VFD settings, pump 1 >



Display_4.2.10.1

Fig. 58 Fixed frequency

Linear control

"Linear control" is used when the pump speed has to be adjusted according to the pit inflow. When the inflow allows the pump to run at "Economy frequency", the pump will run at this frequency and adjust the frequency if the inflow changes.

Select economy parameters:

- Economy level
- Max. economy level
- Economy frequency.

At "Economy level", the pump will run at "Economy frequency" and ramp up the frequency if the inflow increases.

At "Max. economy level", the pump will run at maximum frequency. When the level is below the "Max. economy level", the pump will ramp down until the "Economy level" is reached. See fig. 59.

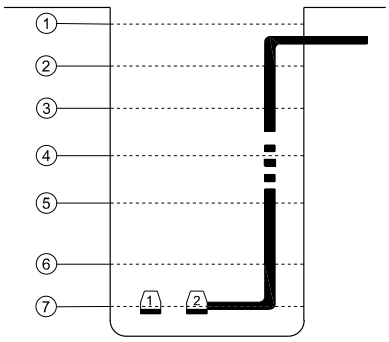


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Fig. 59 Pit levels

Pos.	Description
1	High level
2	Start level 2
3	Max. economy level
4	Economy level
5	Start level 1
6	Stop level
7	Dry-running level

Pump operation:

1-2: The pump is operating in the control mode selected.

2-3: The pump is running at maximum speed.

3-4: The pump is running with linear control.

4-5: The pump is running with linear control.

5-6: The pump is running at "Economy frequency" (buffer range before stop).

6-7: The pump has been stopped.

The parameters can be changed via the following:

- PC Tool WW Controls
- SCADA system
- CU 362 operator display.

If flush settings have to be made, see section *Flush settings* on page 48.

VFD interface:

Select how the VFD is to be controlled:

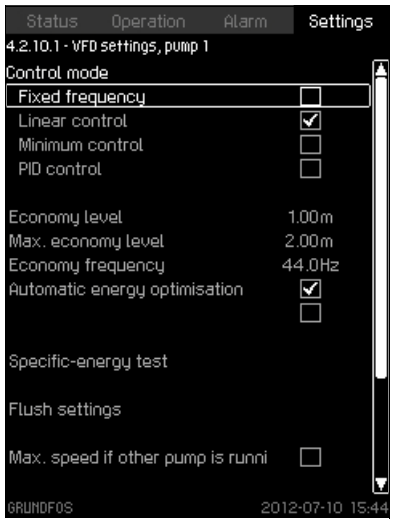
- CUE (GENIbus).
  See installation and operating instructions for Dedicated Controls.
- Analog output (0-10 V).
  See section *9.4.3 Analog outputs*.

"Min. frequency" has been set to 30 Hz as default.

"Max. frequency" has been set to 50 hz as default.

These parameters are the limits for the fixed frequency.
This means that the frequency cannot be set higher than 50 Hz or lower than 30 Hz.

Path: Settings > Advanced functions > Variable-frequency drives > VFD settings, pump 1 >



Display_4.2.10.1

Fig. 60 Linear control

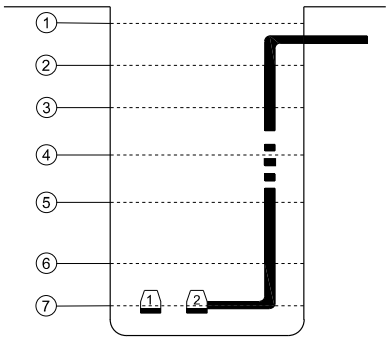
Minimum control

"Minimum control" is basically the same as "Linear control", but in this control mode the parameter "Min. economy frequency" also has to be set. When the water level is lower than "Economy level", the pump will run at "Min. economy frequency".

This control mode is selected when the user wants to keep the pump running at low speed. Having the pump running at low speed minimises the risk of sedimentation in the upstream pipeline.

Note

In some applications, this control mode could be the best solution since the total energy consumption is lower when the pumps are running.



TM04 3327 4308

Fig. 61 Pit levels

Pos.	Description
1	High level
2	Start level 2
3	Max. economy level
4	Start level 1
5	Economy level
6	Stop level
7	Dry-running level

Pump operation:

1-2: The pump is operating in the control mode selected.

2-3: The pump is running at maximum speed.

3-4: The pump is running with minimum control.

4-5: The pump is running with minimum control.

5-6: The pump is running at "Economy frequency" (buffer range before stop).

6-7: The pump has been stopped.

When the inflow allows the pump to run at "Economy frequency", the pump will run at this frequency and adjust the frequency if the inflow changes.

Select economy parameters:

- Economy level
- Max. economy level
- Economy frequency
- Min. economy frequency.

Economy level → Economy frequency

At "Economy level", the pump will run at "Economy frequency" and ramp up the frequency if the inflow increases.

Max. economy level

At "Max. economy level", the pump will run at maximum frequency. When the level is below the "Max. economy level", the pump will ramp down until the "Economy level" is reached.

Min. economy frequency

At "Min. economy frequency", the pump will ramp down to the set frequency and keep the pump running at low speed.

The parameters can be changed via the following:

- PC Tool WW Controls
- SCADA system
- CU 362 operator display.

If flush settings have to be made, see section *Flush settings* on page 48.

VFD interface:

Select how the VFD is to be controlled:

- CUE (GENIbus).
  See installation and operating instructions for Dedicated Controls.
- Analog output (0-10 V).
  See section *9.4.3 Analog outputs*.

"Min. frequency" has been set to 30 Hz as default.

"Max. frequency" has been set to 50 hz as default.

These parameters are the limits for the fixed frequency.
This means that the frequency cannot be set higher than 50 Hz or lower than 30 Hz.

Path: Settings > Advanced functions > Variable-frequency drives > VFD settings, pump 1 >

Display_4.2.10.1

Fig. 62 Minimum control

Automatic energy optimisation (operation)

Note ***This function can only be used if a power meter and flowmeter are installed in the system. Flow calculation can be used instead of a flowmeter.***

"Automatic energy optimisation" is used to optimise the "Economy frequency" during operation. The specific energy Q [kWh/m^3] is measured for each pump cycle (Start → Stop). When the pump is started for the first time, the default "Economy frequency", f_{ECO}, is used. The next time the pump starts, the f_{ECO} + 1 Hz is used as setpoint.

- If Q f_{ECO} + 1 Hz is lower, the frequency is increased by 1 Hz.
- If Q f_{ECO} + 1 Hz is higher, the frequency is reduced by 1 Hz.

This process continues until the lowest specific-energy consumption is found. When the f_{ECO} is optimised, this frequency will be used over the next 24 hours. After 24 hours, a new "Automatic energy optimisation" routine is initiated to ensure that the pump runs with an optimised frequency.

If "Start flushing" is enabled, this function will run before the "Automatic energy optimisation" function.

To ensure a reliable measurement, a 5-second delay has to pass before the measurement is started. The delay timer is started when the "Economy level" is reached. See fig. 63.

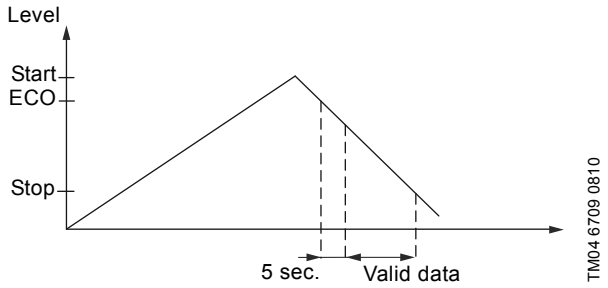


Fig. 63 Measurement delay

If the "Economy level" is higher than the "Start level", the measurement is started 5 seconds after the "Start level" has been reached.

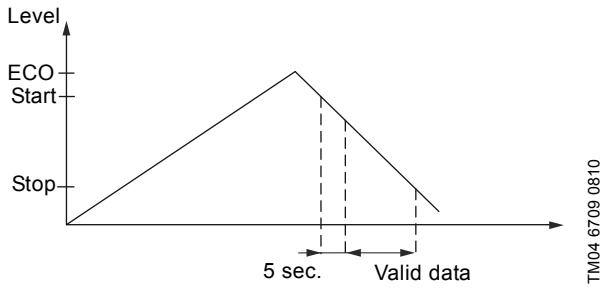


Fig. 64 Measurement delay (Start level > Economy level)

Note ***If the flow into the pit is larger than the flow out of the pit, the pump and the measurement are stopped.***

If the pump has been in operation for more than 10 minutes, it will be stopped. The specific energy measured during this period will be used. If another pump is started during the measurement, it will be stopped, and the measured specific energy will not be used.

Specific-energy test (installation)

Note ***This function can only be used if a power meter and flowmeter are installed in the system. Flow calculation can be used instead of a flowmeter.***

The specific-energy test can be used during installation (commissioning) to check the pit performance and to find $f_{min.}$. This function can be activated when one of these control modes is selected:

- Linear control
- Minimum control.

The function must be enabled. Some parameters must be entered before the test is started:

- Measurement settling time
- Max. offset below start level.

Measurement settling time

"Measurement settling time" (x) is a delay set in seconds and is the time that has to pass before the measurement is started after the "Economy level" is reached.

Max. offset below start level

As the specific energy may change when pumping from a filled pit, compared to a nearly empty pit, the "Max. offset below start level" can be set so that no energy test is made, both in a filled and an empty pit. The "Max. offset below start level" is the distance below the start level to where the energy test must be active. If the water level falls below this level during the energy test, the rest of the test will not continue before the start level is reached again. The "Max. offset below start level" will ensure a realistic energy test.

The specific-energy test can be used with benefit during installation (commissioning) to give an indication of the "Economy frequency" and "Min. frequency" for the actual application. When the function is active, only one pump is running to give a reliable result. When the test is started, 50 Hz is used as reference, and the pump ramps down with 2 Hz per 2 x "Measurement settling time". See fig. 65.

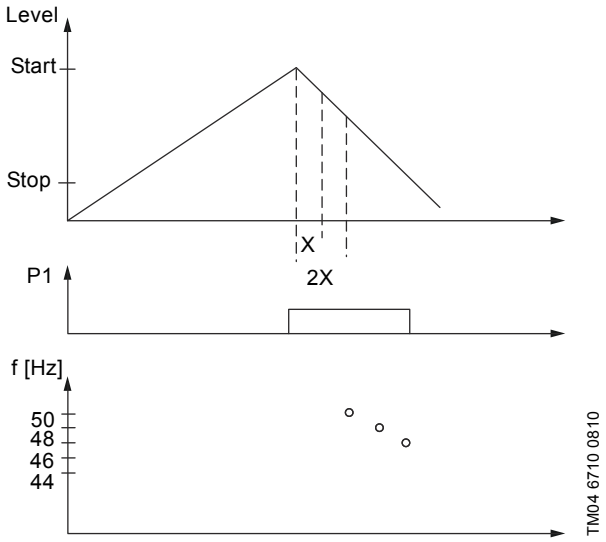
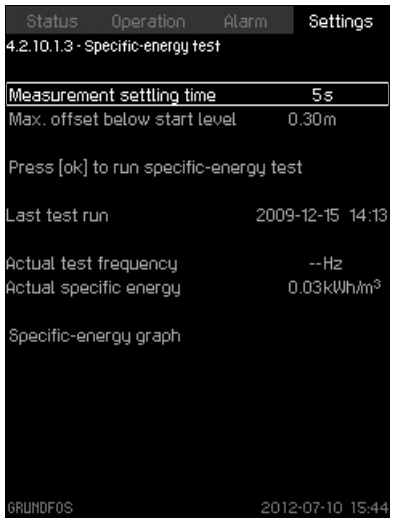


Fig. 65 Specific-energy test

Based on the measurements, a diagram is created and can be viewed by pressing [ok] in the line "Specific-energy diagram". The actual test frequency and actual specific energy are shown in the display. See section *Specific-energy diagram* on page 47.

Path: Settings > Advanced functions > Variable-frequency drives > VFD settings, pump 1 > Specific-energy test >



Display_4.2.10.1.3

Fig. 66 Specific-energy test

Specific-energy diagram

Note

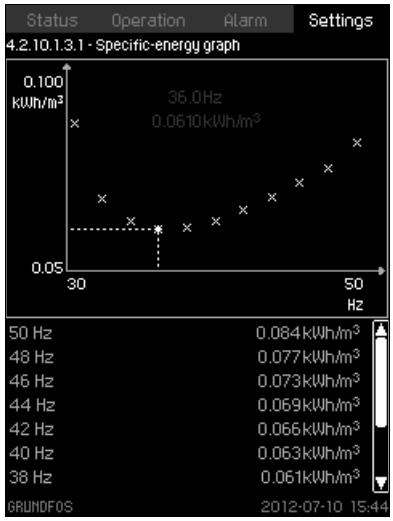
This function can only be used if a power meter and flowmeter are installed in the system. Flow calculation can be used instead of a flowmeter.

Specific energy is a measure of the pump efficiency measured as used energy [kWh] per pumped volume [m^3].

This display is used to show the "Specific-energy test".

The frequency representing the lowest specific-energy consumption is displayed when the test is done. This frequency can be used as reference in the "Automatic energy optimisation" function or set as fixed frequency.

Path: Settings > Advanced functions > Variable-frequency drives > VFD settings, pump 1 > Specific-energy test > Specific-energy diagram >



Display_4.2.10.1.3

Fig. 67 Specific-energy diagram

PID control

The parameters can be changed via the following:

- PC Tool WW Controls
- SCADA system
- CU 362 operator display.

If flush settings have to be made, see section *Flush settings* on page 48.

VFD interface:

Select how the VFD is to be controlled:

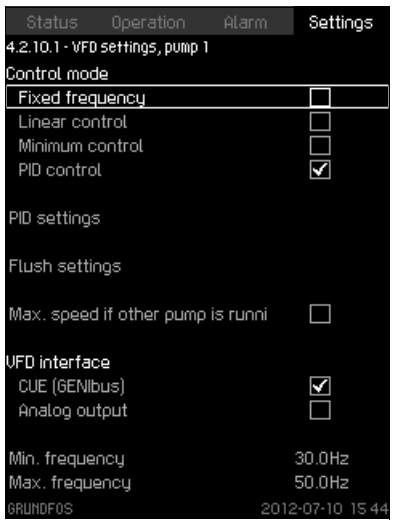
- CUE (GENIbus).
  See installation and operating instructions for Dedicated Controls.
- Analog output (0-10 V).
  See section *9.4.3 Analog outputs*.

"Min. frequency" has been set to 30 Hz as default.

"Max. frequency" has been set to 50 hz as default.

These parameters are the limits for the fixed frequency. This means that the frequency cannot be set higher than 50 Hz or lower than 30 Hz.

Path: Settings > Advanced functions > Variable-frequency drives > VFD settings, pump 1 >



Display_4.2.10.1

Fig. 68 PID control

PID settings

The type of control loop to be used is selected in this display.

Select control loop.

- P
- PI
- PD
- PID.

It is assumed that the user has knowledge of PID control loops, otherwise consult third-party instructions. These control loops are not described in detail in these instructions.

Path: Settings > Advanced functions > Variable-frequency drives > VFD settings, pump 1 > PID settings, pump 1 >

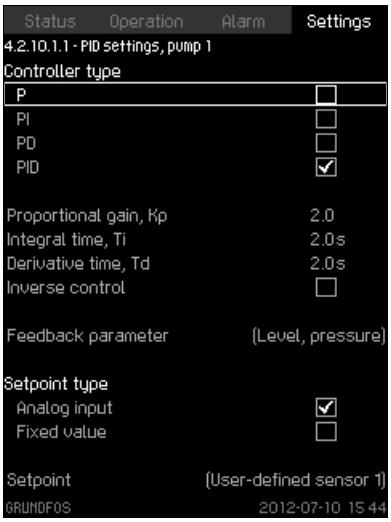


Fig. 69 PID settings, pump 1

Flush settings

"Flush settings" are used to prevent blocking of the pump and to minimise the risk of sedimentation in the upstream pipeline.

Enable flush functions:

- Reverse start
- Start flushing
- Run flushing
- Stop flushing.

See fig. 70.

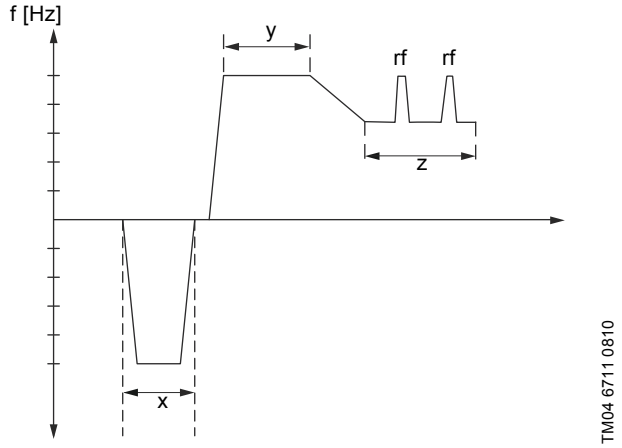


Fig. 70 Flushing

Reverse start

Caution ***This function must only be used if the pump is designed for reverse start.***

"Reverse start" (x) is used to prevent pump blocking caused by sedimentation in the pit. The user has to enable the function and set the time in seconds that the pump has to rotate in the reverse direction.

"Min. delay between reversing" must also be set.

Start flushing

"Start flushing" (y) starts the pump at full speed and lets it run for a few seconds (set by the user). Then the pump ramps down to the frequency (z) according to the parameters set in the specific control mode.

Run flushing

"Run flushing" (rf) minimises the risk of sedimentation in the upstream pipeline when the pump is running at low speed. The pump ramps up to rated frequency for a set time and ramps down again. The user has to set the time in seconds and the interval between "Run flushing" cycles.

Stop flushing

"Stop flushing" ensures that the pump ramps up and flushes the upstream pipeline before stop. The user has to set the time in seconds.

Path: Settings > Advanced functions > Variable-frequency drives > VFD settings, pump 1 > Flush settings, pump 1 >

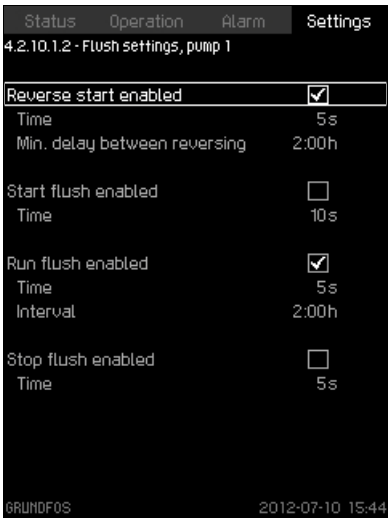


Fig. 71 Flush settings, pump 1

9.2.10 Start level variation

"Start level variation" is used to reduce sedimentation on the inner pit walls.

In this display, "Start level variation" is set up. "Start level variation" is only possible if an analog level sensor is used.

This function has to be enabled/disabled, and "Max. variation above start level 1" has to be set.

Start level variation

"Start level variation" is a function connected to pump group 1. When "Start level 1" varies, these rules must be followed:

- (Start level 1 + Max. variation) < Start level 2.

Each time "Pit level" < "Stop level 1", a new start level for pump group 1 is calculated.

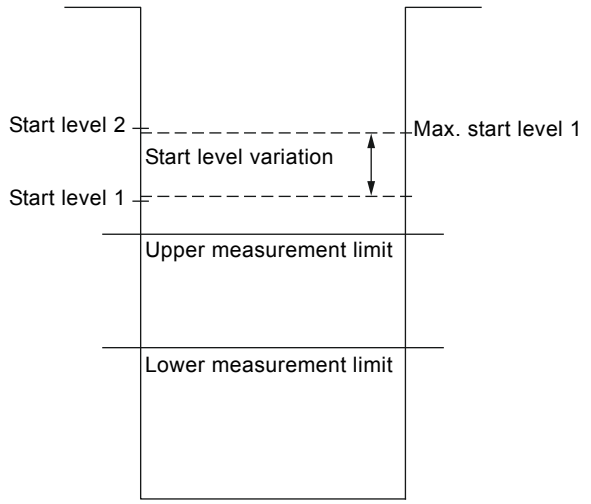


Fig. 72 Start level variation

Note ***If a mixer is installed in the system, "Start level, mixer" would also be variable. "Start level, mixer" depends on an offset of "Start level 1".***

Example

The "Start level variation" function is enabled and has been set to 20 cm.

Path: Settings > Advanced functions > Start level variation >

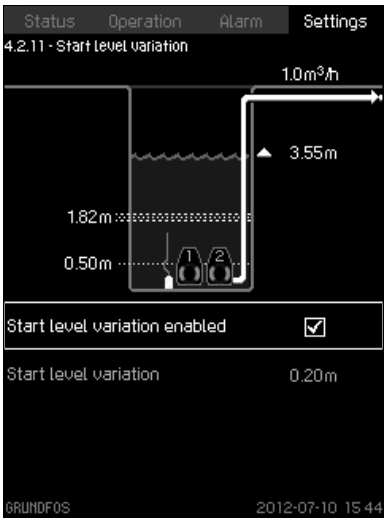


Fig. 73 Start level variation

9.2.11 Anti-blocking

Note ***"Reverse start" requires either a CUE, VFD or an MP 204 and an extra set of contactors in the control cabinet. Digital output DOx also has to be set up to control the contactor for reverse start.***

"Anti-blocking" is used to prevent overheating of the motor windings if the rotor is blocked.

In this display, "Anti-blocking" is set up. This function has to be enabled/disabled. "Reverse start time" and/or "Start flushing time" as well as the parameters that have to generate an alarm or warning have to be set.

"Max. flush attempts, 24 hours" also has to be set by the user.

Example

The "Anti-blocking" function is enabled, and "Reverse start time" has been set to 5 sec. (default).

"Max. flush attempts, 24 hours" has been set to 3 (default).

Path: Settings > Advanced functions > Anti-blocking >

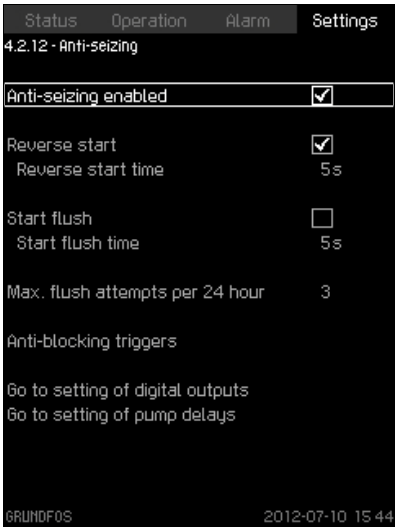


Fig. 74 Anti-blocking

Note ***It is only possible to use this function when the installed pumps are larger than 4 kW.***

Anti-blocking triggers

The parameters that have to generate an alarm or warning must be selected. Before this function is used, a reference curve has to be created for each parameter. To create a curve, press [ok] in the line "Press [ok] to measure and store current pump parameters as reference".

These measurements represent normal operation, and the acceptable variations of these parameters must be entered. Finally, a trigger delay has to be set. If these limits are exceeded, the alarm or warning "Blocked" is generated, and the pump is stopped.

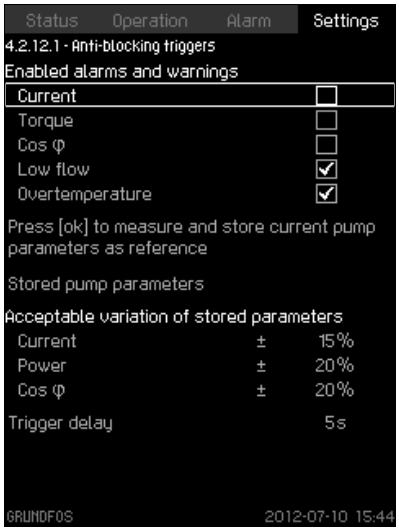
An alarm or warning can be generated by these parameters:

- Current
- Torque (a CUE is required)
- Cos φ
- Low flow (flowmeter or flow calculation is required)
- Overtemperature.

Note

The pump parameter test function and acceptable variations are only visible if either an MP 204 or a CUE is installed in the system.

Path: Settings > Advanced functions > Anti-blocking > Anti-blocking triggers >



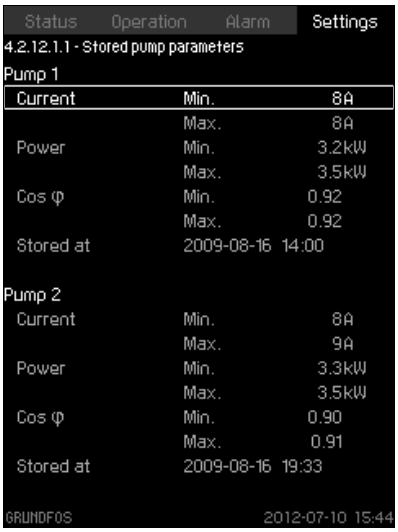
Display_4.2.12

Fig. 75 Anti-blocking triggers

Stored pump parameters

This display is used to show the current pump values obtained during measurement of current pump parameters.

Path: Settings > Advanced functions > Anti-blocking > Stored pump parameters >



Display_4.2.12

Fig. 76 Stored pump parameters

9.2.12 Overflow calculation

This display is used to set up overflow calculation. The function must be enabled. See section *9.1.4 Float switch functions*. Overflow calculation requires an analog level sensor for measuring the water level.

If the overflow function is selected, it must be placed on digital input DI3 on the CU 362. The digital input will be supplied from the backup battery making overflow calculation possible if the power supply fails. In existing installations, other switches on DI3 must therefore be moved to the next available digital input.

Activation delay is the time that has to pass before an overflow becomes a true overflow. The activation delay can be set up to 9999 seconds (2.77 hours).

Re-activation delay is the time that has to pass when a true overflow has ceased before an overflow becomes a new true overflow.

If a new true overflow (> activation delay) occurs before the re-activation delay has expired, the overflow will be added to the first true overflow.

If the re-activation delay has expired and a new true overflow (> activation delay) occurs, it will be counted as a new true overflow. Overflows are logged in terms of both number and volume. In the example in fig. 77, the re-activation delay is set to five hours and 30 minutes.

The calculation of overflow is based on up to ten reference points. Level and flow must be calculated and entered by the user. If only a few reference point are entered, linear calculation will be used to estimate the overflow. See example.

Path: Settings > Advanced functions > Overflow

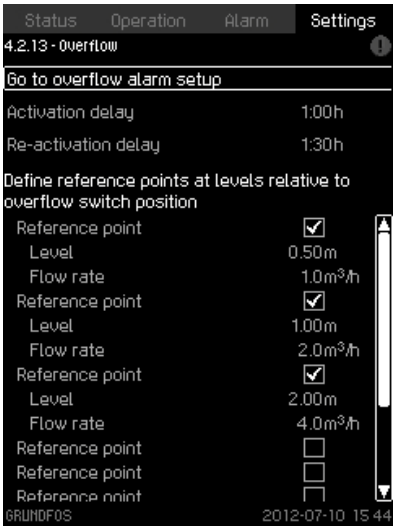


Fig. 77 Overflow reference points

When the overflow switch is activated, the actual level (measured by the analog level sensor) is set to be used as a "zero" reference. The zero reference is used to calculate the level in the overflow channel.

Channel level = actual level - zero reference.

All pumps are running, the level is increasing, and at reference point 0, the actual level is set as zero reference. The level still increases to reference point 1. The level in the channel is calculated by the advanced overflow calculation based on the reference point.

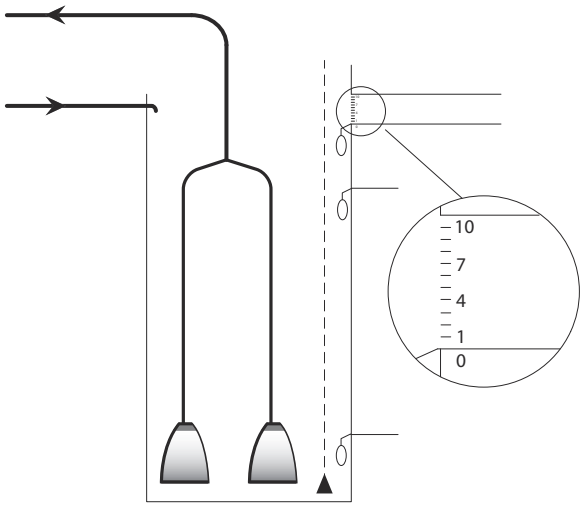


Fig. 78 Reference points for overflow calculation

Example 1

The user have entered these values:

Reference point 1

– 1 cm

– 1 m^3/h.

Reference point 2

– 10 cm

– 10 m^3/h.

If the measured level in the overflow channel is 5 cm, the calculated overflow will be 5 m^3/h. At 15 cm, the overflow will be 15 m^3/h.

Example 2

The user have entered these values:

Reference point 1

– 1 cm

– 1 m^3/h.

Reference point 2

– 10 cm

– 10 m^3/h.

Reference point 3

– 20 cm

– 15 m^3/h.

If the measured level in the overflow channel is 5 cm, the overflow will be calculated to 5 m^3/h. At 15 cm, the overflow will be 12.5 m^3/h.

The function is not possible if the system already consists of five float switches.

If the system consists of five float switches, the high-level float switch must be configured as overflow switch.

9.3 Communication settings

The CU 362 must have a CIM module (Communication Interface Module) fitted to be able to transfer data to the SCADA system or to a mobile phone.

Various CIM modules are available, depending on the type of network. The CIM module must be fitted in the CU 362. See installation and operating instructions for the CU 362.

For configuration of the CIM module, see the installation and operating instructions and the functional profile on the CD-ROM supplied with the module.

9.3.1 Selecting communication module

In this display, the user must select the communication module fitted in the CU 362.

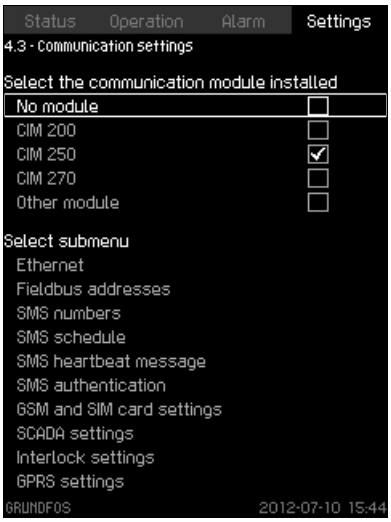
Each communication module has a series of configuration submenus and special functions.

The CU 362 supports these CIM modules:

- CIM 200 (Modbus RTU via RS-485)
- CIM 250 (Modbus and SMS via GSM/GPRS)
  - Modbus TCP via GPRS
  - Modbus RTU via GSM
- CIM 270 GRM (Grundfos Remote Management)
- Other module (future communication modules).

Note ***The type of communication module used can be found on the back of the CU 362.***

Path: Settings > Communication settings >



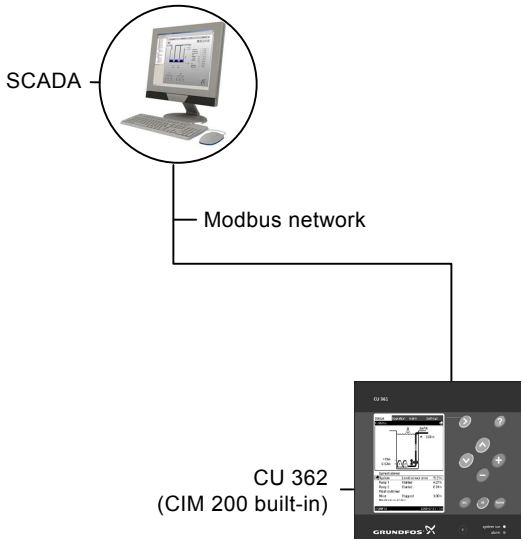
Display_4.3

Fig. 79 Communication settings

CIM 200 (Modbus via RS-485)

The CIM 200 module transfers data to/from the CU 362 and the local Modbus network. See fig. 80.

Use the Functional profile and user manual "Grundfos CIM 200, Modbus RTU for Grundfos Dedicated Controls".



TM04 3221 3908

Fig. 80 Example, CIM 200

CIM 250 (Modbus and SMS via GSM/GPRS)

The CIM 250 module transfers data to/from the CU 362 and a GSM/GPRS network. See fig. 81.

When the CIM 250 is installed in the system, several settings have to be made before the CIM 250 is ready to communicate with mobile phones and SCADA systems.

Before the CIM 250 can be used to send/receive SMS messages via GSM/GPRS, these settings must be made:

Note ***A series of system parameters must be set before SMS messaging can be used.***

Submenus	See section
SMS numbers	*9.3.4 SMS numbers*.
SMS schedule	*9.3.5 SMS schedule*.
SMS heartbeat message	*9.3.6 SMS heartbeat message*.
SMS authentication	*9.3.7 SMS authentication*.
GSM and SIM card settings	*9.3.8 GSM and SIM card settings*.
SCADA settings	*9.3.9 SCADA settings*.
Interlock settings	*9.3.10 Interlock settings*.
GPRS settings	*9.3.11 GPRS settings*.

The CIM 250 can send/receive SMS messages to/from one or more mobile phones. See section *9.3.4 SMS numbers*.

The CIM 250 can also send data to a remote SCADA system. See section *9.3.9 SCADA settings*.

Use the Functional profile and user manual "Grundfos CIM 250, GSM for Grundfos Dedicated Controls" on the CD-ROM supplied with the module.

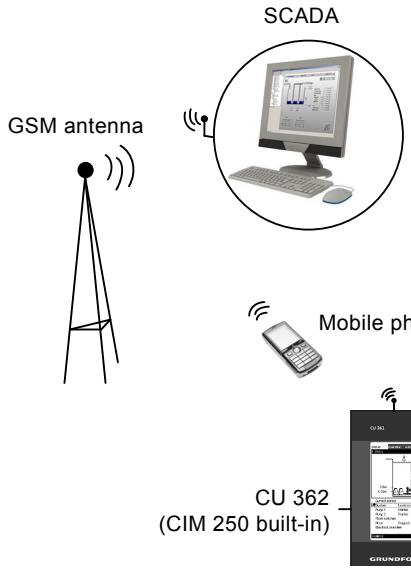


Fig. 81 Example, CIM 250

CIM 270 GRM (Grundfos Remote Management)

The CIM 270 module is used to link with Grundfos Remote Management.

When the CIM 270 is installed in the system, several settings have to be made before the CIM 270 is ready to communicate with the (Grundfos Remote Management) systems.

Submenus	See section
SMS numbers	*9.3.4 SMS numbers*.
SMS schedule	*9.3.5 SMS schedule*.
SMS heartbeat message	*9.3.6 SMS heartbeat message*.
SMS authentication	*9.3.7 SMS authentication*.
GSM and SIM card settings	*9.3.8 GSM and SIM card settings*.
Interlock settings	*9.3.10 Interlock settings*.
GPRS settings	*9.3.11 GPRS settings*.

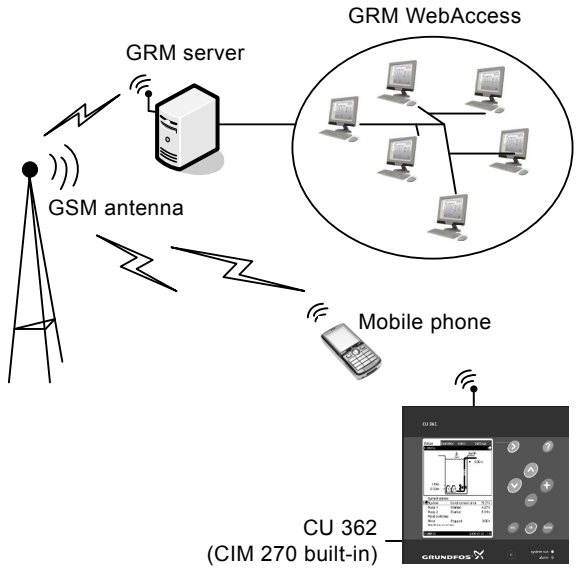


Fig. 82 Example, CIM 270

9.3.2 Ethernet

The web server of the CU 362 makes it possible to connect a computer to the CU 362 via an Ethernet connection (Ethernet crossover cable). The user interface can thus be exported from the CU 362 to a computer so that the CU 362 and consequently the Dedicated Controls system can be remotely monitored and controlled.

The CU 362 can communicate with a PC via a local Ethernet connection or direct on line over the internet connection.
See figs 83 and 84.

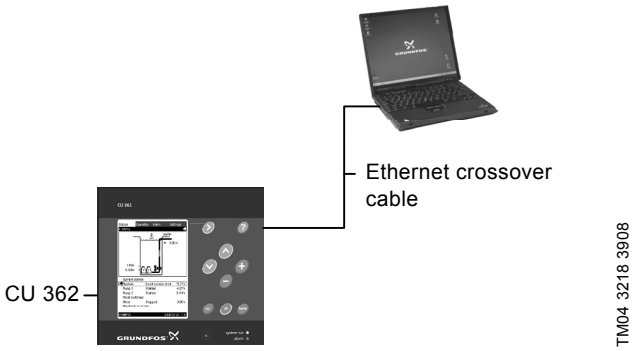


Fig. 83 Example, local Ethernet connection

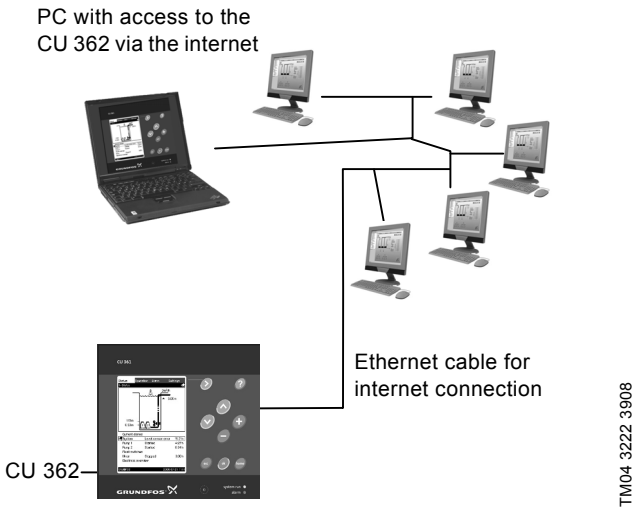


Fig. 84 Example, internet connection

Ethernet configuration

The Ethernet setup can be made in two ways:

- Automatic DHCP
- Manual.

DHCP configuration

A "Host name" must be entered in this display. The host name is used when establishing an internet connection. Enter the host name in the web browser address line.

DHCP must be enabled to establish an internet connection. The browser will now connect with the CU 362.

The user can choose to run the DHCP automatically or to assign an IP address.

Example

"Host name" has been set to "CU362", and DHCP is disabled.

The IP address is 192.168.0.2, the subnet mask is 255.255.255.0, and the standard gateway is set to 192.255.0.1.

The MAC address is 00 14 44 12 34 56.

A password is required to establish a VNC connection to the CU 362.

The password can be reset.

Note ***Both username and password are factory-set to "admin".***

Path: Settings > Communication settings > Ethernet >

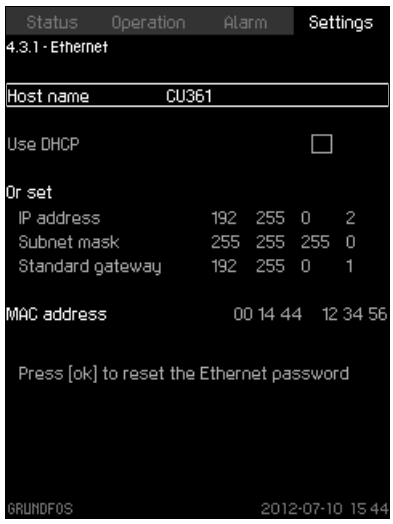


Fig. 85 Ethernet

Note ***Grundfos recommends that the system administrator is contacted to arrange security protection for the CU 362 connection.***

In order to use the web server, the user must know the IP address of the CU 362. All network units must have a unique IP address to communicate with each other. The IP address of the CU 362 from factory is 192.168.0.2.

Alternatively to the factory-set IP address, it is possible to use a dynamic assignment of IP address. This is possible by activating a DHCP (Dynamic Host Configuration Protocol) either directly in the CU 362 or via the web server. See section *9.3.2 Ethernet*.

Dynamic assignment of an IP address for the CU 362 requires a DHCP server in the network. The DHCP server assigns a number of IP addresses to the electrical units and makes sure that two units do not receive the same IP address.

A standard internet browser is used for connection to the web server of the CU 362.

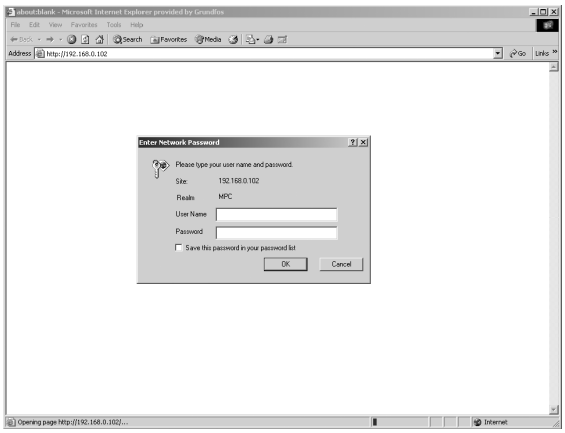
If the user wants to use the factory-set IP address, no changes are required in the menu display. Open the internet browser and enter the IP address of the CU 362. See section *9.3.2 Ethernet*.

Now open the browser, and enter the CU 362 "Host name" instead of the IP address. The internet browser will try to connect to the CU 362. The host name can be read in the display, but can only be changed using a PC tool or via a web browser.

See section *Change of network setting* on page 55.

Note ***DHCP requires a host name.***

This is the first menu display seen when the CU 362 connects.



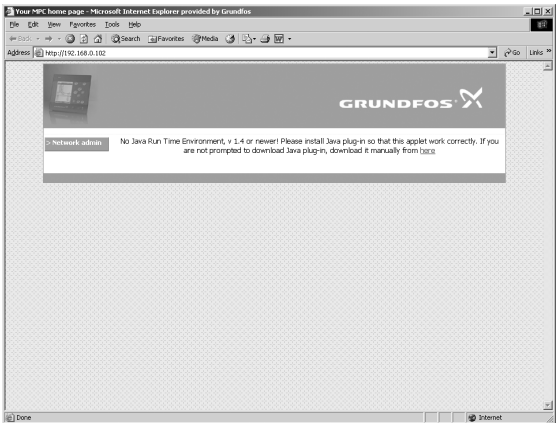
TM03 2048 3505

Fig. 86 Connecting to the CU 362

Factory setting

Username: admin
Password: admin

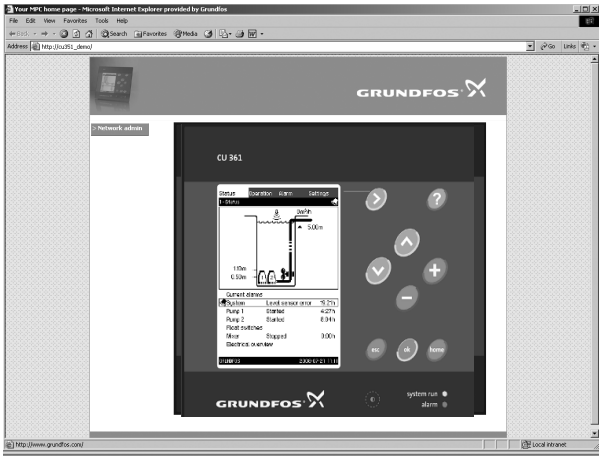
When username and password have been entered, a Java Runtime Environment application starts up in the CU 362, provided that it has been installed on the computer in question. If this is not the case, but the computer is connected to the internet, then use the link on the screen to download and install the Java Runtime Environment application.



TM03 2049 3505

Fig. 87 Display with link to JavaScript® application

The Java Runtime Environment application transfers the CU 362 user interface (including display and panel functions) onto the computer screen. The CU 362 can now be controlled from the PC.

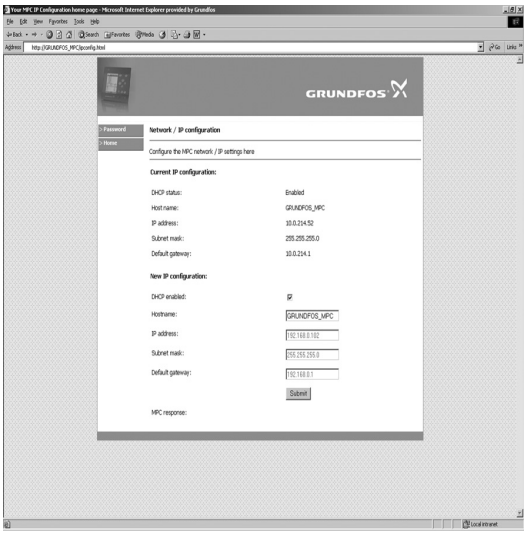


TM03 2047 3505

Fig. 88 Network setting

Change of network setting

When the connection to the web server of the CU 362 has been established, it is possible to change the network setting.

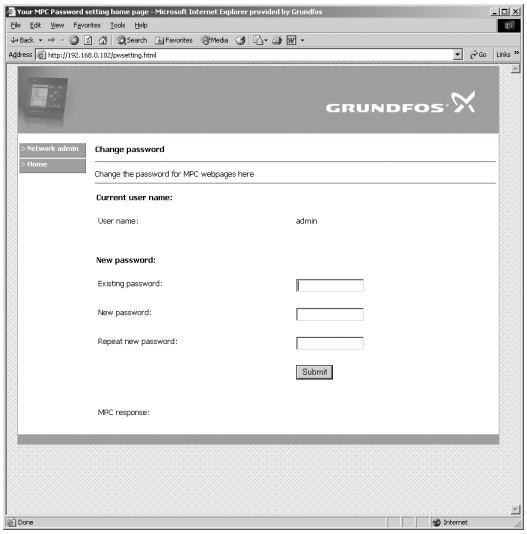


TM03 2050 3505

Fig. 89 Change of network setting

1. Click the icon "Network admin".
2. Enter the changes.
3. Click [Submit] to enable the changes.

Change of password



TM03 2051 3505

Fig. 90 Change of password

1. Click the icon "Change password".
2. Enter the new password.
3. Click [Submit] to enable the new password.

9.3.3 Fieldbus addresses

By installing a GENIbus module, it is possible to connect a CU 362 to an external network. The connection can be established via a GENIbus-based network or a network based on another protocol via a gateway. See fig. 83. For more information, contact Grundfos.

The CU 362 can communicate with external units via an RS-485 interface (optional).

The RS-485 interface is an add-on module which is fitted in the CU 362. For further information, see installation and operating instructions for the CU 362.

Communication is carried out according to the Grundfos GENIbus protocol and enables connection to a building management system or another external control system.

Operating parameters can be set via the bus signal. Furthermore, status about important parameters and fault indications can be read from the CU 362.

Contact Grundfos for further information.

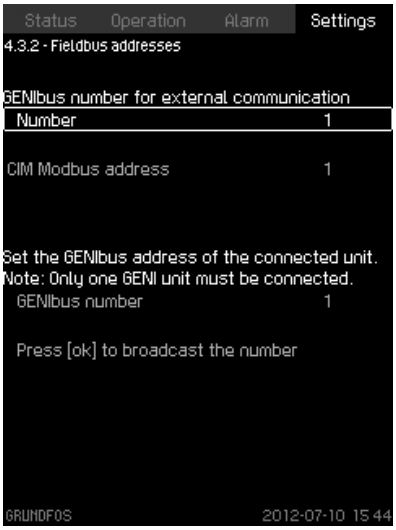
It is possible to set a GENIbus number for each module using the CU 362 display.

Example

Note ***Make sure that only one module is connected when setting the GENIbus number.***

1. Enter the new number in the line "GENIbus number".
2. Press [ok] to broadcast the number.
3. Disconnect the module and connect the next one, if several modules need a new number.

Path: Settings > Communication settings > Fieldbus addresses >



Display_4.3.2

Fig. 91 Fieldbus addresses

9.3.4 SMS numbers

Telephone numbers for alarm SMS and the SCADA system are entered in this display.

It is possible to enter three alarm SMS numbers and one SCADA system number.

SMS numbers

The SMS numbers are used with the schedule to send SMS-message-enabled warnings or alarms.

These SMS numbers are also used for SMS authentication. See section *9.3.7 SMS authentication*.

SCADA number

The SCADA number is used for SCADA callback when the CU 362 has a SCADA-callback-enabled warning or alarm.

Send alarm SMS to

An alarm SMS can be sent in three different ways:

- Primary number only
- Primary and secondary numbers
- First primary then secondary number if not acknowledged.

Acknowledgement deadline

This deadline is the time allowed for the user of the primary number to acknowledge an alarm SMS before the SMS message is sent to the secondary number.

Example

Enter the desired telephone numbers for the alarm SMS and SCADA system.

Enter digit using ⊕ and ⊖. Go to next digit using ⌃ and ⌄. Press [ok] to save number.

SMS numbers

- No 1 +4512345678
- No 2 +4511223344
- No 3 +4599988877.

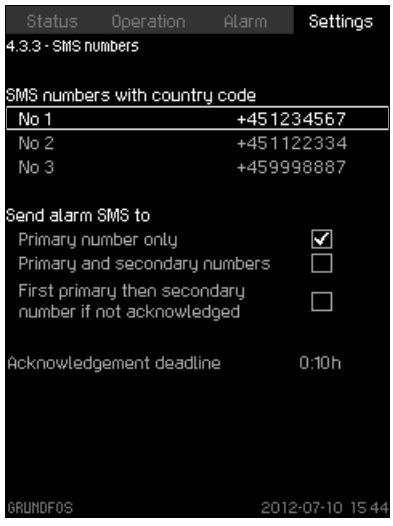
SCADA number

- +4512345678.

Acknowledgement deadline

The time allowed to pass before the alarm SMS is sent to the secondary number is ten minutes.

Path: Settings > Communication settings > SMS numbers >



Display_4.3.3

Fig. 92 SMS numbers

9.3.5 SMS schedule

The SMS schedule, i.e. the alarm SMS phone number and the message timing, is set in this display.

Select day of the week

When a day has been selected, the day's three periods can be set:

- Work
- Off
- Sleep.

The settings for the selected day apply to all three periods. A shift change can also be set in the schedule. Schedule periods serve practical purposes, e.g. to avoid sending SMS messages about minor faults to the service manager in the middle of the night. The service manager will receive the SMS messages when he/she has returned to work.

View SMS schedule

This function is used to call up a graphical overview of the SMS schedule.

Select one of the graphical overviews:

- Work/Off/Sleep. See page 58.
- Primary recipients. See page 58.
- Secondary recipients. See page 58.

Example

Select the day of the week to be set or the desired graphical overview.

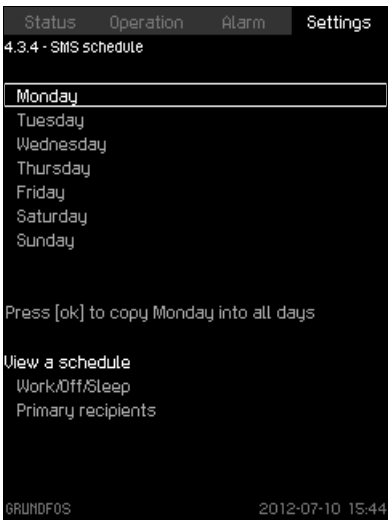
Select day of the week

- Monday
- Tuesday
- Wednesday
- Thursday
- Friday
- Saturday
- Sunday.

View SMS schedule

- Work/Off/Sleep
- Primary recipients
- Secondary recipients.

Path: Settings > Communication settings > SMS schedule >



Display_4.3.4

Fig. 93 SMS schedule

Select day of the week

The selected week day is set up in this display.

Minor and serious alarms can be kept separated, e.g. at night.

Enter the starting point of the three periods:

- Work
- Off
- Sleep.

To enable the period, tick the box and enter the period starting point.

Shift changeover

Enter the shift changeover time. Three different shift changeover times can be set for any 24-hour period. Every shift changeover can be set with both a primary and a secondary telephone number.

Note ***A shift changeover can take place in the middle of a period.***

Example

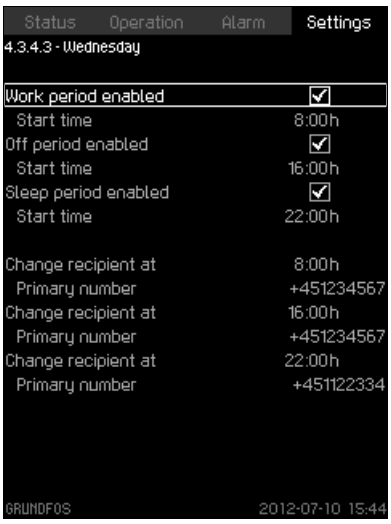
The display shows that the service manager's workday for Wednesday starts at 08:00, and that he/she is off from 16:00, and asleep from 22:00.

The display shows that the shift changes at 08:00 Wednesday morning.

At 16:00 there is no shift change. Thus no change in SMS recipients.

At 22:00 there is a shift change and hence a change in recipients.

Path: Settings > Communication settings > SMS schedule > Wednesday >



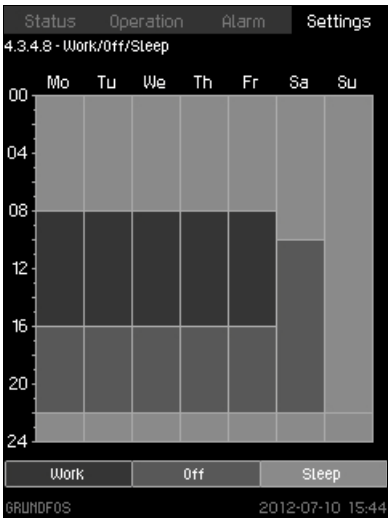
Display_4.3.4.3

Fig. 94 Wednesday

Graphical illustration of SMS schedule

This display gives a graphical overview of how a week is divided up.

Path: Settings > Communication settings > SMS schedule > Work/Off/Sleep >



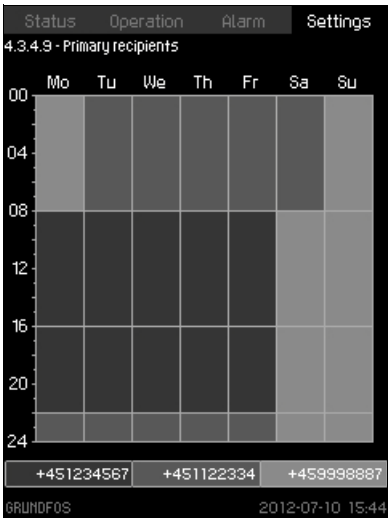
Display_4.3.4.8

Fig. 95 Work/Off/Sleep

Graphical illustration of primary recipients

This display gives a graphical overview of designated primary recipients during the week day and over the week.

Path: Settings > Communication settings > SMS schedule > Primary recipients >



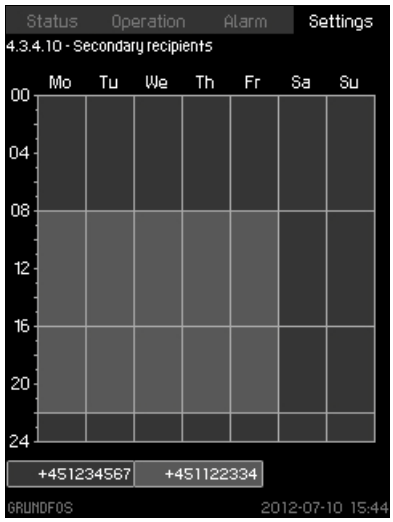
Display_4.3.4.9

Fig. 96 Primary recipients

Graphical illustration of secondary recipients

This display gives a graphical overview of designated secondary recipients during the week day and over the week.

Path: Settings > Communication settings > SMS schedule > Secondary recipients >



Display_4.3.4.10

Fig. 97 Secondary recipients

9.3.6 SMS heartbeat message

The heartbeat function is set in this display.

A heartbeat message informs the user that the CU 362 can communicate. The user can select one or more days for heartbeat messaging. Enter the time for the heartbeat outgoing call.

Example

Select day(s) for heartbeat messaging and time for the outgoing call.

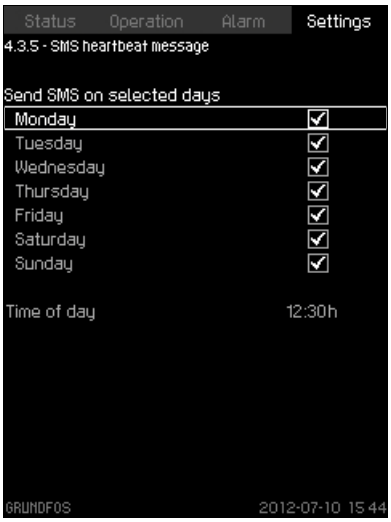
An SMS will be sent on the selected days

- Monday
- Tuesday
- Wednesday
- Thursday
- Friday
- Saturday
- Sunday.

Time for outgoing call

Heartbeat message is sent at 12:30.

Path: Settings > Communication settings > SMS heartbeat message >



Display_4.3.5

Fig. 98 SMS heartbeat message

9.3.7 SMS authentication

In this display, it is possible to set incoming message authentication so that others cannot send SMS messages to the control system.

Three methods of authentication:

- Via phone number
- Via PIN code
- Both (both via phone number and PIN code).

Phone number

SMS messages will only be accepted from specially selected telephone numbers.

PIN code

Only SMS messages beginning with the correct PIN code will be accepted.

The following SMS messages are received:

- ACK
  Acknowledges an alarm SMS so that it is not passed on to the secondary number.
- ALARMRESET or RESETALARM
  Resets hanging alarms. Same as resetting via the CU 362 control panel.
- GETALARMS
  Sends an alarm SMS for every alarm.
- STATUS or STATUS1
  Returns an SMS system status message.
- AUTO
  Changes from interlock to automatic operation.
- INTERLOCK
  Changes to interlock, i.e. a type of stop.
- FORCERELAY
  Operates the user-defined relay.
- RELEASERELAY
  Releases the user-defined relay.
- SIGNALLEVEL
  Returns signal strength for GSM modem.
- GPRS STATUS
  Obtains the IP adress from the GPRS connection.
- HELP or ?
  Sends a list of commands.
- AOx y
  x is the number of the user-defined output (1 to 3).
  y is a number between 0 and 100 and is the setpoint for the output.

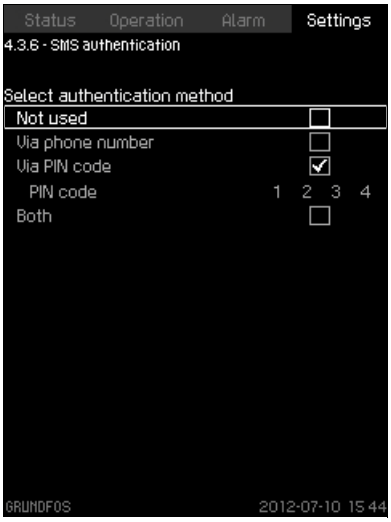
Note ***The space between x and y is important to make the function work.***

Example

When a user receives an alarm SMS, it must be acknowledged. If an acknowledgement is not sent, the alarm SMS is sent to another user.

Note ***The PIN code is also used for the interlock function.***

Path: Settings > Communication settings > SMS authentication >



Display_4.3.6

Fig. 99 SMS authentication

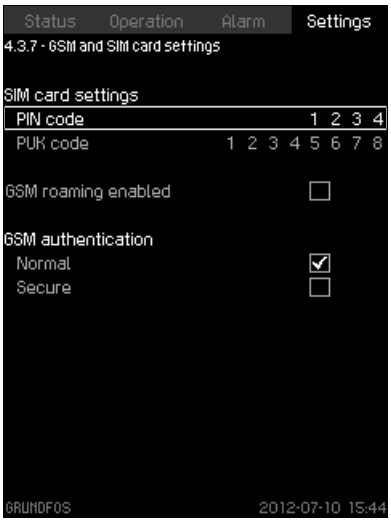
9.3.8 GSM and SIM card settings

The PIN and PUK codes for the SIM card are entered in this display.

The SIM card and its PIN and PUK codes are supplied by the telephone company.

Note ***Not all SIM cards use a PIN code.***

Path: Settings > Communication settings > GSM and SIM card settings >



Display_4.3.7

Fig. 100 GSM and SIM card settings

9.3.9 SCADA settings

The SCADA system is set up in this display.

The user must select the individual alarms and warnings that are to be sent to the SCADA system (SCADA callback).
See section *11.7 System alarms*.

SCADA callback

The SCADA callback must be enabled in this display.

SCADA callback test

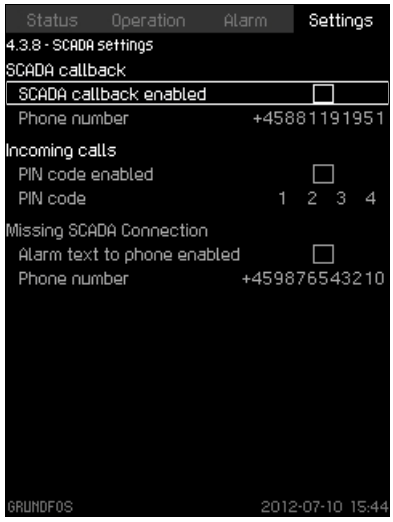
A test can be performed to ensure that the SCADA callback function works as intended. It can be carried out on site using the CU 362 or remotely via PC Tool. The CU 362 sends out a test message, and the SCADA system acknowledges.

Incoming calls

This function is used to protect the SCADA system connection. The user can enter a SCADA system password for communication with the CU 362.

A password must have four digits.

Path: Settings > Communication settings > SCADA settings >



Display_4.3.8

Fig. 101 SCADA settings

9.3.10 Interlock settings

The interlock function is set in this display.

The function can be divided into two areas:

- Incoming interlock
- Outgoing interlock.

Incoming interlock

This function ensures that the current pit is stopped if the next pit is full. Incoming interlock requires SMS authentication.

Outgoing interlock

This function is used when the current pit is full. When the pit is full, up to three downstream pits can be stopped. This prevents an overflow in this pit.

To enable outgoing interlock, the following criteria must be fulfilled:

- The pit level is higher than the alarm level.
- The alarm for alarm level is triggered.

The outgoing interlock is disabled only when the pit level has fallen to the lowest stop level.

Example

Select or ignore incoming interlock.

Incoming interlock

- Ignore incoming interlock.

Outgoing interlock

- Interlock, pit 1
- Interlock, pit 2
- Interlock, pit 3.

Path: Settings > Communication settings > Interlock settings >

Display_4.3.9

Fig. 102 Interlock settings

Outgoing interlock, pit 1

Outgoing interlock for "Pit 1" is set in this display.

The user must enable an outgoing interlock and enter the telephone number of the pumping station to be stopped.

Installation name

The user can rename "Pit 1" to the actual installation name. This makes it easier to identify the pumping station.

Phone number

Enter the telephone number of the pumping station under the installation name.

PIN code enabled

The user can enable the PIN code function. "Pit 1" is thus code-protected. The PIN code is sent with the SMS interlock message to stop "Pit 1".

Example

"Pit 1" must receive a PIN code with an SMS interlock message. This PIN code must correspond to the code of "Pit 1", otherwise the command will not be received.

Interlock timeout

An interlock is valid for a specific time period. When the time period has passed, a new SMS interlock message is sent to stop the pumping station.

Example

Enable outgoing interlock.

Installation name

- Pit 1.

Phone number

- +4512345678.

PIN code enabled

- PIN code.

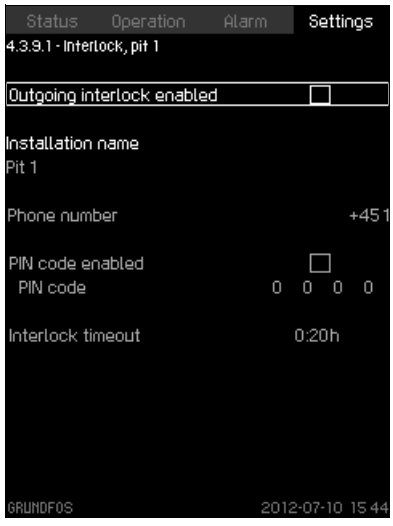
Interlock timeout

The interlock is disabled after 20 minutes.

Note ***It is important that the receiving pumping station has the same configuration.***

Note ***The time limit ensures that a pumping station is not staying in this condition. Only a communication failure can cause an indefinite stop.***

Path: Settings > Communication settings > Interlock settings > Interlock, pit 1 >



Display_4.3.9.1

Fig. 103 Interlock, pit 1

9.3.11 GPRS settings

The GPRS communication info is entered in this display.

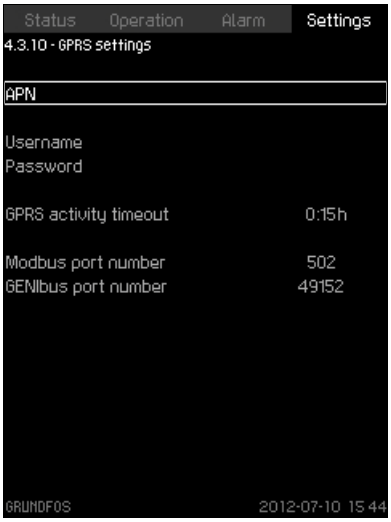
The user must enter the APN (Access Point Node), username and password.

Enter the following:

- APN
- Username
- Password.

Note ***The SIM card, APN address, username and password are supplied by the telephone company.***

Path: Settings > Communication settings > GPRS settings >



Display_4.3.10

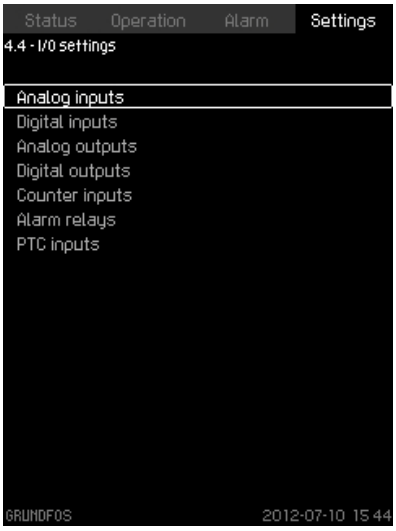
Fig. 104 GPRS settings

See the Functional profile and user manual "Grundfos CIM 250, GSM for Grundfos Dedicated Controls" on the CD-ROM supplied with the GSM module.

9.4 I/O settings

This display shows the options in menu "I/O settings".

Path: Settings > I/O settings >



Display_4.4

Fig. 105 I/O settings

9.4.1 Analog inputs

The analog input to be set is selected in this display.

As standard, there are five analog inputs. The display shows each input so that its physical location can be quickly identified.

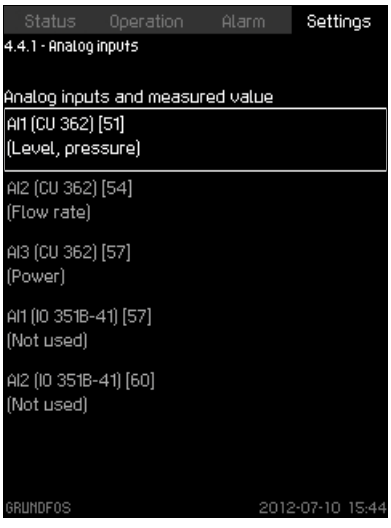
Example

The AI1 analog input on the CU 362 (designated terminal 51) is linked to the function "Level, pressure".

AI1 (CU 361) [51] and AI1 (IO351B-41) [57].

Input	Control unit/ module	Terminal
AI1	CU 362	51
AI1	IO 351B	57

Path: Settings > I/O settings > Analog inputs >



Display_4.4.1

Fig. 106 Analog inputs

Analog input, configuration

The analog input to be set is selected in this display.

Each analog input has its own display. The number of displays depends on the number of analog inputs.

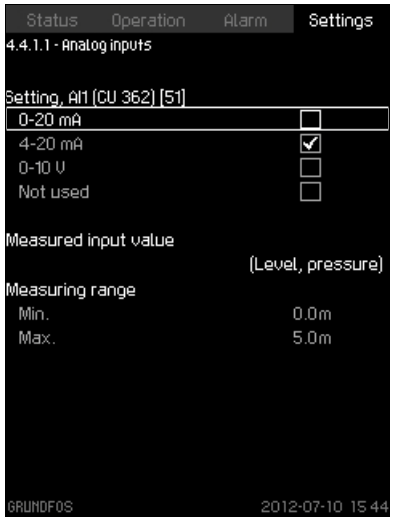
Example

1. Select input signal type, e.g. 4-20 mA.
2. Select input value, e.g. "Level, pressure".
3. Set sensor measuring range (minimum and maximum limits), e.g. 0.0 to 5.0 m.

Note ***If an analog input is disabled, the display will only show the upper part, i.e. the input setting.***

If the input is enabled, "Measured input value" is shown.
A function can be linked to an analog input in another display.
The CU 362 will return to the analog input setting display.

Path: Settings > I/O settings > Analog inputs > Analog inputs >



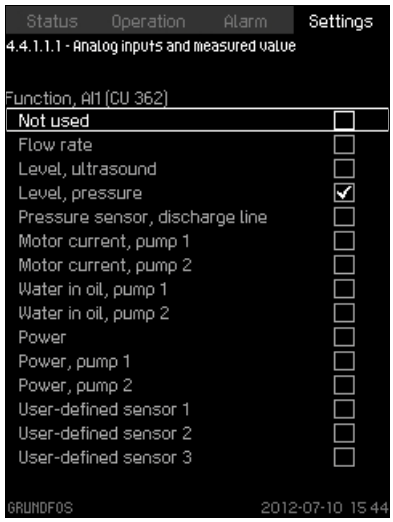
Display_4.4.1.1

Fig. 107 Analog inputs

Analog inputs, input value

The input value for the selected analog input is set in this display.

Path: Settings > I/O settings > Analog inputs > Analog inputs > Analog inputs and measured value >



Display_4.4.1.1.1

Fig. 108 Analog inputs and measured value

9.4.2 Digital inputs

The digital input to be set is selected in this display.

As standard, there are 12 digital inputs. The display shows each input so that its physical location can be quickly identified.

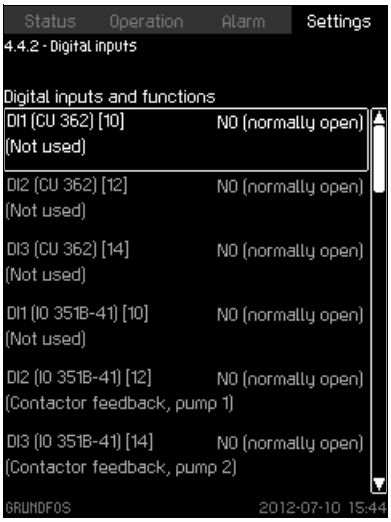
Example

The DI2 digital input on the IO 351B (designated terminal 12) is linked to the function "Contactor feedback, pump 1", and the contactor type is normally open.

DI1 (CU 361) [10] and DI2 (IO351B-41) [12].

Input	Control unit/ module	Terminal
DI1	CU 362	10
DI2	IO 351B	12

Path: Settings > I/O settings > Digital inputs >



Display_4.4.2

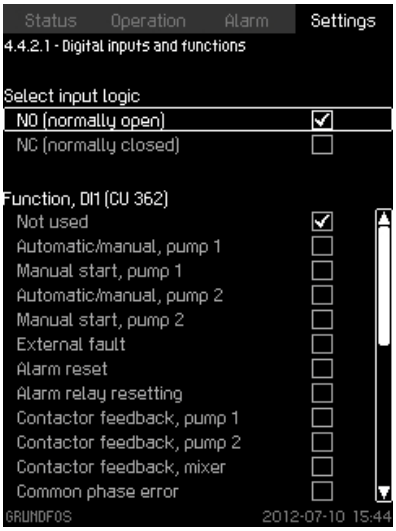
Fig. 109 Digital inputs

Digital inputs and functions

The signal input logic and the digital input function are set in this display. Four of these functions can be renamed. The default names are "Extra fault 1" to 4. The default name can be changed by the user. The new name will be shown in the alarm log if an alarm becomes active.

See section *9.5.1 System alarms*.

Path: Settings > I/O settings > Digital inputs > Digital inputs and functions >



Display_4.4.2.1

Fig. 110 Digital inputs and functions

9.4.3 Analog outputs

The analog output to be set is selected in this display.

As standard, there are three analog outputs. The display shows each output so that its physical location can be quickly identified.

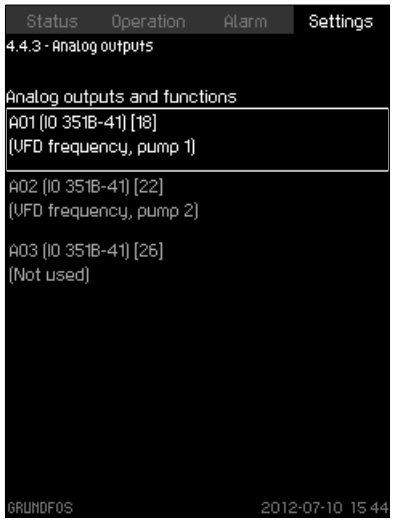
Example

The AO1 analog output on the IO 351B (designated terminal 18) is linked to the function "VFD frequency, pump 1".

AO1 (IO351B-41) [18].

Input	Module	Terminal
AO1	IO 351B	18

Path: Settings > I/O settings > Analog outputs >



Display_4.4.3

Fig. 111 Analog outputs

9.4.4 Digital outputs

The digital output to be set is selected in this display.

As standard, there are nine digital outputs. The display shows each digital output so that its physical location can be quickly identified.

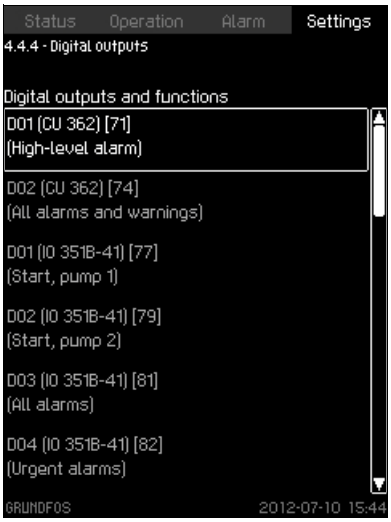
Example

The DO1 digital output on the CU 362 (designated terminal 71) is linked to "High-level alarm".

DO1 (CU 361) [71] and DO1 (IO351B-41) [77].

Output	Control unit/ module	Terminal
DO1	CU 362	71
DO1	IO 351B	77

Path: Settings > I/O settings > Digital outputs >



Display_4.4.4

Fig. 112 Digital outputs

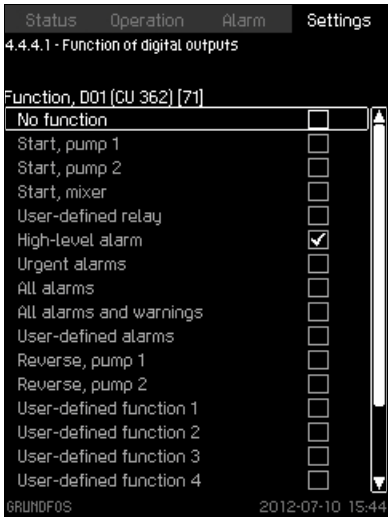
Digital outputs, output value

The output value for the selected digital output is set in this display.

Example

The DO1 digital output on the CU 362 (designated terminal 71) is linked to "High-level alarm".

Path: Settings > I/O settings > Digital outputs > Function of digital outputs >



Display_4.4.4.1

Fig. 113 Function of digital outputs

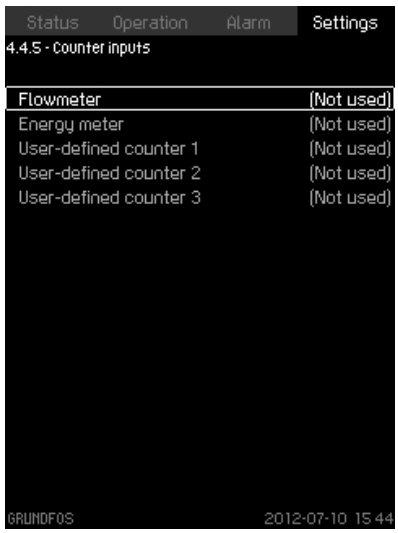
9.4.5 Counter inputs

The counter input to be set is selected in this display.

A counter input can be connected to a flowmeter, energy meter or similar device.

As standard, there are five counter inputs. Each counter can be set via a submenu. The user-defined counters can be renamed.

Path: Settings > I/O settings > Counter inputs >



Display_4.4.5

Fig. 114 Counter inputs

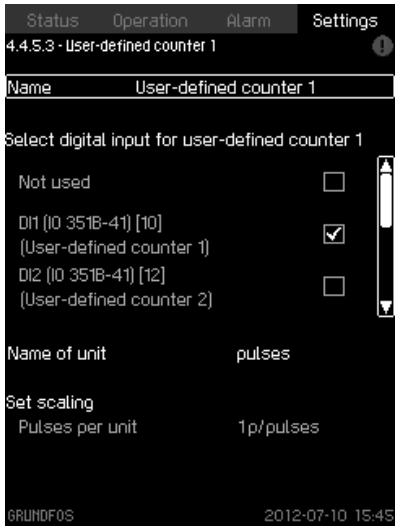
Counter inputs, configuration

The selected counter input is set in this display.

1. Identify the digital input connected to the counter input in the system.
2. Select the digital input the meter or sensor is connected to, select unit and scaling.
3. Rename the user-defined counter.

Note ***The IO 351B pulse input has a maximum frequency of 12 Hz.***

Path: Settings > I/O settings > Counter inputs > Flowmeter >



Display_4.4.5.3

Fig. 115 User-defined counter

All counter inputs are shown in the status display and can be accessed via the electrical overview.

9.4.6 Alarm relays

The alarm relays are activated by a series of defined alarms (faults).

Select how the individual alarms are to be reset.

There are five types of relay alarms:

High-level alarm

Activated by a high water level.

Urgent alarms

Activated by

- High level
- Level
- Dry running
- Mains supply fault
- Common phase error.

All alarms

Activated by all alarms.

All alarms and warnings

Activated by all alarms and warnings.

User-defined alarms

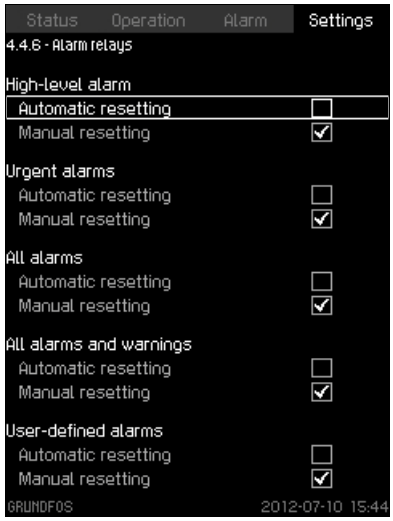
Activated by all user-defined relay alarms.
See sections *9.5.5 Analog fault configuration* and *9.5.6 Digital fault configuration*.

The individual relay alarms can be reset in two ways:

- Automatic resetting
- Manual resetting.

The user has to select how the individual relay alarms are to be reset. Alarm relays must be connected to a digital output.
See section *Digital outputs, output value* on page 65.

Path: Settings > I/O settings > Alarm relays >



Display_4.4.6

Fig. 116 Alarm relays

9.4.7 PTC inputs

The PTC input to be set is selected in this display.

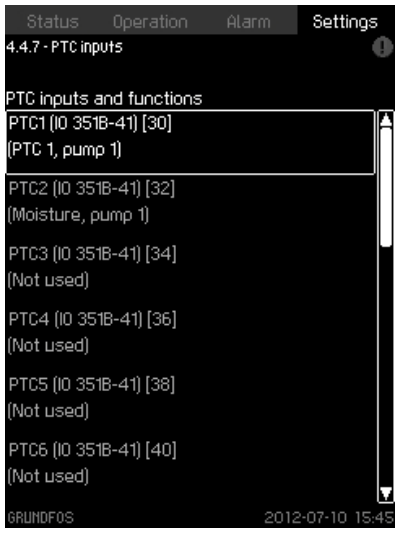
As standard (1 IO 351B module), there are six PTC inputs. If an extra IO 351B module is installed, 12 PTC inputs will be available The display shows each input so that its physical location can be quickly identified.

The user must select the function for each PTC input.

– PTC sensor

– moisture sensor.

Path: Settings > I/O settings > PTC inputs >



Display_4.4.7

Fig. 117 PTC inputs

PTC input, configuration

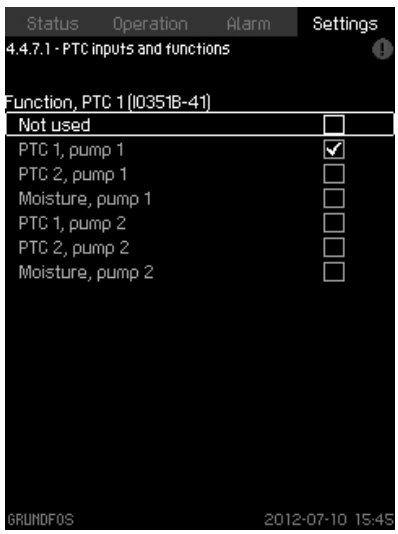
The PTC input to be set is selected in this display.

Each PTC input has its own display. The number of displays depends on the number of PTC inputs.

Example

1. Select the function of the PTC sensor, PTC1.

Path: Settings > I/O settings > PTC inputs > PTC inputs and functions >



Display_4.4.7.1

Fig. 118 PTC inputs and functions

9.5 Alarm settings

This display shows the options in menu "Alarm settings".

Follow this procedure in each submenu:

1. Enable or disable alarms and warnings.
2. Set alarm or warning limits.
3. Set the alarm resetting as automatic or manual.
   A time delay can also be set. The time delay may be practical if a measuring signal is unstable.

Note ***Every fault indication can be set like this, which means that the alarm and warning settings can be customised.***

Alarms

A tripped alarm will typically stop a pump or cause some other action.

Warnings

A warning will not cause the pump to stop. A warning shows that the system is approaching an alarm state.

All warnings are automatically acknowledged.

Note ***The individual sensors must be set before this menu can be used.***

System alarms

Set the required system alarms in this menu.
See section *11.7 System alarms*.

Pump alarms

Set the required pump alarms in this menu.
See section *11.8 Pump alarms*.

Pump alarms contain alarms and warnings for the individual pump.

Mixer alarms

Set the required mixer alarms in this menu.
See section *11.9 Mixer alarms*.

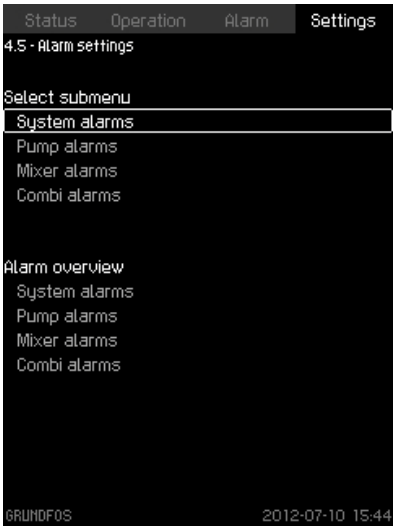
Combi alarms

Combi alarms enable the user to combine two alarms in one. Both alarms must be active before the SCADA system is called or an SMS message is sent. See section *11.10 Combi alarms*.

Alarm status

If an alarm has been enabled either as a warning or alarm, it will be displayed in one of the sub menus.

Path: Settings > Alarm settings >



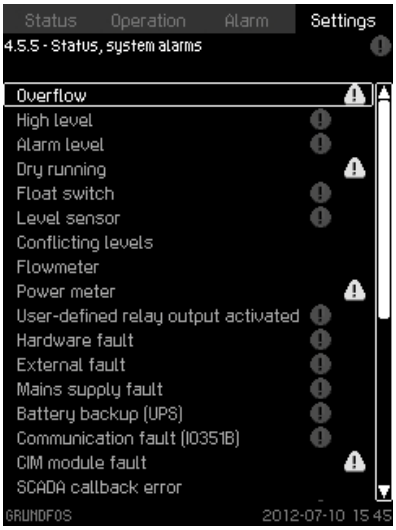
Display_4.5

Fig. 119 Alarm settings

Note ***If the function "Pump groups" is enabled, submenu "Pump alarms" will be split into two groups.***

Symbols show the status of each alarm input. Analog alarm inputs can be displayed with both symbols. See fig. 120.

Path: Settings > Alarm settings >



Display_4.5.5

Fig. 120 Example, Status, system alarms

9.5.1 System alarms

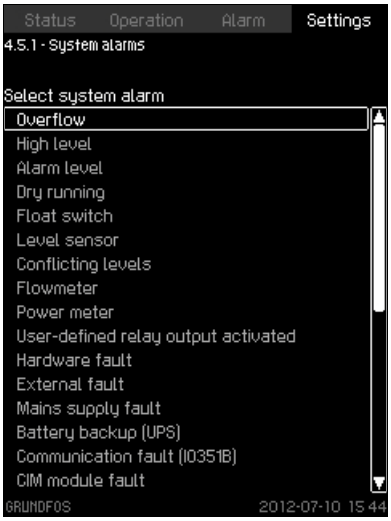
This display shows the parameters defined as system alarms.

Select the parameter to be monitored, and set it as desired.

System alarms can be triggered by two fault types:

- Analog fault. See section *9.5.5 Analog fault configuration*.
  An analog fault will trip an alarm if its value lies outside a set limit.
- Digital fault. See section *9.5.6 Digital fault configuration*.
  A digital fault will trip an alarm if a fault occurs (on/off).

Path: Settings > Alarm settings > System alarms >



Display_4.5.1

Fig. 121 System alarms

Description of system alarms

Alarm	Description
Overflow	The alarm is displayed if an analog level sensor or a float switch registers an overflow.
High level	A high level can be set to activate an alarm relay. When the high level is reached, the system attempts to start both pumps. High level must always be the highest level in the system.
Alarm level	An alarm level can be randomly selected. Enables interlock.
Dry running	The dry-running level can be randomly set as the lowest level in the system. When the dry-running level is reached, both pumps are stopped. The foam-draining level will ignore the dry-running alarm and the system will pump down to the foam-draining level.
Float switch	The warning is displayed in the event of a discrepancy between the input signals from the various float switches, e.g. if the float switch "Start" is enabled and the float switch "Stop" is disabled in a wastewater pit.
Level sensor	The alarm is displayed if the level sensor input is outside the measuring range.
Conflicting levels	The alarm is displayed if the signal from the analog level sensor does not correspond with the float switches. This situation may occur if the level sensor is damaged or clogged. If the dry-running float switch displays dry running without the level sensor having displayed dry running, or if the high-level float switch is enabled without the level sensor also displaying high level, the system considers the level sensor to have failed and disregards it. If this situation occurs, it is possible to continue with only a high-level float switch and a dry-running float switch. When the high-level float switch is enabled, the pumps that are allowed to start will start pumping for a preset period of time or until the dry-running float switch displays dry running. **Note:** If the analog sensor is damaged, "Dry running" and "High level" will appear in the display even if the alarms have not been set to "Enabled". **Note:** If the analog sensor is damaged, "Conflicting levels" will appear in the display even if the alarms "High level" and "Dry running" have not been set to "Enabled".
Flowmeter	The warning is displayed if the flowmeter input is outside of the measuring range.
Power meter	The warning is displayed if the power meter input is outside of the measuring range.
User-defined relay output activated	The alarm is displayed when a relay is manually controlled.
Hardware fault	Hardware fault in a system module.
External fault	Indicates an external fault registered via a digital input.
Mains supply fault	A mains supply fault can be displayed if an emergency power supply module is connected. No power supply to the system.
Battery backup (UPS)	The alarm is displayed if the emergency power supply can no longer power the system.

Alarm	Description
Communication fault (IO351B)	The alarm is displayed if there is no GENIbus communication with the IO 351B. The system will not control/read the module's digital/analog input and output signals.
CIM module fault	Indicates a CIM module fault.
SCADA callback error	The alarm is displayed if there is a modem communication fault.
Ethernet, no IP address from DHCP	No IP address assigned by a DHCP server.
Ethernet disabled due to misuse	The Ethernet shuts down as protection against incorrect use.
SIM card fault	Faulty SIM card. The SIM card is inserted in the CIM module.
User-defined sensor 1	The sensor is faulty.
User-defined sensor 2	The sensor is faulty.
User-defined sensor 3	The sensor is faulty.
Pressure sensor, discharge line	The pressure sensor installed in the discharge line is faulty.
Extra fault 1 to 4	User-defined, external faults registered via a digital input.
Gas detector	Gas detector active.
Water on pit floor	There is water on the floor in the pump pit.

9.5.2 Pump alarms

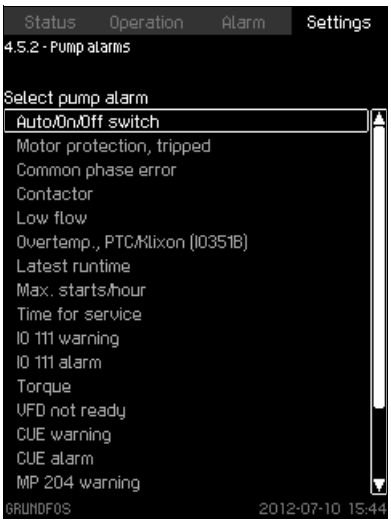
This display shows the parameters defined as pump alarms.

Select the parameter to be monitored, and set it as desired.

Pump alarms can be triggered by two fault types:

- Analog fault. See section *9.5.5 Analog fault configuration*.
  An analog fault will trip an alarm if its value lies outside a set limit.
- Digital fault. See section *9.5.6 Digital fault configuration*.
  A digital fault will trip an alarm if a fault occurs (on/off).

Path: Settings > Alarm settings > Pump alarms >



Display_4.5.2

Fig. 122 Pump alarms

Description of pump alarms

Alarm	Description
Auto/On/Off switch	The alarm must be set to enable the Auto/On/Off switch function. If the pump has been started or stopped by either SCADA/CU 362 operator display or "Auto/On/Off switch" for more than 5 minutes (default), this alarm will be displayed. The user can set the delay as desired and select either warning or alarm. To prevent personal injury in the event of failure, the pump must be stopped.
Motor protection, tripped	A motor circuit breaker has stopped the pump to protect it.
Common phase error	If one or more phases are missing in a three-phase system, the pumps will stop. If the phase sequence is incorrect, the pump motor will rotate in the wrong direction. If this occurs during operation, the pump will either stop or not start.
Contactor	An "NO" auxiliary contact is used for feedback from the main contactor to check that the contact set is not welded or hanging.
Low flow	The low-flow limit can be set to receive an indication that a decrease in pump performance has occurred.
Overtemp., PTC/Klixon (IO351B)	This fault will stop the pump, but the pump will automatically restart once the fault is corrected and the pump has cooled.
Water-in-oil sensor	Faulty water-in-oil sensor.
Overload	The pump consumes more current that expected. The pump may be blocked.
Underload	The pump consumes less current that expected. The pump may run dry.
Latest runtime	The maximum time the pump is allowed to operate without interruptions. At the end of the alarm time set, the pump stops and the other pump starts, provided that the conditions of pump operation are still fulfilled. This setting is intended for a system with pump alternation, characterised by an almost identical inflow and pump capacity. This results in forced alternation when a pump reaches its maximum operating time.
Max. starts/hour	The desired maximum number of starts per hour can be set. The warning is displayed if the number of pump starts per hour exceeds the limit set.
Time for service	The warning is displayed if the recommended service interval has been exceeded or if the total pump operating time exceeds the limit set.
GENIbus com. fault (IO 111)	GENIbus communication fault with the IO 111.
IO 111 warning	The IO 111 indicates a warning (all warnings from the module).
IO 111 alarm	The IO 111 indicates an alarm (all alarms from the module).
Torque	The torque is too high (CUE only).
VFD not ready	Feedback signal missing (VFD only).
CUE warning	The CUE indicates a warning (all warnings from the module).
CUE alarm	The CUE indicates an alarm (all alarms from the module).
MP 204 warning	The MP 204 indicates a warning (all warnings from the module).

Alarm	Description
MP 204 alarm	The MP 204 indicates an alarm (all alarms from the module).
Ammeter	Faulty ammeter.
Power meter	The power meter is out of range, for example lower or higher than 4-20 mA.
Blocked	The alarm is displayed if the set limits for "Anti-blocking" are exceeded. See section *9.2.11 Anti-blocking*.
Moisture	The moisture sensor indicates an alarm.

9.5.3 Mixer alarms

This display shows the parameters defined as mixer alarms.

Select the parameter to be monitored, and set it as desired.

Mixer alarms can be triggered by two fault types:

- Analog fault. See section *9.5.5 Analog fault configuration*.
  An analog fault will trip an alarm if its value lies outside a set limit.
- Digital fault. See section *9.5.6 Digital fault configuration*.
  A digital fault will trip an alarm if a fault occurs (on/off).

Path: Settings > Alarm settings > Mixer alarms >

Display_4.5.3

Fig. 123 Mixer alarms

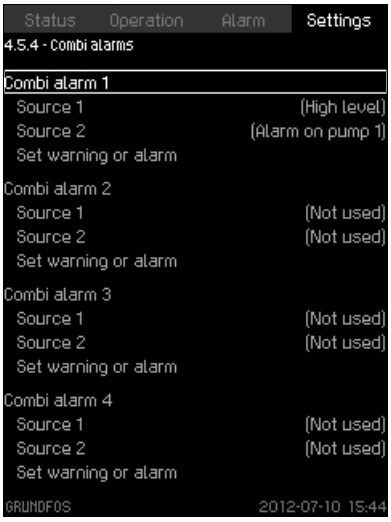
9.5.4 Combi alarms

This display shows the four combi alarms that can be set.

Alarm source

Each combi alarm consists of two alarms. Select an alarm for each combi alarm source (sources 1 and 2). For the combi alarm to trip, both alarms must be active at the same time.

Path: Settings > Alarm settings > Combi alarms >



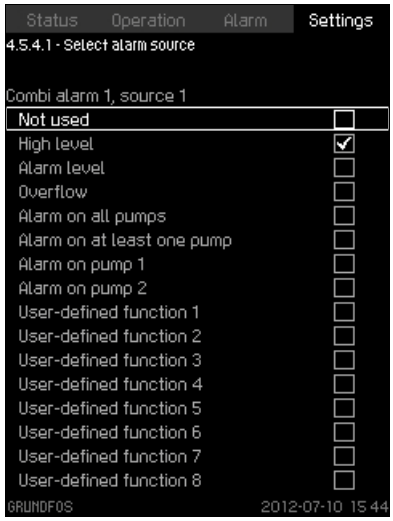
Display_4.5.4

Fig. 124 Combi alarms

Alarm source 1

Select the first alarm source for combi alarm 1 in this display.

Path: Settings > Alarm settings > Combi alarms > Select alarm source >



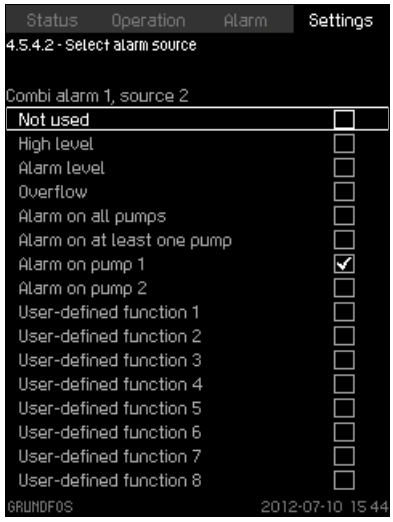
Display_4.5.4.1

Fig. 125 Select alarm source

Alarm source 2

Select the second alarm source for combi alarm 1 in this display.

Path: Settings > Alarm settings > Combi alarms > Select alarm source >



Display_4.5.4.2

Fig. 126 Select alarm source

9.5.5 Analog fault configuration

Analog faults are activated if the currently measured value is outside a set limit. An analog fault can be registered as a warning or as an alarm.

Alarm delay

An alarm delay is typically used when a measuring signal is unstable. The signal from surface water waves may generate a high water level for a short period. An alarm delay allows time for the unstable signal to pass, e.g. for the water level to steady.

User-defined alarm relay

A warning or alarm can be coupled to a relay output.

Alarm resetting

Select the alarm resetting as manual or automatic. All warnings will be reset automatically.

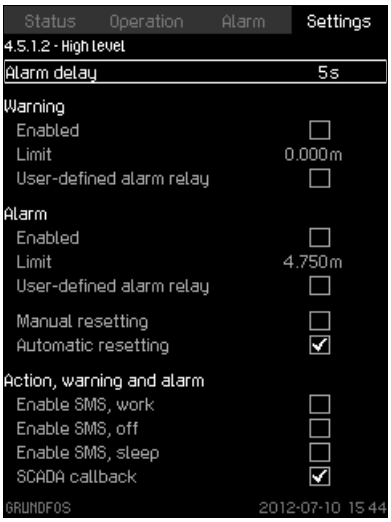
Action, warning and alarm

Set SMS messaging schedules for the service manager in the following periods: Work, Off, Sleep.

Schedule periods serve practical purposes, e.g. to avoid sending SMS messages about minor faults to the service manager in the middle of the night. The service manager will receive the SMS messages when he/she has returned to work.

Warning or alarm callback to the SCADA system is also selected in this display.

Path: Settings > Alarm settings > System alarms > High level >



Display_4.5.1.2

Fig. 127 High level

9.5.6 Digital fault configuration

Digital faults are activated in case of a faulty system condition. A digital fault can be registered as a warning or as an alarm.

Alarm delay

An alarm delay is typically used when a measuring signal is unstable. The signal from surface water waves may generate a high water level for at short period. An alarm delay allows time for the unstable signal to pass, e.g. for the water level to steady.

User-defined alarm relay

A warning or alarm can be coupled to a relay output.

Alarm resetting

Select the alarm resetting as manual or automatic. All warnings will be reset automatically.

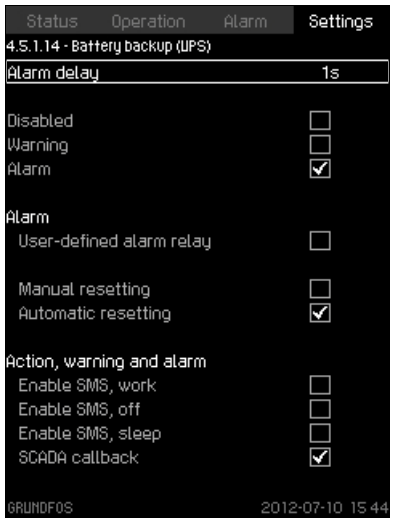
Action, warning and alarm

Set SMS messaging schedules for the service manager in the following periods: Work, Off, Sleep.

Schedule periods serve practical purposes, e.g. to avoid sending SMS messages about minor faults to the service manager in the middle of the night. The service manager will receive the SMS messages when he/she has returned to work.

Warning or alarm callback to the SCADA system is also selected in this display.

Path: Settings > Alarm settings > System alarms > Battery backup (UPS) >



Display_4.5.1.14

Fig. 128 Battery backup (UPS)

9.6 General settings, CU 362

This display shows the options in menu "General settings, CU 361".

Display language

In this menu, the CU 362 display language is selected. In connection with service, it is easy to change over to the service language, using the function "Change language to the service language (English)".

Run configuration wizard again

This function enables the user to reconfigure the system with the initial settings.

Other functions related to CU 361

A series of other functions can be set in this menu.

Path: Settings > General settings, CU 361 >

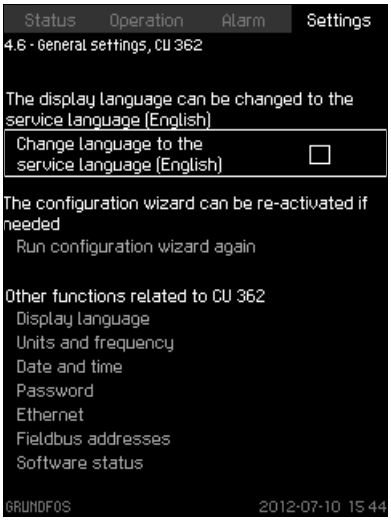


Fig. 129 General settings, CU 361

9.6.1 Run configuration wizard again

The configuration wizard can be run again in this display.

This function enables the user to reconfigure the system with the initial settings. See installation and operating instructions for Dedicated Controls.

Note ***The configuration wizard is self-explanatory.***

Note ***All settings, including level sensor settings, will be lost.***

Path: Settings > General settings, CU 361 > Run configuration wizard again >

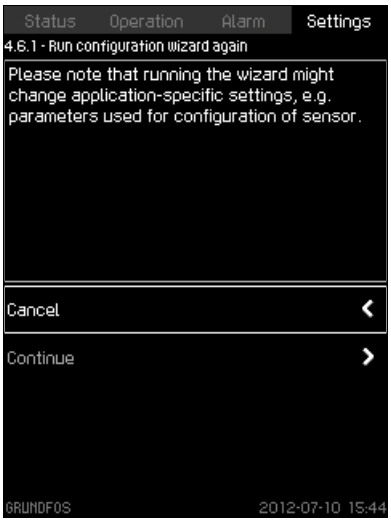


Fig. 130 Run configuration wizard again

9.6.2 Display language

The CU 362 display language is selected in this display.

Path: Settings > General settings, CU 361 > Display language >

Display_4.6.2

Fig. 131 Display language

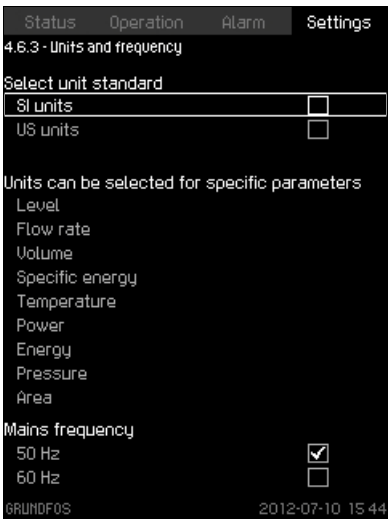
9.6.3 Units and frequency

In this display, it is possible to select the unit standard for the various parameters.

As basic setting, it is possible to select SI or US units. It is also possible to select other units for the individual parameters.

The unit of measurement has no influence on the data, e.g. as seen in the SCADA system.

Path: Settings > General settings, CU 361 > Units and frequency >



Display_4.6.3

Fig. 132 Units and frequency

Possible settings

Parameter	Basic setting		Optional units
	SI	US	
Level	m	ft	m, cm, ft, in
Flow rate	m^3/h	gpm	m^3/s, m^3/h, l/s, gpm, yd^3/s, yd^3/min, yd^3/h
Volume	m^3	gal	l, m^3, gal, ydv
Specific energy	kWh/m^3	kWh/gal	J/m^3, kWh/m^3, Wh/gal, Wh/kgal, BTU/gal, hph/gal
Temperature	°C	°F	K, °C, °F
Power	kW	hp	W, kW, MW, hp
Energy	kWh	kWh	J, kWh, MWh, BTU, HPh

Note

If units are changed from SI to US or vice versa, all individually set parameters will be changed to the basic setting in question.

9.6.4 Date and time

In this display, date, time and date-time format are set.

The real-time clock has a built-in rechargeable power supply which can supply the clock for up to 20 days if the power supply to the CU 362 is interrupted.

If the clock is not powered for more than 20 days, it must be set again.

Setting range

The date can be set as day, month and year.

The time can be set as a 24-hour clock showing hours and minutes.

There are three formats:

Examples of format
2008-06-27 13:49
27-06-2008 13:49
6/27/2008 1:49 pm

Factory setting

Local time.

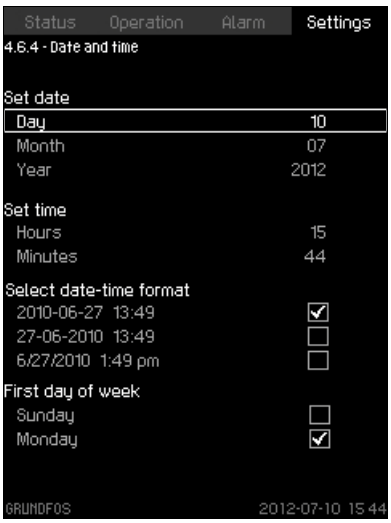
Note

If the system has not been powered for more than 20 days since it left the factory, the clock may have returned to the original setting: 01-01-2008 0:00.

Date and time may have been changed during the setting of the CU 362.

There is no automatic changeover to/from daylight-saving time.

Path: Settings > General settings, CU 361 > Date and time >



Display_4.6.4

Fig. 133 Date and time

9.6.5 Password

In this display, it is possible to limit the access to the menus "Operation" and "Settings" by means of a password.

If the access is limited, it is not possible to view or set any parameters in the menus.

A password must have four digits.

Note

If you have forgotten your password, contact Grundfos.

Factory setting

Both passwords are disabled.
Factory setting is "1234".

Path: Settings > General settings, CU 361 > Password >

Display_4.6.5

Fig. 134 Password

9.6.6 Ethernet

See section *9.3.2 Ethernet*.

9.6.7 Fieldbus addresses

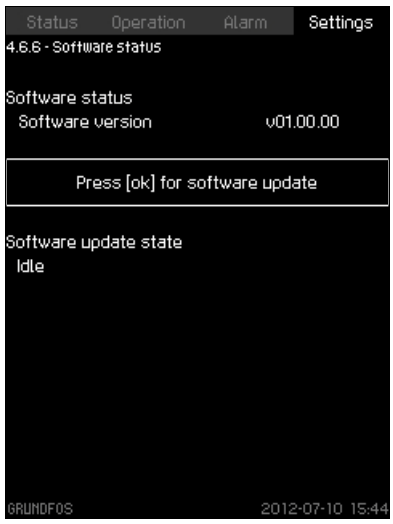
See section *9.3.3 Fieldbus addresses*.

9.6.8 Software status

This display shows the version of the software installed in the CU 362.

In this display, it is possible to upgrade the software, using the Grundfos CU 362 Firmware Upgrader Box. See installation and operating instructions for the CU 362 Firmware Upgrader Box on the CD-ROM supplied with the Dedicated Controls control cabinet.

Path: Settings > General settings, CU 361 > Software status >



Display_4.6.6

Fig. 135 Software status

10. Fault finding

Warning

Before making any connections in pumps, terminal boxes or control cabinet, make sure that the power supply has been switched off for at least 5 minutes and that it cannot be accidentally switched on.

Fault	Cause	Remedy
1. Pumps do not run when started.	a) CU 362 fault.	• Reset alarms, or replace the CU 362.
	b) Power supply disconnected.	• Switch on the power supply. • Replace fuse. • Replace the main switch.
	c) Main switch cut out.	• Cut in the main switch.
	d) Main switch defective.	• Replace the main switch.
	e) Motor protection tripped.	• Check the setting. • Motor defective (contact Grundfos). • Open thermistor. • Phase failure. • Contact Grundfos.
	f) Motor defective.	• Repair or replace the motor.
	g) Sensor fault.	• Check sensor configuration. • Replace the sensor.
	h) Cable defective.	• Repair or replace the cable.
	i) No water in pump pit.	• Wait until the level control activates a pump.
	j) Level control fault.	• Check level control configuration. • Replace the sensor/float switch.
	k) External on/off switch switched off.	• Switch on the on/off switch.
2. Pumps start, but stop immediately.	a) Dry running or no inlet pressure.	• Wait until the level control activates a pump.
	b) Motor protection tripped.	• Check the setting. • Motor defective (contact Grundfos).
	c) Level control fault.	• Check level control configuration. • Replace the sensor/float switch.
3. Pump performance unstable.	a) Suction port blocked by impurities.	• Clean the pump.
	b) Suction pipe or pumps partially blocked by impurities.	• Clean the suction pipe, strainer or pumps.
	c) Pumps suck air.	• Incorrect positioning of pump relative to level control (dry running).
	d) Valves closed.	• Open the valves.
4. Pumps are running, but deliver no water.	a) Valves closed.	• Open the valves.
	b) Suction pipe or pumps blocked by impurities.	• Clean the suction pipe or pumps.
	c) Non-return valve blocked in closed position.	• Clean the non-return valve. The non-valve must be able to move freely.
5. Pumps start and stop frequently.	a) Incorrect distance between start and stop levels.	• Set start and stop levels correctly.

11. Factory settings

This section gives an overview of the factory settings for the individual units and functions in the Dedicated Controls system. Users can thus use this overview to reconfigure the system using the factory settings. Users can also note their own settings in the overview.

11.1 Pump

Description	Factory setting	Own settings
Pump 1	Installed In operation Contactor feedback IO 111 not installed MP 204 not installed CUE/VFD not installed	
Pump 2	Installed In operation Contactor feedback IO 111 not installed MP 204 not installed CUE/VFD not installed	
Pump 3	Installed In operation Contactor feedback IO 111 not installed MP 204 not installed CUE/VFD not installed	
Pump 4	Installed In operation Contactor feedback IO 111 not installed MP 204 not installed CUE/VFD not installed	
Pump 5	Installed In operation Contactor feedback IO 111 not installed MP 204 not installed CUE/VFD not installed	
Pump 6	Installed In operation Contactor feedback IO 111 not installed MP 204 not installed CUE/VFD not installed	

11.2 Pit

Description	Factory setting	Own settings
Pit depth	5.0 m	
Upper measurement level	1.5 m	
Lower measurement level	0.5 m	
Volume (upper ↔ lower)	0.1 m^3	
Max. measurement time	3,600 sec.	
Max. start-up delay	2 sec.	
Start → start delay	2 sec.	
Stop ← stop delay	2 sec.	
Start ↔ stop delay	2 sec.	
After-run delay	2 sec.	
After-run delay, high level	2 sec.	
Analog level sensor	AI1 (CU 362) Level, pressure 4-20 mA Min. value: 0 m Max. value: 5 m	

11.3 Level

Description	Factory setting	Own settings
Overflow level	4.95 m	
High level	4.75 m	
Alarm level	3.5 m	
Start level 2	2.0 m	
Start level 1	1.75 m	
Stop level 1	0.5 m	
Stop level 2	0.5 m	
Dry-running level	0.25 m	
Foam-draining level	0.15 m	

11.4 CU 362 configuration

Description	Factory setting	Own settings
Units and frequency	SI	
Password, Operation menu	Disabled	
Password, Settings menu	Disabled	
Display language	English	

11.5 SMS numbers

Description	Factory setting	Own settings
SMS phone number 1	+45 12345678	
SMS phone number 2	+45 12345678	
SMS phone number 3	+45 12345678	
Send alarm SMS to	Primary SMS number	
Acknowledgement deadline	10 minutes	
SMS heartbeat message	Monday to Sunday at 12:30	
SMS authentication, method	Via PIN code	
SMS authentication, PIN code	1234	

11.6 SCADA configuration

Description	Factory setting	Own settings
SCADA callback	Disabled	
SCADA phone number	+45 12345678	
Number of retries	3	
Incoming calls, PIN code enabled	Disabled	
Incoming calls, PIN code	1234	

11.7 System alarms

Description	Factory setting	Own settings
Overflow	-	
High level	-	
Alarm level	-	
Dry running	-	
Float switch	-	
Level sensor	-	
Conflicting levels	-	
Flowmeter	-	
Power meter	-	
User-defined relay output activated	-	
Hardware fault	-	
External fault	-	
Mains supply fault	-	
Battery backup (UPS)	-	
Communication fault (IO351B)	-	
CIM module fault	-	
SCADA callback error	-	
Ethernet, no IP address from DHCP	-	
Ethernet disabled due to misuse	-	
SIM card fault	-	
User-defined sensor 1	-	
User-defined sensor 2	-	
User-defined sensor 3	-	
Pres. sensor, discharge	-	

11.8 Pump alarms

Description	Factory setting	Own settings
Auto/On/Off switch	-	
Motor protection, tripped	-	
Common phase error	-	
Contactor	-	
Low flow	-	
Overtemp., PTC/Klixon (IO351B)	-	
Water-in-oil sensor	-	
Overload	-	
Underload	-	
Latest runtime	-	
Max. starts/hour	-	
Time for service	-	
GENIbus com. fault (IO 111)	-	
IO 111 warning	-	
IO 111 alarm	-	
Ammeter	-	
Torque	-	
VFD not ready	-	
CUE warning	-	
CUE alarm	-	
MP 204 warning	-	
MP 204 alarm	-	
Ammeter	-	
Power meter	-	
Blocked	-	

11.9 Mixer alarms

Description	Factory setting	Own settings
Contactor, mixer	-	
Time for service, mixer	-	
Max. starts/hour, mixer	-	

11.10 Combi alarms

Description	Factory setting	Own settings
Combi alarm 1	-	
Combi alarm 2	-	
Combi alarm 3	-	
Combi alarm 4	-	

12. Logical operators

This section is intended for users who have basic knowledge of logical operators.

Status high = 1

Status low = 0.

12.1 AND operator

The "AND" function is used when both sources must be active (status high = 1) before the output signal changes status (0 to 1). If just one of the source signals changes to low (1 to 0), the output signal also changes to low (1 to 0).

See fig. 136.

1st source	2nd source	Output signal
0	1	0
1	0	0
1	1	1
0	0	0

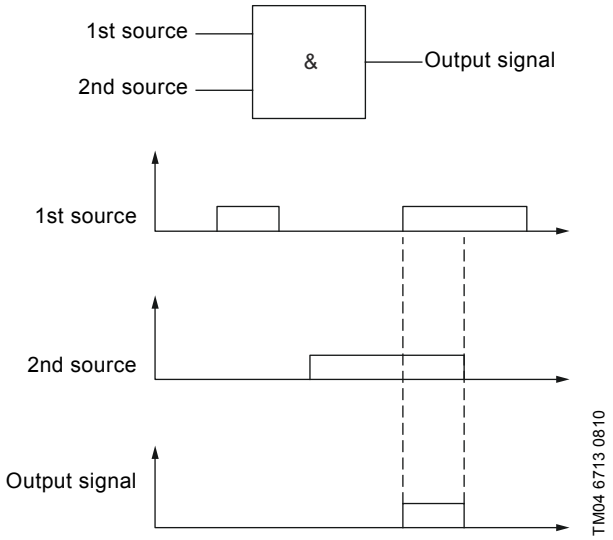


Fig. 136 Logical AND function

12.2 OR operator

The "OR" function is used when only one of the sources must be active (status high = 1) before the output signal changes status (0 to 1). If both sources are activated, the output signal remains unchanged (1).

See fig. 137.

1st source	2nd source	Output signal
0	1	1
1	0	1
1	1	1
0	0	0

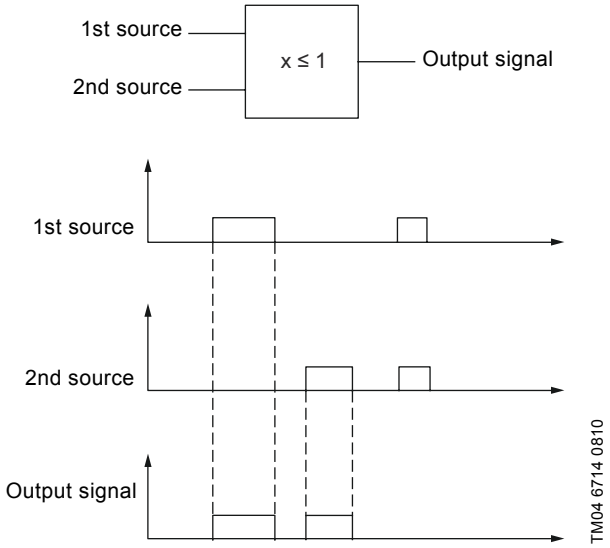


Fig. 137 Logical OR function

12.3 XOR operator

The "XOR" function is used when an output signal equal to low (0) is needed when both sources are either high (1) or low (0). If just one of the sources is high (1), the output signal is high (1).

Note ***When the input signal to the two sources has different status, the output signal is high.***

See fig. 138.

1st source	2nd source	Output signal
0	1	1
1	0	1
1	1	0
0	0	0

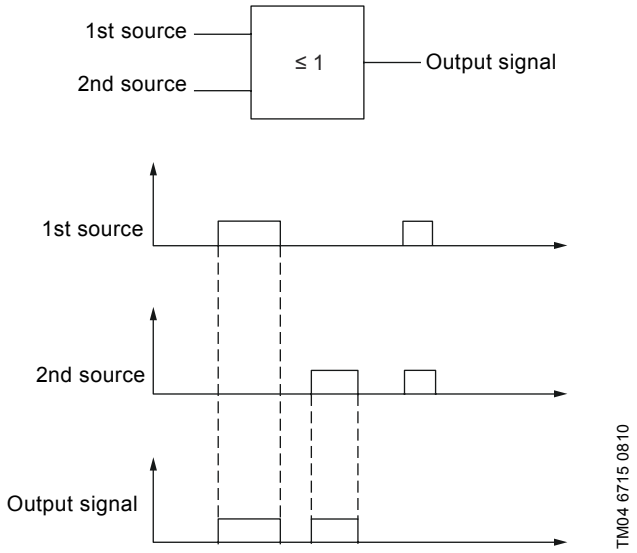


Fig. 138 Logical XOR function

12.4 Set/reset flip-flop

The "Set/reset flip-flop" function (SR-FF) is used when the 1st source has to be used to set an alarm or just to change the output signal to high (1). The output signal remains high (1) even if the 1st source changes to status low (0).

The output signal can only be changed to status low (0) when the 2nd source changes status to high (1). The output signal remains low (0) even if the 2nd source changes to status low (0).

If both 1st source and 2nd source have status high (1), the 1st source (set signal) has the highest priority.

See fig. 139.

1st source/ set	2nd source/ reset	Action	Output signal
0	1	Reset	0
1	0	Set	1
1	1	Set	1
0	0	No change	Unchanged signal

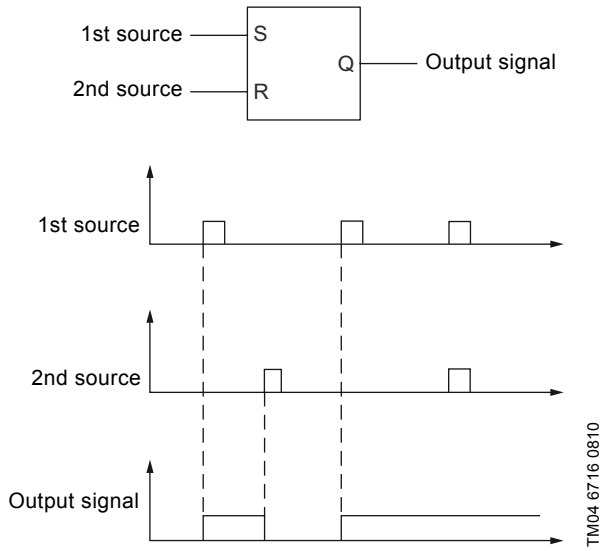


Fig. 139 Logical Set/reset flip-flop function

12.5 Reset/set flip-flop

The "Reset/set flip-flop" function (RS-FF) is the same as the function described in section *12.4 Set/reset flip-flop*. The only change is that the 1st source and 2nd source are switched over.

The 1st source resets the output signal (1 to 0), and the 2nd source sets the output signal (0 to 1).

See fig. 140.

1st source/ reset	2nd source/ set	Action	Output signal
0	1	Set	1
1	0	Reset	0
1	1	Set	1
0	0	No change	Unchanged signal

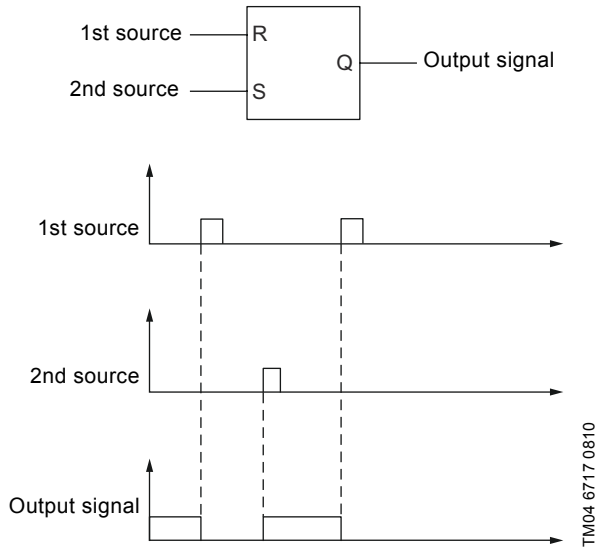


Fig. 140 Logical Reset/set flip-flop function

12.6 Toggle flip-flop

The "Toggle flip-flop" function (T-FF) is to be used together with a timer function.

The 1st source has to be configured as "Constantly high", and the 2nd source has to be configured as "Timer function".

When both sources are high, the timer function is activated, and after a selected time in seconds, the output signal changes status.

The output signal is unpredictable and depends on the following:

- internal state of the Toggle flip-flop
- current output signal.

See fig. 141.

1st source/ set	2nd source/ reset	Output signal
0	1	0
1	0	1
1	1	Undefined
0	0	Unchanged signal

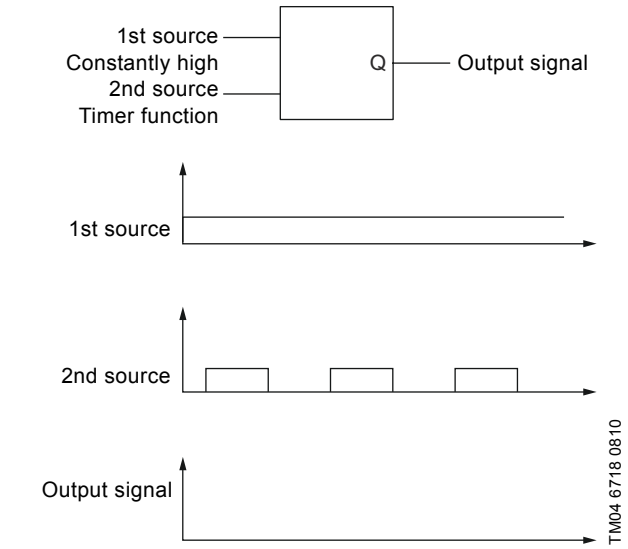


Fig. 141 Logical Toggle flip-flop function

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Revised 27.04.2012

96939460 0812
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