Model 9690

MANUAL

Ultrasonic Inline Density Analyzer

Document history

Version	Date	Description of changes
1	24/11/2008	For software version V2.1.28
2	23/02/2009	Update for software version V2.1.29
3	06/07/2009	Update for software version V2.1.30
4	10/11/2009	Update for software version V2.2.6
5	04/12/2009	Update for software version V2.2.7
6	21/02/2012	Update for software version V2.2.7b
7	04/03/2013	Update for software version V2.2.7c
8	25/04/2013	Update for software version V2.3.4
9	28/10/2013	Update for software version V2.3.4
10	22/04/2014	Update for software version V2.3.7
11	26/01/2016	Russian translation of V2.2.7b
12	17/06/2016	Update for software version V2.3.30

Preparation and precautions

- These safety and operating instructions should be available at all times for reference.
- The product is equipped with a three-wire electrical grounding-type plug. This plug will only fit into a grounding-type power outlet. This is a safety feature. If you are unable to insert the plug into the outlet, the outlet must be replaced. Do not evade the safety purpose of the grounding-type plug.
- Internal batteries (user interface only)
  The user interface is provided with a battery powered circuit. There is a danger of explosion and risk of personal injury if the battery is incorrectly replaced or mistreated. Do not attempt to recharge the battery, disassemble it, immerse it in water, or dispose of it in fire. Replacement has to be done by the manufacturer.
- Unplug the product from the mains power before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.
- The product should be situated away from heat sources such as radiators, heat registers, stoves, or other products (including amplifiers) that produce heat.
- Upon completion of any service or repairs to the product, ask the service technician to perform safety check to determine that the product is in proper operating condition.
- Do not use options and upgrades not recommended by the manufacturer as they may cause hazards.

Never push objects of any kind into the product through openings as they may touch dangerous voltages or damage parts that could result in a fire or electric shock

TABLE OF CONTENT

1. Preface

1.1 Purpose of the manual

This manual explains the installation, configuration, operation and calibration of your Rhosonics analyzer.
For ease of reading and understanding, the manual is organized in logical steps, divided over several chapters and sections. Where necessary, the manual provides additional information about the above mentioned issues, and gives you all the answers regarding ultrasonic inline concentration analysis in the added section with ***Frequently Asked Questions***.

1.2 Symbols and conventions

WARNING:

This symbol indicates that failure to follow directions in the warning could result in bodily harm.

CAUTION:

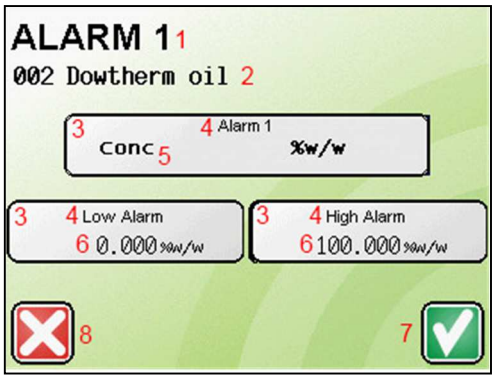
This symbol indicates that failure to follow directions could result in damage to the equipment or loss of information.

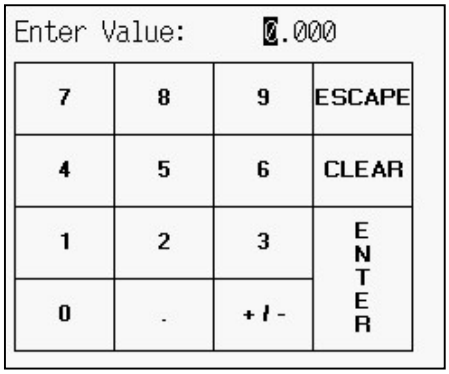
IMPORTANT:
This word indicates that the text that follows contains clarifying information or specific instructions.

NOTE:
This word indicates that the text that follows contains comments, sidelights or interesting points of information.

1.3 About this manual

- The symbol ► indicates a step to be performed.
- Text represented as **[Bold]** indicates the (drawn) button on the touch screen display to be pressed.
- Text in *ITALIC* refers to text displayed on the touch screen display
- Pages on the touch screen display are represented as figures. Below figures with numbers in red explain how to access information and how to change numbers.





1 The title of the menu is given. In this example, the settings of the alarm relay #1 is given.
2 The name of the liquid calibration, to which the alarm settings are connected to.
3 This is a standard button, with details of the current settings.
Pressing the button allows adjustment of context sensitive settings, for example:
4 Button title.
In this example, pressing the large button allows you to assign the alarm to a specific physical measurement or calculated result, such as Concentration, wt%.
The two smaller buttons allow you to change the value.
5 The actual physical/chemical parameter, monitored by the alarm relay.
6 The current value for this particular setting.
Pressing any button representing causes a numeric keyboard to pop up. (see second figure above)
7 Ok button. Pressing this button will store all values as listed in the menu page.
8 Not ok button. No changes will be made. You will then return to the previous page.

1.4 About this analyser

This Rhosonics analyser is part of a product family, which is able to measure a number of physical variables of a process fluid, for automation purposes. The product family and capabilities (depending on analyser model) is given in the below table:

Liquid type	Model	Application area	Application examples
Binary liquids	8500	Diluted chemicals (wt% strength)	NaOH, H2SO4 purity etc.
	8520	Same, but suitable for 2 probes	
	8550	Binary liquids, sample cell system	
	8580	Diluted chemicals (wt% strength)	Corrosive liquids
Ternary liquids	9570	Two chemicals in solution.	TMAH & PR, Electrolytes
	9580	For more corrosive resistance	H2SO4 & Zn++ or Cu++
	9585	Same, + solids & SG reading	COD; customer option
	9590	Ternary analysis by means of sound speed and density	Pickling, i.e. HCl & Fe++
	9595	As 9590 for full-bore, zero intrusion	As 9590; Caustic/Alumina
Slurries	9660	Clarity, diluted chemicals	Overflow clarity
	9670	Clarity & high solids in slurries	
	9671	All SG applications which cannot be done with 9690	Slurries which contain oil
	9680	as 9670, tank installation	Solids, SG, caustic strength
	9690	Slurry density only	Tailings, Ball mill pulp, lime, coal slurry

2. Technical specifications

2.1 Dimensions

Dimensions (weather proof housing)	300x300x120 mm, (HxWxD)
Dimensions (split unit)	170x245x42 mm, (HxWxD)
Display effective area	115x86 mm (WxH)
Display resolution and color	320x240 (WxH) monochrome LCD (8 levels)
Touch switch	Analog resistance film type
Weight (weather proof housing)	± 6.2 kg
Weight (split unit w/o display)	± 1.4 kg
Power consumption	Maximum 35 W (boot), 24 Watts (normal)
Fuse (AC)	1,6AT
Fuse (DC)	3,15AT

2.2 Specifiations

2.2.1 Overview

Temperature circuit:

Resolution	± 0.5 °C (24 hours warm-up)
Reproducibility	± 0.1 °C (24 hours warm-up)
Range	-10 °C through 150 °C (depending on probe type)

Density circuit:

Resolution	0.2 g/l
Accuracy	+/- 0.005 S.G. (approx. +/- 5g/l density)
Reproducibility	0.1 g/l
Range	700 g/l through 3000 g/l

4-20mA Outputs (2x):

Resolution	± 0.002 % of FS
Repeatability	± 0.02 % of FS
Output current & load	± 4-20 mA into 450 Ω

Alarm outputs (2x):

Type	SPDT, adjustable low-low high alarm (2x)
Ratings	± 250 VAC - 2A max.

Interfaces:

Serial interface	RS232, RS422, RS485 (optional)
Ethernet	Ethernet available as option

Storage of product calibrations

Calibration polynomials for liquids	2 (standard), 200 (optional)

Measurement Units:

Solids	g/l or %wt, accuracy: 5 g/l or 0.5 %wt

2.2.2 Options

On customer request the factory will equip the analyzer with either a:

- Ethernet-10 adapter with webpage
- Logging option, files accessible through Ethernet-10 adapter
- USB-memory stick option, for logging and debugging purposes
- Profibus DP interface
- 100-240 VAC 50/60 Hz power supply converter **or** a 24 VDC power supply

- 4-20 mA Output 1 with non-isolated output (standard) **or** isolated output

2.2.3 Environmental conditions

WARNING:

To prevent electrical fire or shock hazards, do not expose the instrument to rain or excessive moisture.

2.2.4 Ingress Protection (WPF-housing)

External touch screen display front side: IP65 (when using gasket)
External touch screen display rear side: IP20
Control unit front side: IP20/55
Control unit rear side: IP20/24
Sensor: IP68

2.2.5 Temperature

To meet and maintain the specifications listed, the analyzer should be operated within -5ºC to +50°C ambient temperature.
Consult the factory for details.

2.2.6 Humidity

Relative humidity < 95% at 40ºC (non condensing)

2.2.7 Storage conditions

Temperature: -40ºC to +75ºC

3. Installation

3.1 Mechanical Installation

3.1.1 Wheaterproof Housing (WPF-housing)

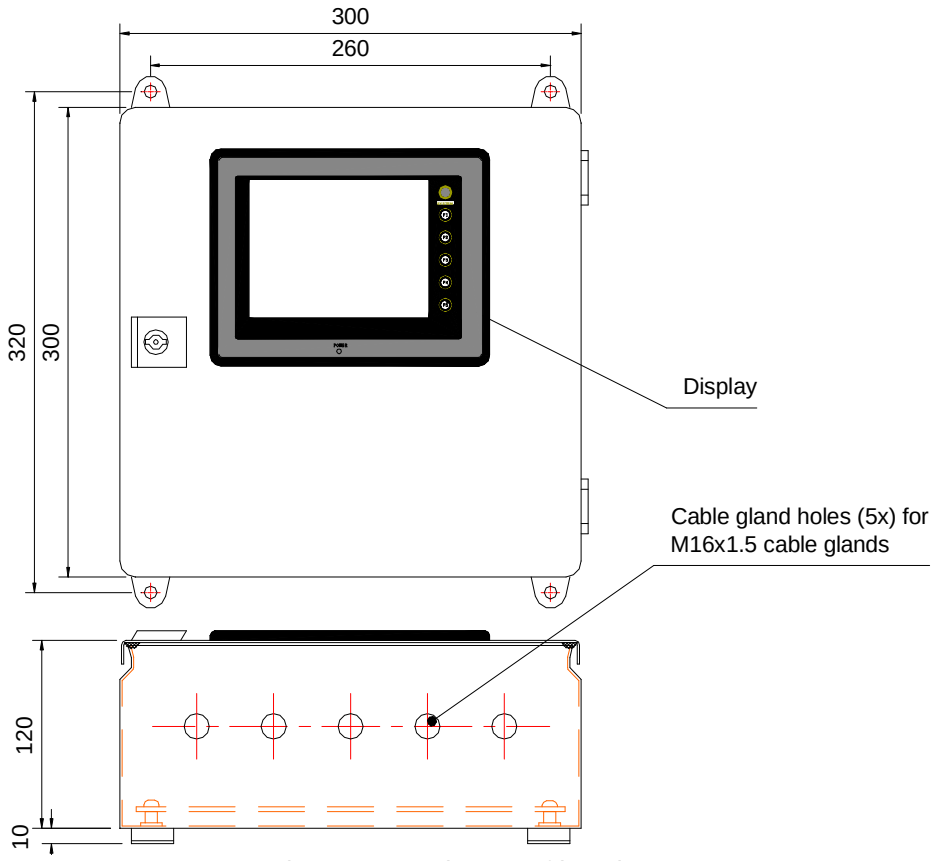


Figure 1: Weather proof housing

Recommendations for installation of this housing are given below:

- Rating of housing is IP65, however when you plan to install outdoors:
  - Always install under a protection cover, to prevent water ingress
  - Always prevent direct sunlight, i.e. by means of a sun shade
- The diameter of the mounting holes is 8 mm
- Recommended bolt diameter is Ø 8 mm. The length depends on the mounting material you are using (Steel, Concrete, etc.)
- The analyzer is supplied with 5 cable glands for use with cable dimensions:
  - 4 glands for Ø 5 – 9mm
  - 1 gland for Ø 9 – 14 mm
- Make sure the analyzer is mounted about at least 100mm above the ground or surface to prevent cable cracks while installing.

3.1.2 Split unit type (SPLIT)

3.1.2.1 Controller installation

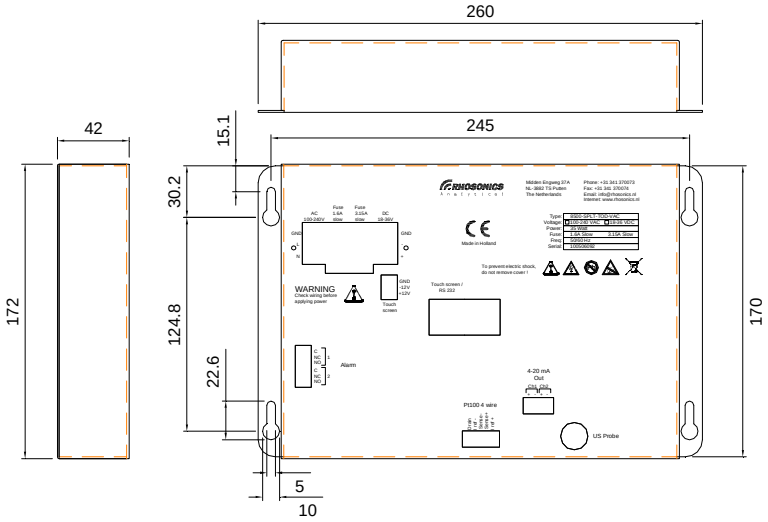


Figure 2: SPLIT housing style.

This housing style is recommended for installation in system cabinets, ships or instrument panels. Recommendations for installation of this housing are given below:

- Rating of housing is IP24, so when you plan to install outdoors:
  - Always install in a dry and moist-free location
  - Always prevent direct sunlight, i.e. by means of a sun shade
- The diameters of the mounting holes are 10mm
- Recommended bolt diameter is 10mm. The length depends on the mounting material you are using.

3.1.2.2 Display installation

The display can be easily installed inside a panel of a cabinet. The instructions below indicate how. This procedure requires a mechanical engineer as this installation may come precise.

1. Make sure that you cut a perfect right-angle like figure 3. The dimensions are given in this figure.

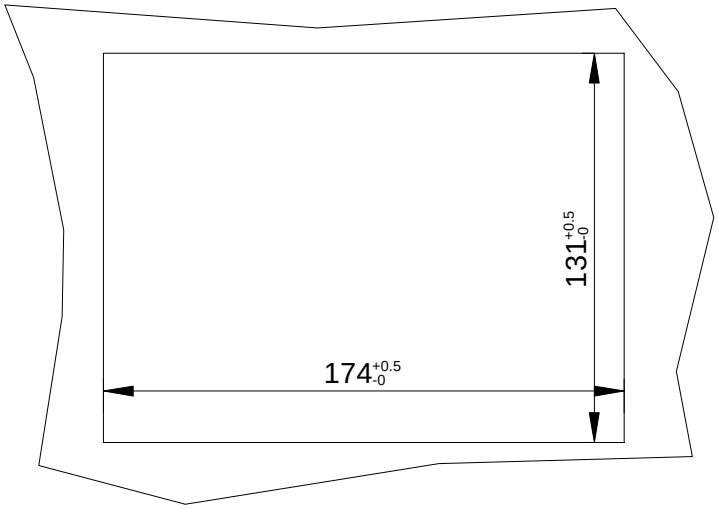


Figure 3: Panel cut-out for display installation.

2. If this cut-out has been made you could check if the display will fit perfectly. Otherwise it needs some corrections made with a file.
3. In the picture below is give how to mount the display in the cut-out with Fixtures

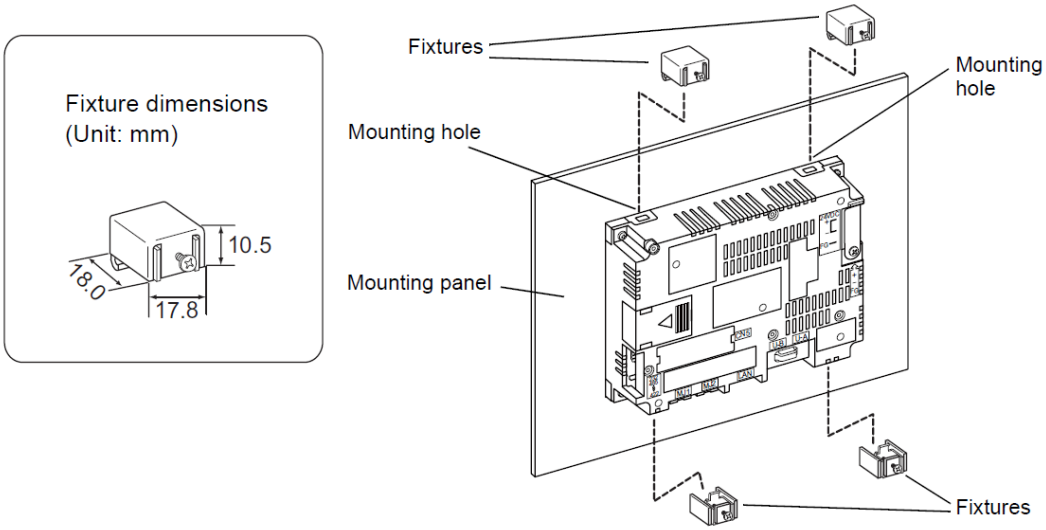


Figure 4: Display insertion with fixtures

These fixtures are included in the display packaging. While inserted the display and the fixtues you could drive the screws in hand-tight.

3.2 Electrical Installation

3.2.1 System overview

In the figure below you will see a system overview. Dependant on your system you are installing the overview will be different.

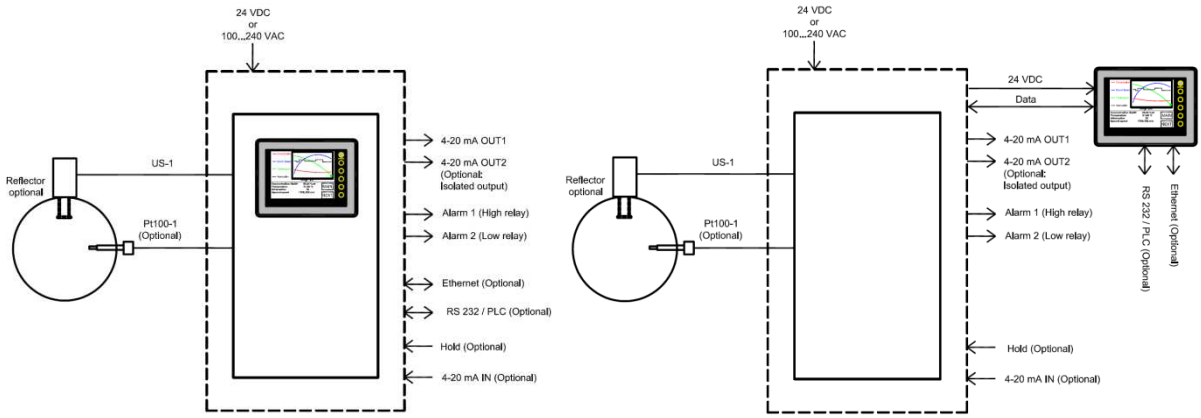


Figure 5: system overview WPF-housing (left) and SPLIT-unit (right)

The figures above are suitable for several systems. The overview does actually dement whether you are installing a WPF-housing or a SPLIT-unit version.

3.2.2 Terminal overview

Figure 6 shows the back of the display. The display is already connected in a WPF housing. When you are installing a SPLIT unit version there are some actions to be done such as connecting the analyzer to the display. This will be made clear further in this manual.

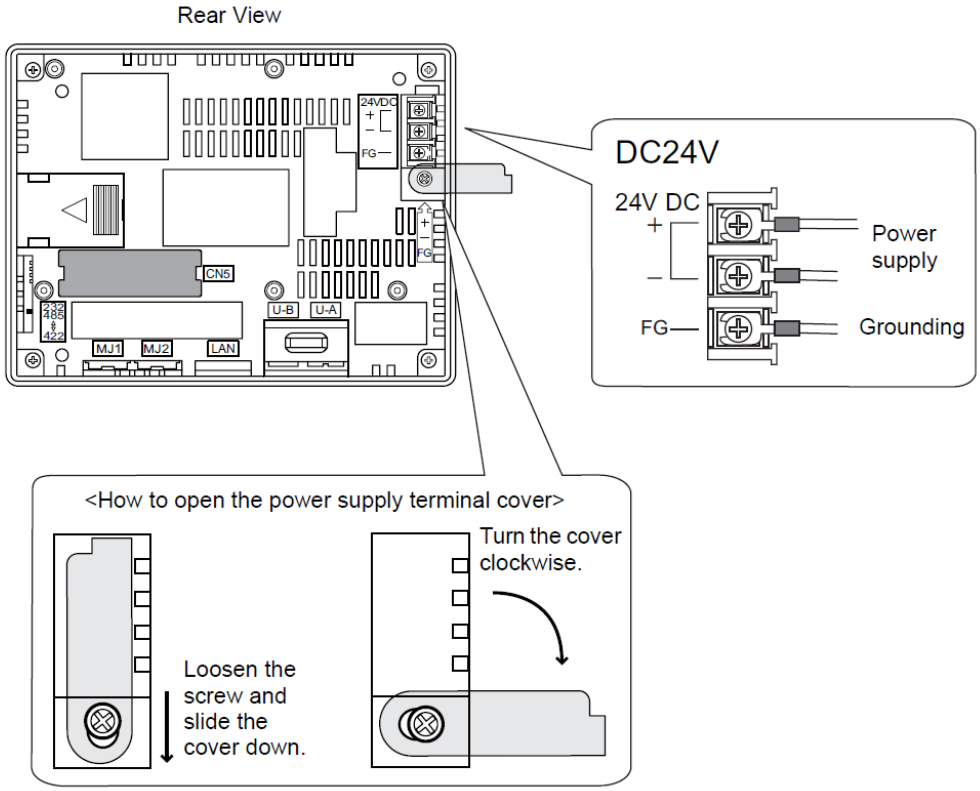


Figure 6: Rear view of the display and his power supply

The analyzer is delivered ready to install. As the 4-20 mA neither as the Ethernet connection is installed on-site. Below there is given information about the terminals to be used (figure 7).

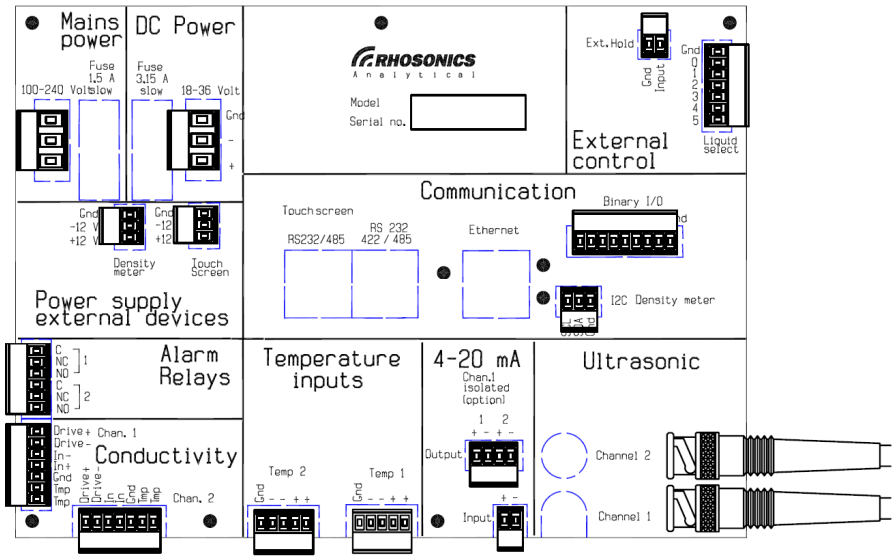


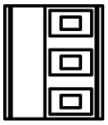
Figure 7: Terminal overview of the analyzer.

3.2.3 Terminal Wiring

In the tables below you can see all the connectors which could be attached to the analyzer. Depending on the analyzer model you are installing there are a couple of connectors which are accessible. Most of the analyzer models do not require an accessibility of all terminals. Figure six shows the possible terminals and connectors on your analyzer model.

18-36 Volt DC POWER (TM11)

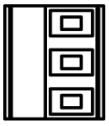
3 pole straight header, pitch 7.5



pin	signal	description	specification / remarks
1	Gnd	Ground	Polarity Protected, Fuse = 3.15A Slow Blow
2	-12V	Input Voltage	
3	+12V	Input Voltage	

100-240 Volt MAINS POWER (TM12)

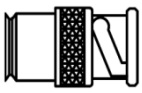
3 pole straight header, pitch 7.5



pin	signal	description	specification / remarks
1	Gnd	Protective Earth	Voltage = 90-240Vac Frequency = 50/60Hz Fuse = 1.6A Slow Blow
2	L	Input Voltage, Line	
3	N	Input Voltage, Neutral	

Channel 1 ULTRASONIC (US1)

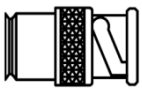
BNC straight 75Ω jack



pin	signal	description	specification / remarks
1	US1	Ultrasonic Output	Rout = 75Ω, Upk = 35-190V /190ns (nominal)
2	Gnd	Ground	

Channel 2 ULTRASONIC (US2)

BNC straight 75Ω jack



pin	signal	description	specification / remarks
1	US2	Ultrasonic Output	Rout = 75Ω, Upk = 35-190V /190ns (nominal)
2	Gnd	Ground	

4-20 mA Input (TM6)

2 pole straight header, pitch 3.5

pin	signal	description	specification / remarks
1	+	+ Current Input	Rin = 75Ω, Clamp Voltage = 5V
2	-	- Current Input	

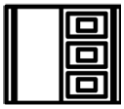
Ext. Hold (TM10)

2 pole straight header, pitch 3.5

pin	signal	description	specification / remarks
1	Ext.Hold	External Hold Input	+24Vdc = 'Hold', Rin = 10kΩ
2	Gnd	Ground	

Touchscreen (TM13)

3 pole straight header, pitch 3.5



pin	signal	description	specification / remarks
1	Gnd	Ground	Load = 0.25A (evenly loaded +12V and -12V)
2	-12V	Output Voltage	
3	+12V	Output Voltage	

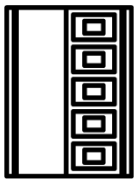
4-20 mA Output (TM7)

4 pole straight header, pitch 3.5

pin	signal	description	specification / remarks
1	+	Output 1	Rload = 250 Ω (optimal), 400 Ω (maximal)
2	-	Output 1 Return	
3	+	Output 2	Rload = 250 Ω (optimal), 400 Ω (maximal) *Option Output 2: Galvanic Isolation*
4	-	Output 2 Return	

Temp 1 (TM5)

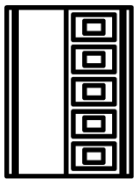
5 pole straight header, pitch 3.5



pin	signal	description	specification / remarks
1	Gnd	Cable Shield	4-wire Measurement U = 3.3Vdc, Imax = 370uA
2	-	Current Source Return	
3	-	Voltage Input	
4	+	Voltage Input	
5	+	Current Source Output	

Temp 2 (TM4)

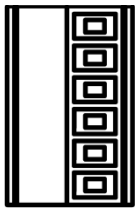
5 pole straight header, pitch 3.5



pin	signal	description	specification / remarks
1	Gnd	Cable Shield	4-wire Measurement U = 3.3Vdc, Imax = 370uA
2	-	Current Source Return	
3	-	Voltage Input	
4	+	Voltage Input	
5	+	Current Source Output	

Alarm Relays (TM1)

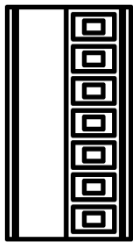
6 pole straight header, pitch 3.5



pin	signal	description	specification / remarks
1	C1	Relay 1, Common	contact rating (resistive) 4 A/30Vdc derated to 0.25 A/220Vdc 4 A/60Vac derated to 0.50 A/250Vac
2	NC1	Relay 1, Normally Closed	
3	NO1	Relay 1, Normally Open	
4	C2	Relay 2, Common	
5	NC2	Relay 2, Normally Closed	
6	NO2	Relay 2, Normally Open	

Conductivity, Chan. 1 (TM2)

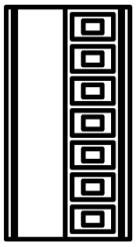
7 pole straight header, pitch 3.5



pin	signal	description	specification / remarks
1	Drive +	● Differential Output	U = 2.4Vpp, f = 6 kHz, Rinput = 50Ω
2	Drive -	○ Differential Output	
3	In -	● Differential Input	Rin = 1MΩ
4	In +	○ Differential Input	
5	Gnd	cable shield	
6	Tmp	Pt1000 Input	
7	Tmp	Pt1000 Input	

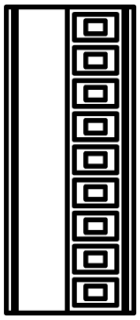
Liquid Select (TM9)

7 pole straight header, pitch 3.5



pin	signal	description	specification / remarks
1	LiqSel-5	Digital Input	24V = 'High' (Limit 48V) 0V = 'Low' Rin = 10kΩ
2	LiqSel-4	Digital Input	
3	LiqSel-3	Digital Input	
4	LiqSel-2	Digital Input	
5	LiqSel-1	Digital Input	
6	LiqSel-0	Digital Input	
7	Gnd	Ground	

Binary I/O (TM8)
8 pole straight header, pitch 3.5



pin	signal	description	specification / remarks
1	I/O-0	Digital Input	5V = 'High' 0V = 'Low' (Voltage Limit: -0.5 +7V) (Esd protection 2kV HBM)
2	I/O-1	Digital Input	
3	I/O-2	Digital Input	
4	I/O-3	Digital Input	
5	I/O-4	Digital Input	
6	I/O-5	Digital Input	
7	I/O-6	Digital Input	
8	I/O-7	Digital Input	
9	Gnd	Ground	

3.2.4 Ferrite installation

Electronic equipment must have a certain level of "immunity" to the Electro Magnetic Interference present in its environment so that it is not "susceptible" to that interference.
One of the measures to gain sufficient resistance to interference noise is to add ferrite beads to the end of an electrical cable. Ferrite beads are used as a passive low-pass filter.
Also energy is absorbed resistively within the ferrite core and dissipated as low level heat.

3.2.4.1 Ferrites

The following ferrites are installed in the analyzer.

Part number	Cable Diameter	Qty.	Usage
74271112S	4.5 to 6 mm	4 (5)	• Data cable display (2x) • Power wiring display • Analog output cable
74271132S	7 to 8.5 mm	2 (1)	• Power cable analyzer • Power wiring display (WPF/EXD only)
74271	-	1	Dislodging key to release assembled ferrites

The following table shows a list of cables and their associated type of ferrite.

Ferrite type associated with cable type		
CABLE TYPE	**742 711 12**	**742 711 32**
Coax cable (green), Heavy Duty		X
Coax cable (white), Standard		X
Coax cable (black), Special	X	
Temperature sensor cable (black), Heavy Duty		X
Temperature cable (beige), Standard	X	
Multicore (Coax + Temperature)		X
Conductivity sensor cable		X
Power cable 90-230 VAC (cable not supplied, ferrite supplied)		X
Power cable 18-36 VDC (cable not supplied, ferrite supplied)		X
Data cable to display	X (9600 2X)	
Power cable 24 VDC display (excl. 9600 models)	X	
Power cable 24VDC to display (9600-WPF/EXD)	X	X
Power cable 24VDC to display (9600-SPLT)	2X	
4-20 mA OUT cable (cable not supplied, ferrite supplied)	X	

The following table gives a list of cable sets and their included ferrite(s).

Cable set	**ZKAB-RFISUP-4,5-6MM-74271112S**	**ZKAB-RFISUP-7-8,5MM-74271132S**
MKSET-DV-###-MUL		1
MKSET-DV-US-ADAPTER		1
MKSET-ECMP-###-ST		1
MKSET-IP68-T1-###-ST	1	1 (coax)
MKSET-IP68-T1-###-MUL		1
MKSET-MPEX-T1-###-ST	1	1 (coax)
MKSET-MPEX-T1-###-HD		2
MKSET-MP-T1-###-MUL		1
MKSET-UFTW-T2-D-###-HD		3
MKSET-UFTW-US-D-###-HD		2
MKSET-UMCS-T2-###-HD		2
MKSET-UMCS-T2-###-ST	1	1 (coax)
MKSET-UMCS-US-###-HD		1
MKSET-UMCS-US-###-ST		1
MKSET-UMP50-T1-###-ST		1

3.2.4.2 Installation Location

Install the ferrites by opening it fully, then put the cable in as in picture 2. Next, close the cover and press firmly until it is completely seated.

Figure 8: Ferrite bead with unlocking key

Figure 8: Installing ferrites

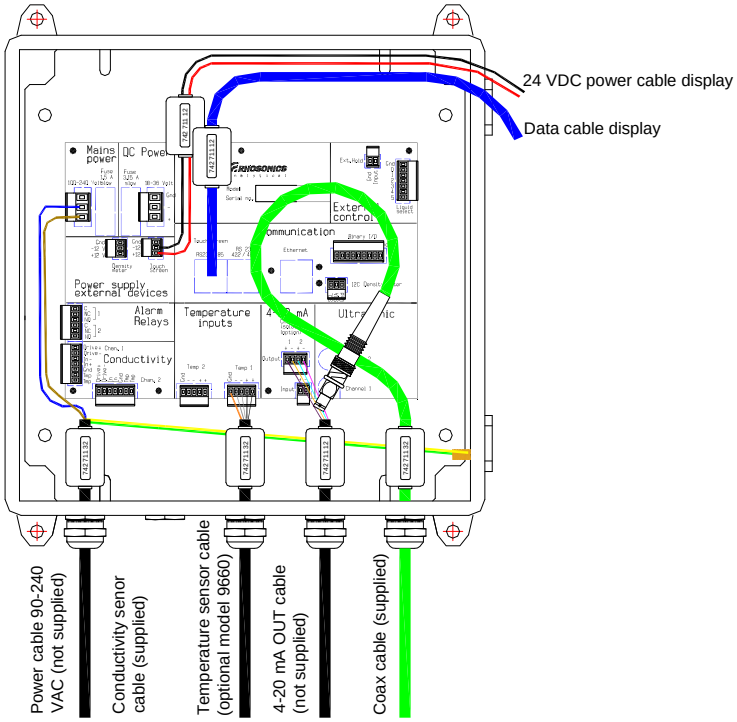


Figure 9: Placement ferrites

Procedure:

Ferrites placement procedure (if not yet placed on the cable)

- All cables (accept cable to alarm relays) to the analyzer board need a ferrite
- Place the ferrite as close to the entrance of the housing (figure 3)
- For cable inside the housing place at maximum of 100 mm to the connection to the analyzer board

Remark:

Drawn in figure 3 is a weather proof housing, but the ferrite placement applies for all Rhosonics analyzer types (Split unit housing, ATEX housing, Portable housing, etc.).

3.2.5 Cable coiling

Sometimes adding ferrites isn't enough to improve the level of "immunity" to the electromagnetic field, especially when cables are very long.
Effects of electromagnetic fields on coiled cable have been observed which influenced density measurements. This is because a normal coiled cable has a higher inductance making it more susceptible for electromagnetic fields.
We therefore recommend that excess of cable is laid out or figure-8 coiled.

Standard coiling is not ok.

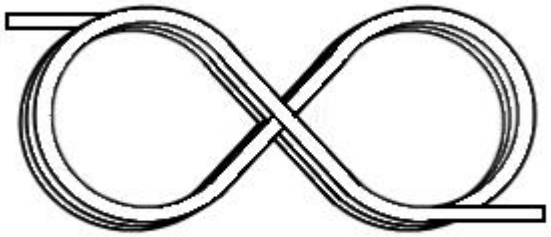


Figure 10: coiling is ok.

4. Operation

4.1 Preparation and precautions

WARNING: Live components may be exposed if covers are opened or components are removed.

The device must be disconnected from all power sources before carrying out any servicing or repair work, this is explained in the next section.

Capacitors inside the device may still carry voltage even though they have been disconnected from all power sources.

Never replace damaged powers supply cables yourself. If necessary, disconnect the device from the mains and take it to a specialist workshop.

Only qualified specialists familiar with the hazards involved and the relevant regulations may perform repairs.

4.2 Boot procedure

Question	Answer
When to do it	To turn on the analyzer
When NOT to do it	During normal operation or after calibrations
What must be done before	
What is needed	
What must be done afterwards	

Following steps are necessary for safely powering up the analyzer system:

- ▶ Make sure that there is no power on the mains cord.
- ▶ Connect the “Mains Power /DC Power” connector.
- ▶ Power up the analyzer from outside the analyzer e.g. by connecting the mains cord or powering up the 24V power supply.

After several seconds the message “Data is Loading” disappears from the screen. At this time the analyzer is finished with booting.

4.3 Primary verifications.

4.3.1 Purpose

The purpose is to verify the proper operation of the analyzer with regard to the ultrasonic echo. Its visualized waveform (time vs. amplitude plot) can be an aid to identify problems which are related to the process (gas bubbles, faulty cable etc.)
When you are asked by the factory or your sales agent to submit a waveform for diagnostics purposes, please follow this procedure.

NOTE: Please read the previous section to learn details about the memory stick that can be used.

4.3.2 Procedure

- ▶ Open “Echo” in the Information / Diagnostics menu

- Press “Refresh” and an echo will be displayed

Some examples and explanations are given below:

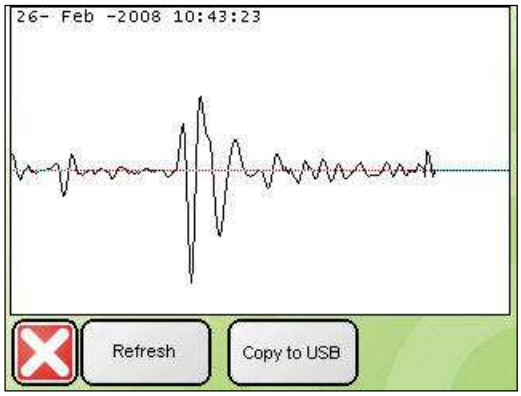


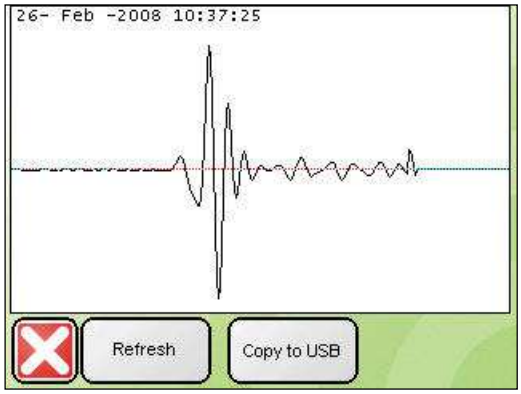
Figure 11: *Example of a “good” echo.*

The x-axis is the time axis, typically the total span is 15 microseconds. With large sound paths, the total span could be up to 100 microseconds.
The Y-axis is the amplitude of the sensor at a given time. From left to right, you should see a horizontal line, with little “noise”. The actual echo should begin with a large negative going peak. After the echo (about 2 periods wide), some noise occurs which is normal.

- Press “Copy to USB” to copy the echo displayed to an USB memory stick.
- You may repeat several times with intervals of your choice (for instance when something unexpected happens). Please make notes of the unexpected situations and record the time and date. A maximum of 100 waveforms can be stored on the memory stick.
- Remove the USB stick (AFTER you have stopped the logging, if applicable, as indicated in the previous section).
- You may view echo’s with a program capable of reading JPG-files (i.e. Paint)

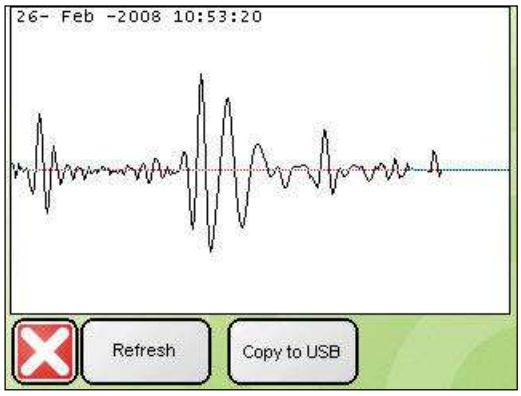
NOTE:
The data will be stored on the USB stick in the following folder: RHO\HDCOPY\. In this folder, the JPG-file will be stored as HD595~00.JPG. The ~00 is the number of the echo stored on the USB stick. If more than 100 echoes are stored, the first JPG-file will be overwritten.

4.3.3 Examples of ultrasonics waveforms



Please refer to the previous section for a general explanation. This echo is extremely good, as there is no noise before the echo (left = before). The system will measure the time based on the first negative going ½-period, which is clearly identifiable.

Figure 12: *Example of a “good” echo with PEEK window sensors.*



This waveform has more noise before (left side of) the arrival of the echo. When noise further increases, the analyzer will disregard it and will try to get a better return echo. The system makes up to 30 measurements including echo evaluations per second.

Figure 13: *Example of a “fair” echo.*

This waveform has a lot of noise before (left side of) the arrival of the echo. The echo is barely identifiable in the middle of all the noise.
This echo is typical for gas bubbles adhering to the probe surface, what happens with liquids with dissolved air at ambient pressure conditions.

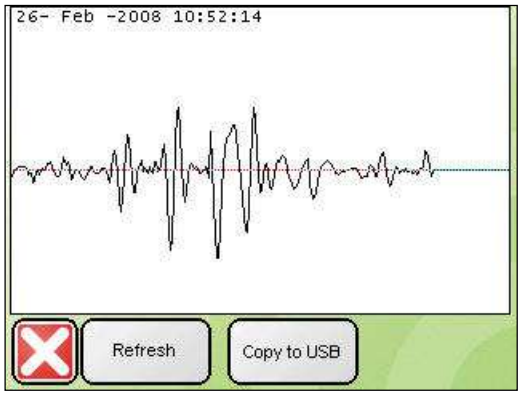


Figure 14: *Example of a "poor" echo.*

This waveform is only noise and no echo,
The echo is not identifiable in the noice.
This echo is typical for a defective probe or cable and/or false probe settings.

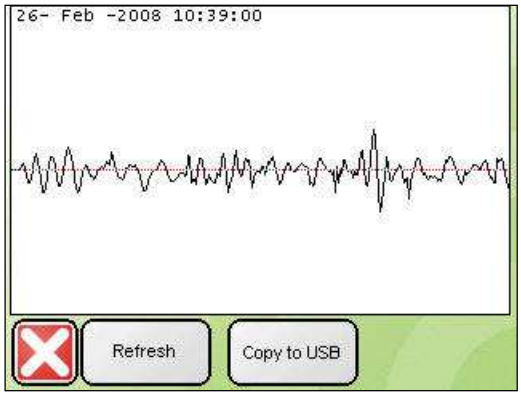


Figure 15: *Example of "Bad" echo.*

ACTIONS:

- Press "Refresh" and wait until a new echo will appears. (2 seconds)
- Repeat this a couple of times.
- The echo pattern either changes significantly, OR the echo pattern remains the same.

4.3.3.1 Repeatable echo pattern:

When the echo pattern remains the same, then gas bubbles may adhere to the probe. Remove gas bubbles and prevent this from happening again. One way to prevent this is to increase the pressure, or to take other measures to prevent gas bubbles to adhere to the probe surface.

4.3.3.2 Random echo pattern:

When the echo pattern changes each 2 seconds after pressing "Refresh", then you may have a cable problem (ground or shield), OR your probe may be defective, OR the liquid may contain suspended gases.

- If possible, shut down the pump to see it there is improvement. If yes, then it is likely that the pump causes cavitations, or the probe is mounted at the suction side of the pump, which may cause flashing.
- When suspended gases are not the problem, check the continuity of the cable (coax) with a universal ohm meter. Disconnect the cable at both ends, then check the resistance between centre conductor and shield (infinite ohms).
- Ask another person to connect the centre conductor with shield at the other end and check the resistance (should be less than 1 ohm per 10 metre of cable).
- If the cable is OK, verify the probe by immersing it in water.
- With "Liquid select", switch to "1 – Water calibration".
- Check the waveform. If the situation is still the same, then your probe is defective. If the situation is now normal, the problem is caused by the liquid as explained above. Please consult your distributor to discuss the problem and possible solutions.

4.4 Optional calibrations

When there are problems during operation it is possible a calibration has to be redone.
In §6.2 it is explained when and what calibration has to be done when a measured value is deviating from a certified value.

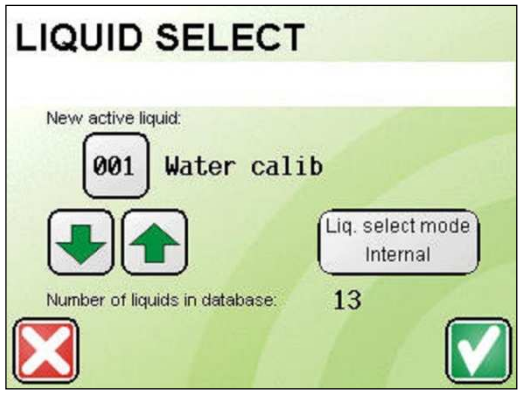
5. Configuration

5.1 Liquid (product) selection

5.1.1 Purpose:
To select a previously stored liquid calibration as the active calibration. When your analyzer is used for one specific type of liquid only, the liquid select procedure may not be of interest to you.

5.1.2 Procedure (manual selection):
The *Liquid Selection* menu is accessible through the *Liquid* menu on the *Main Menu.*

► Press **[Liquid select]** to get access to the selection menu.
The active calibration appears. Information is given about the liquid number and the name of the active liquid calibration.



You may now wish to select another liquid by scrolling through the list with *Previous* and *Next*. If you know the number of the calibration, you can also directly change the number by pressing the liquid number and enter the number of your choice.

Figure 16: *LIQUID SELECT* page

5.1.3 Procedure (remote selection):
You can choose for remote selection through this menu.
An active connection between an external selection device, such as a PLC or remote switch is required to make this work correctly.

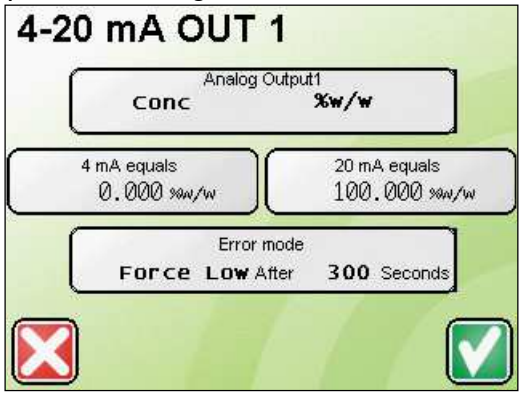
Choose depending on the selection device for *7 pins connector* or *MJ2*, when your system is wired for remote product selection.
Otherwise, leave this setting to internal.

5.2 Configuration of outputs.

5.2.1 Analog Output configuration
This section describes how you can configure your 4~20mA outputs:
With these settings, you can set the following:

- To choose the result to transmit through the 4~20 mA outputs.
- The scaling of these parameters.
- What the system should do when the system detects problems, i.e. gas bubbles.

Access level 2 is required (supervisor).
The access code is 7410.



5.2.1.1 Procedure:
For reaching the analog output configuration do the following:
► Via Main Menu => Configuration =>
4-20 mA OUT => Configuration => 4-20 mA OUT1

Figure 17: *4-20 mA OUT 1* page

5.2.1.2 Changing the output source:

► Press **[Analog Output1]** you go to the *Assignment* page

► Here you can choose between the results of the polynomial *Poly(1), Poly (2)* and one of the measured value's. The result of the polynomial are dependent of the loaded liquid and the number of variables you can choose from is dependent from the analyzer model.

►When you choose the desired value you will be returned to the *4-20 mA OUT #* menu.

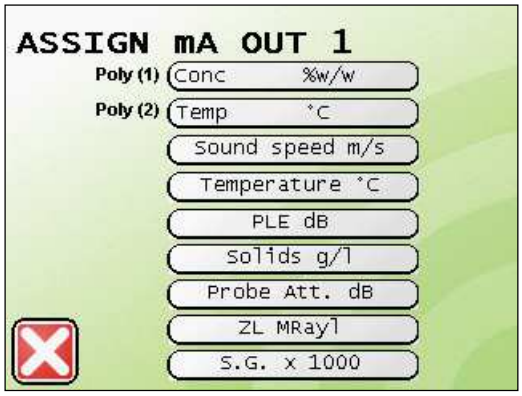


Figure 18: *ASSIGNMENT* page

5.2.1.3 Output Scaling:

The analog output is of the 4~20 mA type.

As an example we scale the output to a range from 10 to 15 wt%, the procedure is as follows:

► Enter the lowest value corresponding to 4 mA by pressing **[4 mA Equals],** and enter 10.

► For the highest value do the same by pressing **[20 mA Equals],** and enter 15.

CAUTION:

Scaling the output to a high range, i.e. 0~100 wt%, results in loss of accuracy. The accuracy of the output is 0,05 % of scale. Choosing a smaller range (difference between low and high value) results in a better resolution. In the above example, the accuracy of the output is 0,1% of (15-10), which equals 0,0025 wt%.

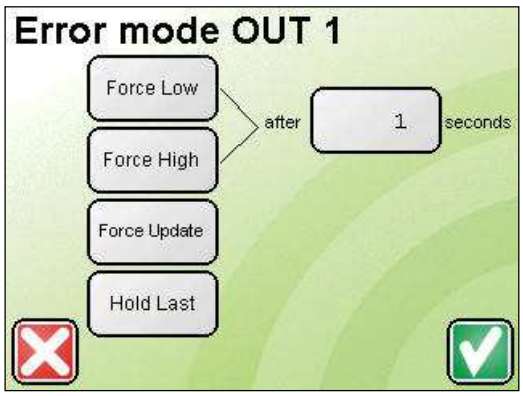
5.2.1.4 Error communication through analog outputs:

During an inline analysis, conditions may not always be perfect to perform a correct measurement. The analyzer automatically detects when the liquid is not homogeneous, or when gas bubbles are present, generates errors and initially holds its last valid reading.

In most processes, upset conditions may occur incidentally, due to not completely dissolved gases. The analyzer freezes the measurement during these conditions.

Too long freezing may lead to a constant output, which in turn may lead to the conclusion that the process is perfect. To signal a too long duration of upset process conditions, the analyzer can react to these errors in four different modes.

- Force Low: force output to 3mA after XXX seconds
- Force High: force output to 21mA after XXX seconds
- Force Update: force output to maintain measurement (only for Temp and Gain)
- Hold last: Hold last correct measured value



Determine first:

- How long do I allow the system not to signal any upset process conditions?
- What milli-Amp value do I wish to receive when erratic conditions continue for a too long period of time?

Figure 19: *ERROR MODE OUT 1* page

Example: We want the output to force low when 120 seconds of continuous loss of signal occurs.

► Press **[Error Mode] => [Force Low]=>** Enter "120

After the specified number of seconds, the 4~20 mA OUT will be forced to the specified level (Low level is 3 mA, High level is 21 mA).
Repeat this procedure for 4~20 mA OUT 2.

NOTE
When you wish to output temperature, set to "**Force update**" (no time can be set).

5.2.2 Display configuration

5.2.2.1 Purpose:

1. Define the parameters you wish to be viewed during normal operation.
2. Define smoothing (decay time).
3. Define the resolution on the display.
4. Graph scaling by trend line configuration.
5. Adjusting backlight turn off time.

5.2.2.2 Selecting the results (1):

Normally, you wish to view the concentration as main parameter, and the temperature as second parameter (shown small). Should your analyzer be capable of measuring more chemical components, you may wish to select another component. In addition, it is possible to view other, secondary parameters, such as sound speed or Ultrasonic attenuation, for specific evaluations.

► From the *Configuration* menu, press **[Display]**
► The procedure is similar to the assignment of mAout.

NOTE: This procedure does not affect the output and alarm configurations.

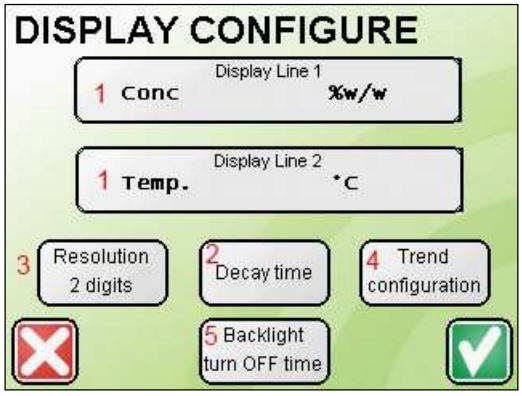


Figure 20: *DISPLAY CONFIGURE* page

5.2.2.3 Smoothing / Decay time (2):

Smoothing is strongly recommended, since it gives you more accuracy. In addition, rapid changes in concentration are being smoothed, hence the output value more represents the "bulk" value of the liquid. When fast response is not required, we strongly recommend setting the τ63 time between 5 and 20 seconds. Since smoothing affects the response time, the best setting is a trade-off between accuracy and response time.

A decay rate of 5 seconds is recommended for most applications.

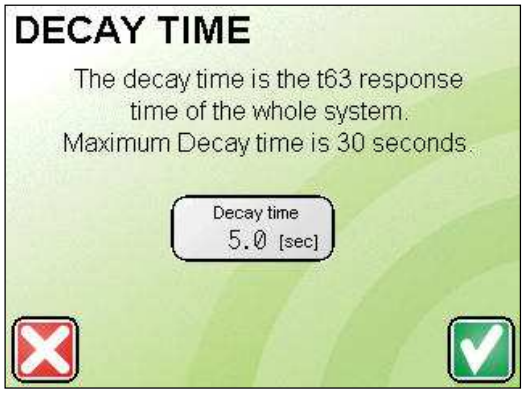


Figure 21: *DECAY TIME* page

5.2.2.4 Setting the display resolution (3):

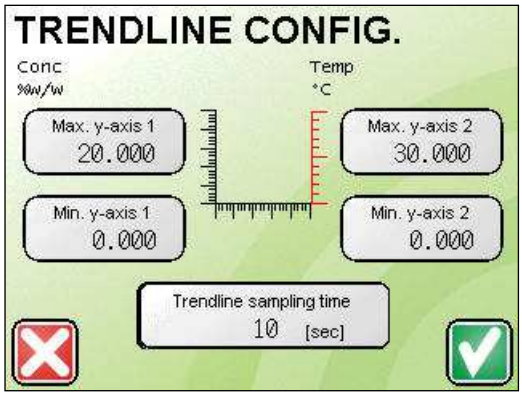
This button allows you to toggle between 2 digits and 3 digits resolution. This setting does not affect the output resolution. The 3-digit resolution may be selected when additional readout accuracy is required, which is useful during field calibrations. For additional readout accuracy, it is recommended to apply some display smoothing too. See next section for details.

5.2.2.5 Graph scaling (4):

During normal operation of the analyzer, you can activate additional screens, such as the graphs, allowing you to see the trend of the results as configured in the previous section. The graphs show the trend of the results over the last 15 minutes of operation.
The scaling of the graph is done in this section.

- Define the scales of the 2 graphs (Y-axis starting and ending points).
- The plotted results are those which were configured in the display menu.

In the display menu press
► **[Trend configuration]** ► **[Min/Max value y-axis 1/2]**
Now you can enter the values that should correspond to minimum and maximum of the y-axis 1 and y-axis 2 (via pop-up keypad)
► With **[Trendline sampling time]**
you can enter the time that should correspond to the time a trend value is written on the graph.



NOTE: The graph will plot the results which are monitored by the display. Should you wish to plot other results, then this is only possible by changing the display source value.

Figure 22: *TRENDLINE CONFIGURATION* page

5.2.2.6 Backlight turn off time (5):

This setting allows you to set the time that the backlight has to be turned OFF automatically. If the backlight doesn't have to be turned OFF, enter 0 minutes. Touching the screen will turn the backlight ON. The set time has a fixed cycle and starts when the display is powered ON, so it can happen that if you touched the screen the backlight is turned OFF within the set time.

5.2.3 Alarm configuration.

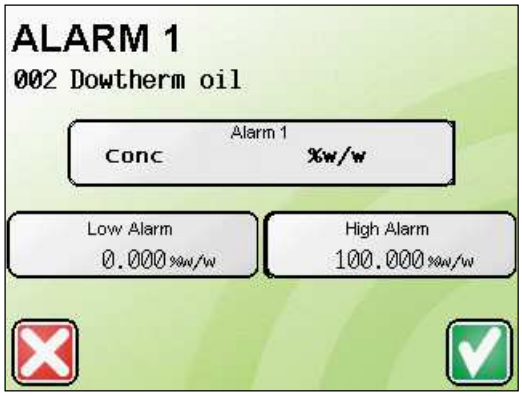
5.2.3.1 Introduction

Alarm relays are provided for monitoring specific measured concentrations. The analyzer allows you to define which parameters are monitored, and at what values the relays should be possible. In addition, you may select whether the alarms are activated during fault conditions (Normal) or activated when no alarm is present (inverted operation).

5.2.3.2 Preparation.

- Determine which value you wish to monitor with each alarm.
- Determine whether you wish the alarm relay contacts to be activated during normal operation (no alarm) or during a fault condition. This decision has consequence for the alarm wiring, as a Normally Open (NO) contact will be closed when the value falls within the low and high limit.
- Determine high and low trip points for each alarm.

NOTE
The analyzer has a database with specific alarm set points for each individual liquid. As the adjustment of the set points is liquid type dependant, the procedure for changing the set points is covered in chapter "Liquid selection and editing", paragraph "Editing liquids".



5.2.3.3 Selecting the alarms

► Via *Configuration* menu, ► *Alarm (1or 2)*
► **[Alarm ½]**
► The procedure is similar to the assignment of mAout.

Figure 23: *ALARM 1* page

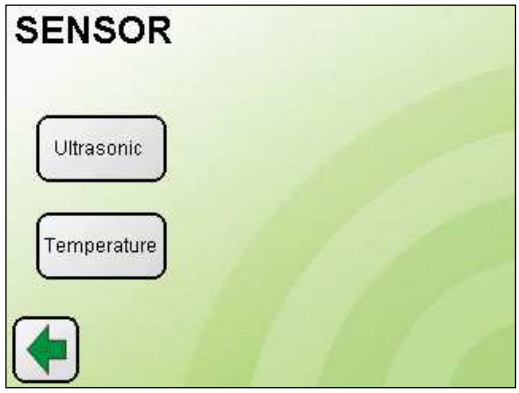
NOTE: Usually this would be the main parameter, i.e. concentration in %w/w.

5.2.3.4 Setting low and high alarm points.

► Press **[Low Alarm]** and enter the corresponding value.
► Do the same for **[High Alarm].**
► Press **[Accept]** (after pressing Accept it may take up to 10 seconds to return to the *Alarm configuration* page)

Repeat these steps for *Alarm 2* if desired.

IMPORTANT:
Changes made to the alarm settings of an individual liquid will remain valid until the alarm settings for this liquid are changed again.



5.3 Sensor parameters

5.3.1 Introduction

When replacing a probe, it is necessary to enter the probe constants as supplied on the Probe Calibration Data Sheet (PCDS).

Figure 24: *SENSOR* page

5.3.2 Procedure

- Obtain the Probe Calibration Data Sheet. The serial number of the probe is indicated on the sheet.
- From the main menu, choose Configuration – Sensor – US sensor
- Check or modify the data as indicated on the data sheet

NOTE: If a probe is replaced, the previous data sheet is no longer valid.

5.3.3 Instructions:

► Via Main menu => Configuration =>Sensor
=> Ultrasonic=>Sensor1
The following menu appears:
► Enter the appropriate values from the PCDS.

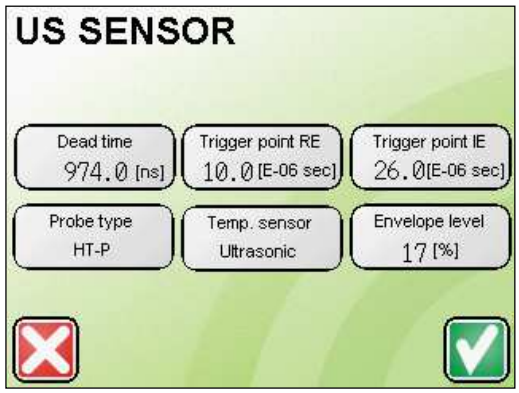


Figure 25: *ULTRASONIC PROBE CONFIGURATION* page

5.4 Editing liquids (polynomial calibrations)

5.4.1 Introduction

For a proper operation, it is vital that you obtain the right calibration data sheet for your liquid. The polynomial constants, in conjunction with the built-in algorithm, compute the concentration from both sound speed and temperature data. These essential data have been established in the factory and sometimes may need to be changed, for instance when the liquid recipe is changed.
This section describes how you can edit existing polynomial calibrations and how to enter new constants from an existing data sheet (sent by the factory).

5.4.2 Purpose:

- To select previously stored liquids, with their specific settings.
- To add new and modify existing liquid names and factors.
- To edit alarm trip points for each liquid type.
- To restore field calibration data or duplicate field calibration data from other analyzers into this analyzer.

- To edit polynomial constants according to Liquid Datasheet sent by Rhosonics

5.4.3 Preparation for editing liquid parameters

- Obtain the liquid data sheet from the factory
- If applicable, obtain the desired alarm trip points for the variables you wish to monitor.

5.4.4 Procedure

► Via main menu => Liquids => Liquid edit
► Select the liquid number that you wish to edit or want to use for a new liquid.
► Edit the name. You may use characters and numbers. The maximum length is 16.
► Edit the minimum and maximum sound speed, as given on the liquid data sheet.
This will overwrite the minimum and maximum sound speed of the selected liquid in the liquid database. Be aware that incorrect setting of the minimum and maximum sound speed can make a proper measurement impossible.
► Press **[More settings]** or **[Main]** to save the minimum and maximum sound speed and to go to the next page or go back to the Main menu (after pressing **[More settings]** or **[Main]** it may take up to 10 seconds to enter the next page)
► Edit the Laboratory and Indicated values after pressing **[More settings]**
► Press **[More settings]** or **[Main]** to save the Laboratory and Indicated values and to go to the next page or go back to the Main menu (after pressing **[More settings]** or **[Main]** it may take up to 10 seconds to enter the next page)

Next step (after pressing **[More settings]**) is the adjustments of the alarm trip points. This is explained in the next section.

5.4.5 Adjusting individual alarm trip points.

You may adjust the alarm trip points for each stored product.
The source of the alarm, i.e. concentration or temperature etc., is determined in the configuration menu.

► Press **[Low Alarm]**
► Enter the value that should correspond to low alarm.
► Press **[High Alarm]**
► Enter the value that should correspond to high alarm.
► Repeat these steps for *Alarm 2* if desired.

Next step is (after pressing **[More settings]**) the editing of the polynomials of the liquid, which calculate the concentration. This is explained in the next section.

5.4.6 Adjusting polynomials.

CAUTION:

Changing polynomials may lead the incorrect concentrations. Only perform this action if Rhosonics asked you to do so.

Rhosonics may send you a new Liquid Datasheet with new liquid polynomials to improve the concentration calculation. To enter the new polynomial values into a liquid follow the next steps.

► Select the liquid number that you wish to edit
► (Optional) Edit the name. You may use characters and numbers. The maximum length is 16.
► Edit the minimum and maximum sound speed
► Press **[More settings]**
► Make sure Laboratory and Indicated value are 1 for any NEW set of data to be entered.
► Press **[More settings]**

► (Optional) edit alarm low and high trip points.
► Press **[More settings]**
Now you get to the most important part, editing the polynomial data.

► Edit ALL parameters exactly as indicated on the data sheet (below)
► Press on each square with a parameter, then
► For each parameter, Enter the corresponding value from the Liquid Datasheet through pop-up screen, and always start with the NUMBER first, then the + or – sign.
► Double check everything. Check the minus signs! And the exponents.
► Press pressing **[More settings]**)
This step is optional. Only set Q and R settings when the factory has given instructions to do so. So normally, press **[Main]**

6. Maintenance

6.1 Verification of operation

There are several things to keep in mind during verification op operation.

The first action is are there any errors? An example of an error is shown in the figure below. In this case the temperature sensor1 is not connected. A detailed description about fault codes and remedies are given in §8.1.

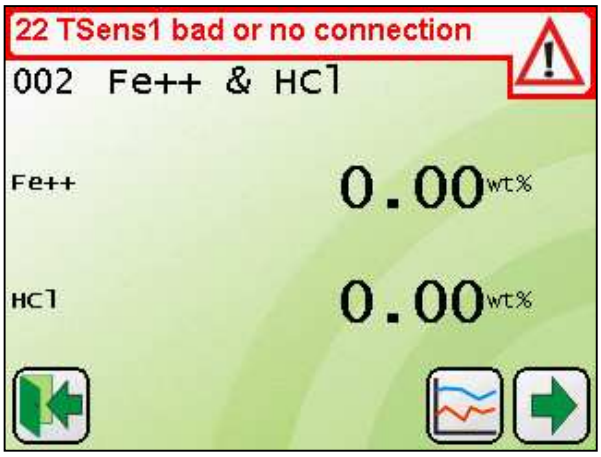


Figure 26: Error example

In case of problems with the ultrasonic wave detection it is recommended to look at §4.3, and verify what the waveform is.
Depending on the analyzer model some values and settings will be put on hold until the error is gone. It is recommended to start with calibrating when there are no errors present, else calibration results can't be trusted.

During verification it is necessary to check whether the analyzer is capable of following the trend of the process, if this is not the case that can have several causes. The next paragraph §6.2 is explaining the calibrations which can be done to adjust variations in measured parameters.

An important part of verification of operation is to check whether measured values are still valid. To assure this there are several calibrations which have to be performed on regular bases. In the beginning of the next paragraph a table with a maintenance schedule is displayed which tells how and when to perform certain calibrations. It is always important that a calibration is done against a known value this can be a sample with a known concentration in case of a sample or field calibration or a calibrated temperature sensor in case of the temperature calibration.

6.2 Adjusting the calibration

You may calibrate the analyzer in order to assure optimal analysis results. This section describes the different calibration routines, and the intervals which are required.

Types of calibration

The following table lists the different types of calibration, their purpose and the interval required to perform these calibrations.

Calibration type	Purpose	Interval
Temperature offset	Proper temperature compensation	Weekly check, 3-months calibration
Low density calibration	Density offset calibration	During first calibration. Following a temperature calibration.
High density calibration	Adjusting the span of the density measurement.	Within 30 days after low density calibration.
Field calibration	Make reading equal to laboratory result, at target level.	Once, repeated for each product.
4~20 mA output	Zero/span of analog output.	Factory, after repair.
Temperature electrical	Electronic basic calibration.	Factory, after repair.

Polynomial calibration	Optimal linearization & compensation	Once, by factory.
Probe calibration	Entering probe data from probe calibration data sheet (PCDS).	Replacement/repair of probe.

There are 4 major calibrations to be performed after you have installed the analyzer.
These 4 calibrations are accessible though one menu, as given below:

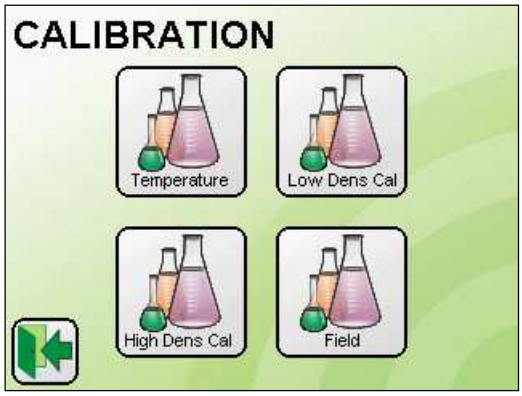


Figure 27: Calibration page

These procedures are discussed in detail in the following sections

6.2.1 Temperature calibration

The analysis result and the linearity highly depends on the integrity of the temperature circuit. The temperature calibration provides a simple and effective way to apply corrections to the temperature measurement, should this be necessary.

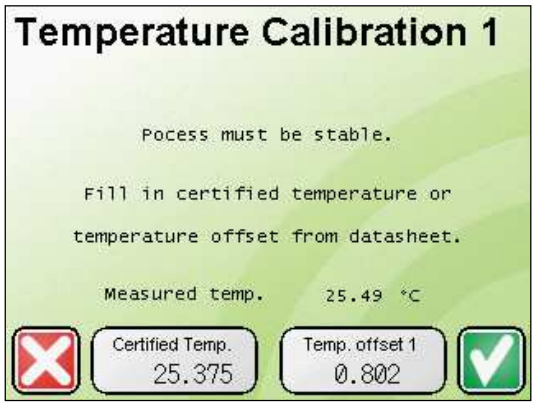
6.2.1.1 When needed

1 Exchange of temperature probe and/or hybrid probe.
2 When indicated temperature deviates from standard.
Check the temperature reading regularly, and perform a calibration when the reading error exceeds 0.5 ºC. It is advised to calibrate the temperature sensor with a laboratory calibrated sensor, as other temperature sensors in the same process may lack accuracy or may not be representative for the temperature at the installation location of the probe.

6.2.1.2 Preliminary

Access the menu via:

- Main=>Calibration=>Temperature
  The left screen appears if a Pt100 is connected, in this case follow the instruction for the Pt100 Temperature calibration.
  The right screen appears if the temperature measurement is done by ultrasonic method, in this case follow the Ultrasonic Temperature calibration.



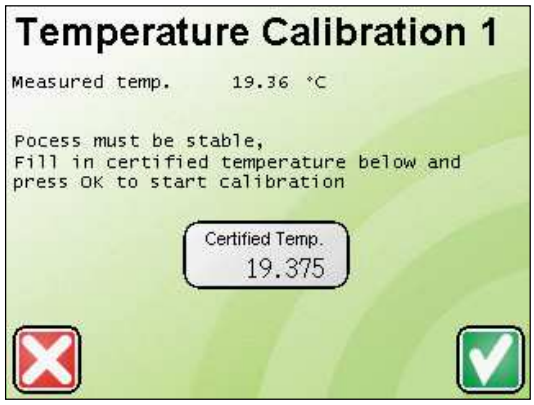


Figure 28: Temperature calibration with Pt100
Figure 29: Temperature calibration without Pt100

6.2.1.3 Pt100 Temperature calibration procedure

Choose one of the following:

1 In case of replacing a temperature probe:

- ► Fill in the Temp. offset from the Probe Calibration Datasheet(PCDS). And **[Accept]**
- ► Figure 3 appears
- ► After 30 seconds, you will see the temperature reading approximate your certified temperature to within +/- 0,1 ºC. Press the **OK** button to leave the menu.
- ► During this time, make sure that the temperature does not change. In addition, it is recommended to perform this calibration only when the temperature has been stable for at least one hour.

2 In the other case

- ► Read the temperature as indicated by the laboratory calibrated sensor.
- ► Fill in the certified Temperature.
- ► In this case the value for Temp. Offset1 is automatically updated. After this **[Accept]** the value.
- ► **Fout! Verwijzingsbron niet gevonden.** appears.
  After 30 seconds, you will see the temperature reading approximate your certified temperature to within +/- 0,1 ºC. Press the **OK** button to leave the menu.
- ► During this time, make sure that the temperature does not change. In addition, it is recommended to perform this calibration only when the temperature has been stable for at least one hour.

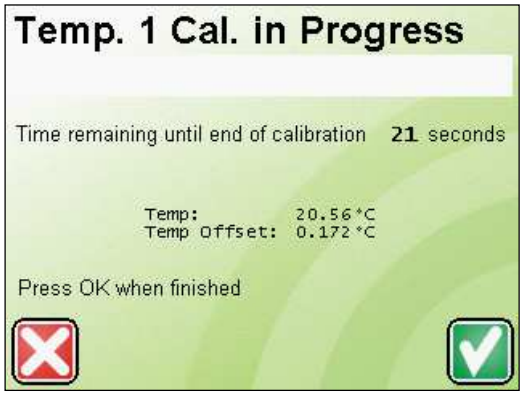


Figure 30: Temperature calibration during averaging

6.2.1.4 Ultrasonic Temperature calibration procedure

Without a Pt100 there is only one way to perform a calibration.

- ► Read the temperature as indicated by the laboratory calibrated sensor.
- ► Fill in the certified Temperature.
- ► In this case the value for Temp. Offset1 is automatically updated.
- ► Press [Accept]. **Fout! Verwijzingsbron niet gevonden.Fout! Verwijzingsbron niet gevonden.** appears.
- ► After 30 seconds, you will see the temperature reading approximate your certified temperature to within +/- 0,1 ºC. Press the OK button to leave the menu.
- ► During this time, make sure that the temperature does not change. In addition, it is recommended to perform this calibration only when the temperature has been stable for at least one hour.

6.2.2 (Low) Density Calibration

6.2.2.1 When needed

- During first installation
- Following a temperature calibration
- When a probe is replaced.
- During periodic calibration

The analyzer can be calibrated at the actual process conditions, provided the temperature and the density is known.

6.2.2.2 Procedure for Initial and Regular Calibration

1. When the process is stable, determine by any appropriate means the density and the temperature.
   The temperature must be known +/- 5 ^{0}C
   When the concentration is known and not the density, the density of the slurry must be determined. This can be done either by taking a sample or by calculating the density based on the concentration and hydraulic laws.
2. Enter the menu **Calibration** and then **Low Calibration** (even when the density is high)
3. Enter the temperature and the SG (i.e. 1500). Confirm after you have entered the appropriate values

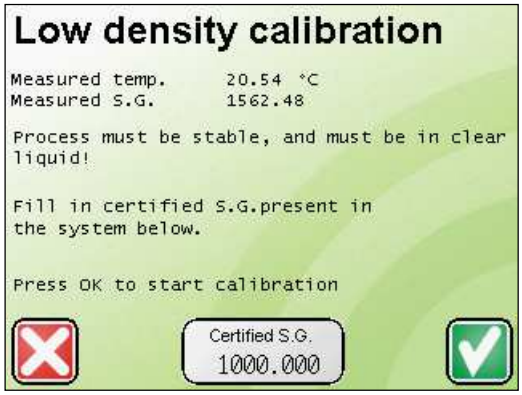


Figure 31: Low density calibration

The analyzer is now ready for use. Please take regular samples and determine whether the analyzer needs a span correction factor.

NOTE: When you are calibrating under actual process conditions, the density may fluctuate more than +/-1 g/l, due to natural variations in the density of the slurry.

As for any calibration, it is essential to use **certified** equipment, and liquids of which the properties are known. You must be CERTAIN about what you enter, otherwise any calibration is useless.
For a solids and density measurement, the density and temperature information is not critical. In fact, the temperature may differ up to 5 ºC from reality. The SG information may be different up to 10 g/l. The purpose of measuring SG and temperature is primarily to aid the system with determining acoustic effects on sound propagation, which in turn affect the accuracy of the attenuation measurement, the parameter that is most sensitive to the presence of suspended solids.

6.2.3 Span Factor correction (High Density Calibration)

6.2.3.1 Purpose
The high density calibration applies an additional SPAN factor. The purpose to assure a correct reading within the low and the high calibration points. This calibration is only necessary when you are interested in true values rather than just trends.

6.2.3.2 When needed
This calibration can be done following the standard or low calibration, and is preferably done within 30 days after completing the (low point) density calibration. Both calibrations do not affect each other and each time the low or the high calibration is done, a new offset and span factor are automatically determined. The analyzer determines a calibration factor and stores this factor in its database. It is known as the “New factor”, which is normally between 0.3 and 9

When the readings are too low when the density increases above 1500, then the span factor needs to be increased.
Example: The analyzer reads 1500 at a density of 1500, but indicates 1575 when it should read 1600.
The span factor is then more than 1. The calculation of the factor is as follows:
(true high value minus true low value) divided by (measured high value minus measured low value) = (1600-1500) / (1575-1500) = 100/75 = 1.333.

1. Determine the span factor using the above method.
2. Enter the menu **Calibration** and then **High Calibration**
3. A span factor is indicated (factory default is 2). Multiply the current factor with the span factor which you determined previously
4. Enter this number as new span factor
5. Confirm and leave all menu's.

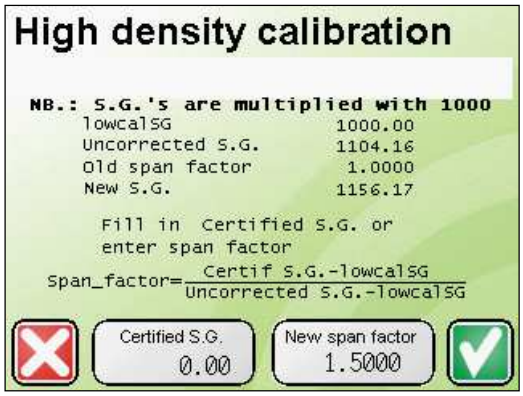


Figure 32: Low density calibration

NOTE: The status of the process at the time of entering the new span factor is not affecting the SPAN calibration.

NOTE2: Do not use the Certified S.G. calibration of the High density calibration page unless Rhosonics tell you to do so. Always calculate the Span factor and enter this value in the proper field.

6.2.4 Repeating the calibration

Typically, the system requires only periodic calibration to compensate for drifts over time, or when process conditions change. As the analyzer has built-in methods to compensate for any internal effect, the only source of drift can occur due to excessive wear of the probe's front surface. The ruggedized probe head can allow wear and tear without noticeable degradation of the sensitivity. The maximum allowable wear of the front surface is 5 mm, 20 mm with a long life (-LL) sensor. When drift is suspected, the following is recommended:

- ► Perform the temperature calibration (only if necessary)
- ► Repeat the low point calibration (Clear Liquor Calibration)

NOTE: It is not necessary to repeat the high calibration for eliminating drift.

IMPORTANT:
Since the ability of the analyzer to correct for temperature change is only limited to +/- 5 ^{0}C, it is recommend to repeat the procedure when the actual temperature deviates more than +/- 5 ^{0}C from the temperature at the time of the last calibration.

6.2.5 Density expressed as wt% Solids

For conversion of the measured solids into g/l or wt%:

1. Determine the apparent density of the ore type.
   For example, typical apparent density of copper ore is 4500 g/l or SG 4.5
2. Go to the menu **Liquids** and then **Select Liquids**
3. Select the appropriate density from the list, i.e. SG 4.5 and confirm your choice
4. Go the menu **Configuration** and then **Display**
5. Select Poly 1 concentration either as first or as second displayed value. It is recommended to select SG as first displayed value and the Poly1 concentration as second display value.
6. Go the menu **Configuration** and then **Output** and then either Output 1 or Output 2
7. Select the appropriate value you wish to send to the output you selected, i.e. SG or Poly1 concentration
8. Adjust upper and lower limits corresponding with 4 and 20 mA
9. Exit all menu's and verify that you have the right values on the display and the desired measured units on your output.

6.2.6 Field calibration

6.2.6.1 Purpose

The field calibration is necessary for each product type. The installed polynomial calibration assures linearization of both the concentration and the temperature dependency. Still, your product may contain contaminations or additives that may have a small impact on the final analysis result. The field calibration corrects this error. This correction can be considered as “slope” correction of the programmed calibration. The final purpose is to make the analyzer read correctly at the target concentration.

6.2.6.2 When needed

After installation, and when the product is flowing. The field calibration is intended to be a specific calibration for your specific product.
The procedure must be repeated for each product. For your convenience, the analyzer determines a calibration factor and stores this factor in its database, so that you don’t need to repeat the procedure when you manually or remotely recall the product with its calibration factor.

6.2.6.3 Procedure

If you did not already do so, create some product types (if necessary) that you are processing in your plant. You can do this through the menu *Liquids=> Liquid Edit.* The calibration will have effect ONLY on the liquid which you have made the active liquid calibration.
The below procedure provides a brief guideline for the necessary steps.

- The analyzer must be powered up for at least 4 hours
- Select the product from the list (Through menu *Liquids=>Liquid Select).*
- During stable processing, read the concentration from the display.
- Take a sample for laboratory analysis.(immediately after taking the reading)
- After taking a sample, take another reading from the display.
- Average the 2 readings.
- After laboratory analysis of the sample, you have 2 numbers, i.e. an “Indicated value” (averaged reading of display) and a “Laboratory value”.
- Enter the field calibration menu (through *Calibration=> Field calibration* menu.
- Enter the 2 values in their appropriate field.

Figure 33: Field calibration Poly 1

After entering the data, you will see a new factor. It should be in the range of 0.900 up to 1.100. In case you suspect a wrong factor, you may press “Cancel” and repeat the procedure. The selected product has now been calibrated. You can see the concentration change after you have done this calibration.

6.3 Shutting down the analyser

Question	Answer
When to do it	For maintenance inside the analyzer
When NOT to do it	For liquids reset
What must be done before	If logging; safe log files see 8.3

What is needed	
What must be done afterwards	

In case of shutting down the analyser, make sure that Logging is off. For information about logging see §8.3.

- ▶ The analyzer must be powered down from the outside of the analyzer. This can be done by e.g. disconnecting the mains cord or shutting down the 24V power supply.
- ▶ It is recommended after powering down to disconnect the mains power connector on the analyzer board.

6.4 Removing

Before removing anything please read the section about preparation and precautions.

Probes can be safely disconnected from the analyzer board without powering down the analyzer. For removing probes refer to the probe manual if available.

If a display has to be replaced, the display can also be disconnected without powering down the analyzer. Chapter 3 shows how the display is connected.

If the analyzer board has to be removed, this has to be done by your agent. The agent knows the proper procedure how to do this.

6.5 Cleaning

It is not recommended to clean the inside of the product.

To clean the outside of the product, a dry and clean cloth is sufficient. Do not use any aggressive cleaning agents. Using them may damage the lettering or the casing itself and might even impair the function of the touch screen.

6.6 Sensor replacement and calibration.

For specific instructions for removing and installation of probes see the specific probe manual (if available).

There are 2 possibilities of probes which can be replaced:

1. Replacing the ultrasonic probe:
    A. When the ultrasonic sensor is replaced. Enter the data from the probe calibration datasheet into the US sensor menu as described in §5.3.
    B. The temperature calibration has to be redone according the procedure described in §6.2.1.
    C. After these calibrations the low density calibration has to be redone following the procedure from §6.2.2.

2. Replacing of a separate Pt100 probe:
    Redo the Pt100 calibration according the procedure described in §6.2.1.

6.7 Rebooting the analyzer

Rebooting is necessary after loading firmware and loading liquids. Both procedures are described in the manual: “Field maintenance & update procedures for all models.”

After changing of settings and or calibrations it is not necessary to reboot the analyzer.

The rebooting procedure which can be performed after shutting down for maintenance is the same as the boot procedure described in §4.2.

7. Frequently asked questions

7.1 Installation questions

Q: Do I need to calibrate the analyzer prior to installation?
A: The analyzer has been calibrated and tested in the factory. There is no need to (re)calibrate the analyzer before installation, because all specific adjustments and calibrations can be done with a fully installed analyzer.

Q: Our analyzer has a probe with 10 meter cable length. We want to install the controller unit further away. Is this possible?
A: Yes, new cables are available. A new probe calibration datasheet will be provided with new settings. For inputting this data see §5.2.

Q: I want to install the analyzer in a pipe line close to a pump. Is this possible?
A: Yes, but install the analyzer downstream of the pump. If cavitation can be expected, it is better to stay at least 20 pipe diameter length away from the pump.

Q: What is the effect of pressure?
A: There is no noticeable effect of pressure, as long as the pressure does not increase above 10 bars. The sound speed may be affected above this pressure, but in case you are running the analyzer at a higher pressure, this must have been discussed before delivery.
If the pressure is atmospheric or lower, then there is an increasing risk of gas bubbles. If installation in an atmospheric tank is required, we recommend installing the probe near the bottom of the tank, as to avoid build-up of gas bubbles on the sensor surfaces. In certain cases, degas systems can be installed to avoid these problems. Contact the factory or your local agent to discuss possible solutions.

Q: In our process, our liquid is constantly used, re-used and recycled. Our production makes that the liquid is agitated and / or injected with air or other gas to improve the process. Can we simply insert a probe in the buffer tank or the tank where the process takes place?
A: The system is capable to operate in liquids, where occasional gas bubbles are present. The analyzer is NOT suitable in liquids, saturated with gas, or liquids with finely dispersed gas. See next question for solutions.

Q: How can I measure in bubble-rich liquids?
A: Your sample take-off point should be located as low as possible in your (buffer) tank. Pump your sample to a bubble removal system. This may be a simple settling tank, or an active removal system. If available refer to the FAQ section “Corrosive liquids” for specific solutions.

7.2 Operation questions

Q: I just installed the analyzer and I am getting all kinds of error messages. How is this possible?
A: After power-up, the analyzer will try to make a valid measurement. As the analyzer has an automatic system to detect the presence of liquid and gas bubbles in the pipe line, it is likely that the pipe is not (completely) filled with liquid. Make sure that product is in the pipe line. Also check the above recommendations in the FAQ installation section.
Some error messages do not necessarily mean that there is malfunction of the analyzer. For instance, if the purpose of the instrument is to measure the suspended solids, specific errors may occur due to the fact that the analyzer fails to make a proper sound speed measurement. Attenuation measurements do not depend on signal quality.

Q: How can I check that the analyzer is working properly?
A: The analyzer will show no error message on the top of the measurement screen.
You can also check the detail measurement screen and compare the values with the values which are considered to be normal, as described in the section “normal operation” in this manual.

Q: How can I calibrate the analyzer?

A: Instrument calibration, i.e. electronic circuits, probes, outputs etc. have been calibrated in the factory and do not need calibration after installation.
When you replace a probe, you will need to enter the probe data, as given in the calibration data sheet, in the configuration menu.
Zero calibration in pure water (<100 mg/l TDS) is recommended every month. Refer to the section “Calibration” in this manual for details.
Polynomial calibration is provided by the factory, while the calibration data already is installed in the analyzer during the final factory test procedure.
A field calibration at the target concentration is recommended after commissioning, by taking a sample and enter the correct concentration into the analyzer. Unless the product formula changes, this procedure is only required once.

Q: During certain process conditions, it can happen that gas bubbles are present in the liquid. How does this affect the measurement?
A: The Rhosonics Ultrasonic Analyzer automatically detects the presence of product and gas bubbles. It will then freeze the measurement until a next valid measurement is possible. Due to its unique method of operation, the analyzer continues to operate reliably during upset process conditions. The analyzer will not be able to measure when gas bubbles are continuously present or when gas bubbles adhere to the surface of the sensor, which will be the case when measurement are done under atmospheric conditions.

Q: How can I see that I am having gas bubbles in the pipe line?
A: Depending on the amount of gas bubbles, you will see occasional or frequent error messages in the measurement screen. The detail measurement screen provides information about specific ultrasonic parameters, such as the measured (ultrasonic) attenuation, which should normally be at a level between 20 and 50, and constant.

Q: We are using the analyzer in a blending installation. When the production has stopped for more than several minutes, the analyzer indicates gives a slight misreading, sometimes leading to alarming situations. This also happens when the product starts flowing again. What is happening and what can we do about it?
A: When the liquid is flowing, the temperature is in equilibrium in the entire pipe line. When the product is standing still, the cold pipe line may either be heated or cooled slowly due to differences in temperature with the ambient environment. Although the temperature of the liquid is measured at a point which is considered representative for the ultrasonically measured product, unpredictable temperature gradients may lead to incorrect temperature compensation, resulting in deviation in the concentration reading.
You can solve this problem by using the optional “External Hold” option. An external 24 Volt DC signal can stop the analyzer, so that the outputs and alarms are no longer updated. See the sections “Installation” and “Automation and communication” for details.
Another method is to insulate the pipe line, so that it is not heated from the outside. For best results, the entire pipe line (upstream) must be isolated.

8. Trouble shooting

8.1 Fault codes:

Status and error codes. Causes, actions and remedies.						
Valid For Model 8500~9999 from v2.2.17 and up						
Module	**Code**	**Message on display**	**Description**	**Possible causes**	**Possible remedies**	**Analyzer action**
SYS	10	10 System: Ext. hold is enabled	External hold is enabled.	1 Caused by signal on external hold connector	1 Not really a fault, because externally given	All calculations are stopped
				2 Caused by modbus address via MJ2	2 Not really a fault, because externally given	
				3 Caused by software update on Rev F Analyzer	3 Hardware modification is needed see update and maintenance manual Revision F. modification	
	253	253 System: Wrong disp. software	Display software is not compatible with analyzer software	Software version from the display software is too low. Problems may occur for certain factory models.	Check for compatible display software	Everything is updated
	Temperature Sensor (TS) codes					
TS1	21, 22	21 T Sens1 bad or no connection	Temperature sensor1. Has a bad connection or is not connected at all.	1 Wiring is defective	1 Check / repair wiring	Calculations are stopped accept for Power and attenuation
				2 Connections are defective	2 Check / repair connections	
				3 Pt100-#1 defective	3 Replace Pt100 probe	
	23	23 TSens1 value out of range	Value of temperature sensor 1 is out of range.	1 Temperature calibration went wrong.	1 Redo temperature calibration from the calibration menu.	
				2 See error 22	2 See error 22	
	220	220 T ADC calibration out of range	The low ADC value for the temperature calibration of sensor 1 is out of range.	Low value calibration for temperature sensor 1 is outside of range should be within 5% of 135000	Redo the low reference calibration for sensor 1 with a precision resistor of 100 ohm.	Everything is updated
	221	221 T ADC calibration out of range	The high ADC value for the temperature calibration of sensor 1 is wrong.	High value calibration for temperature sensor 1 is outside of range should be within 5% of 170000 or 204000	Redo the low reference calibration for sensor 1 with a precision resistor in the range of 125-150 ohm.	

	224	224 T ADC calibration out of range	The resistance value for the low ADC calibration of temperature sensor1 is wrong.	Resistance for low reference should be between 99 and 101 ohm	Redo this calibration with the correct resistor value	
	225	225 T ADC calibration out of range	The resistance value for the high ADC calibration of temperature sensor1 is wrong.	Resistance for high reference should be between 125±1.25 ohm and 150±1.5 ohm	Redo this calibration with the correct resistor value	
	230	230 Temp1 ADC not calibrated	Low value for the ADC calibration for temperature sensor1 is not calibrated	1 Low value ADC calibration for TS1 is not performed. 2 Reset button is pressed in the ADC calibration page from TS1	Redo the low reference calibration for sensor 1 with a precision resistor of 100 ohm.	
	231	231 Temp1 ADC not calibrated	High value for the ADC calibration for temperature sensor1 is not calibrated	High value ADC calibration for TS1 is not performed.	Redo the low reference calibration for sensor 1 with a precision resistor in the range of 125-150 ohm.	
	234	234 TSens1 offset not calibrated	Offset for temperature sensor1 is not calibrated	1 Temperature offset calibration for TS1 is not performed. 2 Temperature offset calibration for TS1 is out of range (+/- 9°C)	Redo the temperature offset calibration for TS1.	
TS2	26, 86, 27, 87	26 TSens2 bad or no connection	Temperature sensor2. Has a bad connection or is not connected at all.	1 Wiring is defective	1 Check / repair wiring	Calculations are stopped accept for Power and attenuation
				2 Connections are defective	2 Check / repair connections	
				3 Pt100-#2 defective	3 Replace Pt100-#2 probe	
	28, 88	28 T Sens2 value out of range	Value of temperature sensor2 is out of range.	1 Temperature calibration went wrong.	1 Redo temperature calibration from the calibration menu.	
				2 See error 27	2 See error 27	
	222	222 T ADC calibration out of range	The low ADC value for the temperature calibration of sensor 2 is out of range.	Low value calibration for temperature sensor 2 is outside of range should be within 5% of 135000	Redo the low reference calibration for sensor 2 with a precision resistor of 100 ohm.	Everything is updated

	223	223 T ADC calibration out of range	The resistance value for the high ADC calibration of temperature sensor2 is wrong.	High value calibration for temperature sensor 2 is outside of range should be within 161500-214200	Redo the low reference calibration for sensor 2 with a precision resistor in the range of 125-150 ohm.	
	226	226 T ADC calibration out of range	The resistance value for the low ADC calibration of temperature sensor2 is wrong.	Resistance for low reference should be between 99 and 101 ohm	Redo this calibration with the correct resistor value	
	227	227 T ADC calibration out of range	The resistance value for the high ADC calibration of temperature sensor2 is wrong.	Resistance for high reference should be between 125±1.25 ohm and 150±1.5 ohm	Redo this calibration with the correct resistor value	
	232	232 Temp2 ADC not calibrated	Low value for the ADC calibration for temperature sensor1 is not calibrated	1 Low value ADC calibration for TS2 is not performed. 2 Reset button is pressed in the ADC calibration page from TS2	Redo the low reference calibration for sensor 2 with a precision resistor of 100 ohm.	
	233	233 Temp2 ADC not calibrated	High value for the ADC calibration for temperature sensor1 is not calibrated	High value ADC calibration for TS1 is not performed.	Redo the low reference calibration for sensor 2 with a precision resistor in the range of 125-150 ohm.	
	235	235 TSens2 offset not calibrated	Offset for temperature sensor2 is not calibrated	1 Temperature offset calibration for TS2 is not performed. 2 Temperature offset calibration for TS2 is out of range (+/- 9°C)	Redo the temperature offset calibration for TS2.	
	Ultrasonic Sensor 1 (US1) codes					
US1	40	40 USens1 Hardware failure	Hardware failure detected during obtaining of the liquid echo of ultrasonic sensor1.	Defective electronics	Replace electronics according the board removal procedure from the update and maintenance manual. Get the electronics repaired.	All ultrasonic measurements are stopped

	50	50 USens1 settings problem	The settings for sound path and or minimum and maximum sound speed are wrong for the liquid echo of ultrasonic sensor1.	1 Minimum and maximum speed setting are too large or too small.	1 Check Cmin and Cmax in Liquid edit menu of selected liquid.	Polynomial calculations and data to outputs are stopped. Data on measurement page 2 are still updated
				2 The sound path is wrong.	2 Check the sound path in the US sensor menu	
	51	51 USens1 settings problem	The settings for start of receiving the ultrasonic data of the liquid echo is set wrong for ultrasonic sensor1.	1 Sound path is set wrong	1 Check the sound path in the US sensor menu	Polynomial calculations and data to outputs are stopped. Data on measurement page 2 are still updated
				2 Dead time is set wrong	2 Check the dead time in the US sensor menu	
				3 Maximum speed is too large or too small	3 Check Cmax in Liquid edit menu of selected liquid.	
	65	65 USens1 value out of range	The attenuation of the liquid echo is bigger than the maximum allowed attenuation for sensor1.	1 US-#1 is not in a liquid	1 Make sure there is a liquid	Handling for ultrasonic errors of the liquid echo are identical. Speed calculations are stopped. mA Outs are forced low or high when selected. Polynomials are only updated when they are power/ attenuation based.
				2 Wiring is defective	2 Check / repair wiring	
				3 Connections are defective	3 Check / repair connections and sensor diagnostics in update and maintenance manual	
				4 US-#1 contaminated	4 Check the probe for contamination and clean if necessary.	
				5 US-#1 defective	5 Replace US-#1 probe	
				6 Maximum attenuation is set wrong	6 Check Max. Attenuation in the sensor menu	
	66	66 USens1 noise problem	The attenuation of the liquid echo is bigger than the maximum allowed attenuation for sensor1.	Same as for error 65	Same as for error 65	
			There is too much noise in the liquid echo of ultrasonic sensor1.	Too much gas bubbles in liquid	Degas the liquid. Make sure the probe is installed according to the instructions in the manual	
	67,69	67 USens1 value out of range	The amplitude of the liquid echo from ultrasonic	1 Minimum and maximum speed setting are too large or too small.	1 Check Cmin and Cmax in Liquid edit menu of selected liquid.	

		sensor1 is too high.	2 The sound path is wrong.	2 Check the sound path in the US sensor menu	
68,70	68 USens1 value out of range	The amplitude of the liquid echo from ultrasonic sensor1 is too small.	1 Should generate error 65 or 66. Therefore error handling is not ok	Contact factory	
71	71 USens1 settings problem	The liquid echo for ultrasonic sensor1 is before the window.	1 Maximum speed setting is too small.	1 Cmax in Liquid edit menu of selected liquid.	
			2 The sound path is too large	2 Check the sound path in the US sensor menu	
			3 Dead time is too great	3 Check the dead time in the US sensor menu	
72-74	72 USens1 wave form problem	The wave form of the liquid echo for ultrasonic sensor1 is not ok.	1 Too much gas bubbles in liquid	1 Degas the liquid. Make sure the probe is installed according to the instructions in the manual	
			2 US-#1 contaminated	2 Check the probe for contamination and clean if necessary.	
Generic codes: Reference Echo + Interface Echo (RE+IE)					
140	140 USens1 Hardware failure	Hardware failure detected during obtaining of the reference and interface echo of ultrasonic sensor1.	Defective electronics	Replace electronics according the board removal procedure from the update and maintenance manual. Get the electronics repaired.	All ultrasonic measurements are stopped
150	150 USens1 settings problem	The settings for sound path and or minimum and maximum sound speed are wrong for the reference and interface echo of ultrasonic sensor1.	1 Trigger point RE is set wrong.	1 Check Trigger point RE in the US sensor menu	Polynomial calculations and data to outputs are stopped. Data on measurement page 2 are still updated
			2 Trigger point IE is set wrong.	2 Check Trigger point IE in the US sensor menu	

151	151 USens1 settings problem	The settings for start of receiving the ultrasonic data of the reference echo is set wrong for ultrasonic sensor1.	Same as for error 150	Same as for error 150	Polynomial calculations and data to outputs are stopped. Data on measurement page 2 are still updated
Reference Echo codes					
165	165 USens1 value out of range	The attenuation of the reference echo is bigger then the maximum allowed attenuation for sensor1.	Same as for error 150	Same as for error 150	Handling for ultrasonic errors of the reference echo are identical. Speed calculations are stopped and ultrasonic temperature calculations are stopped. mA Outs are forced low or high when selected. Polynomials updated when they are power/ attenuation based and only if the temperature is coming from Pt100.
167,169	167 USens1 value out of range	The amplitude of the reference echo from ultrasonic sensor1 is too high.	Same as for error 150	Same as for error 150	
168,170	168 USens1 value out of range	The amplitude of the reference echo from ultrasonic sensor1 is too small.	Same as for error 150	Same as for error 150	
171	171 USens1 settings problem	The reference echo for ultrasonic sensor1 is before the window.	Same as for error 150	Same as for error 150	
172-174	172 USens1 wave form problem	The wave form of the reference echo for ultrasonic sensor1 is not ok.	Same as for error 150	Same as for error 150	
Interface Echo codes		The errors 185-190 will not be displayed			
185	185 USens1 value out of range	IE Note: signal too low	1 In process liquid with high attenuation.	1 Ignore the notification	Except for dead time calculations everything is updated.
			2 Trigger point IE is set wrong.	2 Check Trigger point IE in the US sensor menu	
186	186 USens1 noise problem	IE Note: too much noise	Same as for error 185	Same as for error 185	

	187, 189	187 USens1 value out of range	IE Note: signal too high	Same as for error 185	Same as for error 185	
	188, 190	188 USens1 problem low signal	IE Note: signal too low	Same as for error 185	Same as for error 185	
	Ultrasonic Sensor 2 (US2) codes					
US2	60	60 USens2 Hardware failure	Hardware failure detected during obtaining of the reference and interface echo of ultrasonic sensor1.	Defective electronics	Replace electronics according the board removal procedure from the update and maintenance manual. Get the electronics repaired.	All ultrasonic measurements are stopped.
	103	103 USens2 settings problem	The settings for sound path and or minimum and maximum sound speed are wrong for the liquid echo of ultrasonic sensor2.	1 Minimum and maximum speed setting are too large or too small.	1 Check Cmin and Cmax in Liquid edit menu of selected liquid.	Polynomial calculations and data to outputs assigned to US2 are stopped. Data on measurement page 2 are still updated.
				2 The sound path is wrong.	2 Check the sound path in the US sensor2 menu	
	104	104 USens2 settings problem	The settings for start of receiving the ultrasonic data of the liquid echo is set wrong for ultrasonic sensor2.	1 Sound path is set wrong	1 Check the sound path in the US sensor2 menu	Polynomial calculations and data to outputs assigned to US2 are stopped. Data on measurement page 2 are still updated.
				2 Dead time is set wrong	2 Check the dead time in the US sensor2 menu	
				3 Maximum speed is too large or too small	3 Check Cmax in Liquid edit menu of selected liquid.	
	105	105 USens2 value out of range	The attenuation of the liquid echo is smaller than the maximum allowed attenuation for sensor2.	1 US-#2 is not in a liquid	1 Make sure there is a liquid	Handling for ultrasonic errors of the liquid echo are identical. Speed calculations for channel 2 are stopped. Only mA Outs are forced low or high when selected if they are assigned to values from channel 2. Polynomials which have input from channel 2 are only updated when they are power/ attenuation based.
				2 Wiring is defective	2 Check / repair wiring	
				3 Connections are defective	3 Check / repair connections and sensor diagnostics in update and maintenance manual	
				4 US-#2 contaminated	4 Check the probe for contamination and clean if necessary.	
				5 US-#2 defective	5 Replace US-#2 probe	
				6 Maximum attenuation is set wrong	6 Check Max. Attenuation in the sensor menu	

	106	106 USens2 noise problem	There is too much noise in the liquid echo of ultrasonic sensor2.	Too much gas bubbles in liquid	Degas the liquid. Make sure the probe is installed according to the instructions in the manual	
	107,109	107 USens2 value out of range	The amplitude of the liquid echo from ultrasonic sensor2 is too high.	1 Minimum and maximum speed setting are too large or too small.	1 Check Cmin and Cmax in Liquid edit menu of selected liquid.	
				2 The sound path is wrong.	2 Check the sound path in the US sensor2 menu	
	108,110	108 USens2 value out of range	The amplitude of the liquid echo from ultrasonic sensor2 is too high.	1 Should generate error 85 or 86. Therefore error handling is not ok	Contact factory	
	111	111 USens2 settings problem	The liquid echo for ultrasonic sensor1 is before the window.	1 Maximum speed setting is too small.	1 Cmax in Liquid edit menu of selected liquid.	
				2 The sound path is too large	2 Check the sound path in the US sensor 2 menu	
				3 Dead time is too great	3 Check the dead time in the US sensor 2 menu	
	112tm114	112 USens2 Wave form problem	The wave form of the liquid echo for ultrasonic sensor1 is not ok.	1 Too much gas bubbles in liquid	1 Degas the liquid. Make sure the probe is installed according to the instructions in the manual	
				2 US-#2 contaminated	2 Check the probe for contamination and clean if necessary.	
CS1	conductivity sensor 1					
CS1	236	236 Cond. Zero calibration NOK	Conductivity zero calibration is NOK or out of range.	1 ADC value is NOK	1 See manual for conditions calibration	Analyses of the concentrations are stopped or cannot be trusted.
				2 Conductivity sensor is not connected	2 check wire connection	
	237	237 Cond. ref. calibration NOK	Conductivity reference calibration is NOK or out of range.	1 Conductivity value is out of range.	1 Make sure the reference value is OK	
				2 ADC value is NOK	2See manual for conditions calibration	
	238	238 Conductivity out of range	The value of the conductivity probe	1 Conductivity sensor is not connected	1 Check wires connection	

			is outside specifications.	2 Conductivity of process liquid is out of specified range	2 Check technical specifications of the conductivity sensor	
				3 Conductivity probe is defective	3 Check repair probe according the maintenance and update manual.	
RHO	Ultrasonic sensor 1 density error					
RHO	195	195 USensor1 SG out of range	Ultrasonic sensor 1 sg is out of range.	1 Density calibration has gone wrong	1 Read the model specific manual	Readings based on density cannot be trusted
				2 Probe is out of liquid	2 Check if the processline is completely filled	

8.2 Normal operating values

Note: The following does not apply for model 9690.

The probe attenuation which is displayed on measurement page 2 should have a value lower than 40dB in clear liquid, if not the probe has to be cleaned or replaced.

In deionised water the sound speed should be according the table in the appendix (chapter 11).

- ▶ If this is not the case the temperature should be calibrated according §6.2.1.
- ▶ If the problem still exists then perform a zero calibration according §6.2.2.

In the process the speed of sound should be higher than 400m/s and smaller than 3000m/s.

8.3 Logging for diagnostics & evaluation

During trouble shooting the factory or distributor might need life data from the process. This section explains how to obtain that data ea. how to make a log file.

8.3.1 Preparations

IMPORTANT: Please read this section carefully before starting!

Question	**Answer**
The purpose	Make a log file over a period of time For remote trouble shooting (by factory)
When to do it	When the factory / distributor recommends doing so.
When NOT to do it	Not applicable
What must be done before	Start real-time measurement
What is needed	A USB memory stick
What must be done afterwards	Storage of data in a safe location or sending data to factory in a zipped file.

8.3.2 Memory Stick Logging

- ▶ Slide the empty USB memory stick in the U-A connector of the display
- ▶ Check that the USB memory stick flashes, indicating write/read actions
- ▶ Wait until the continuous flashing stops (the display is making folders on the USB stick, this should take about 5 minutes)
- ▶ Open “Logging” **[Diagnostic] [Information / Diagnostic] [Logging]**
- ▶ Enter the log sampling time
- ▶ Press **[Start logging]**. The main measurement page should indicate that the logging process is active.

Figure 34: Logging page

***Information**: All main data, detail data, and a time tag are recorded in a temporary file on the memory stick.*

NOTE:
Never take out the memory stick without stopping the log process first
ALWAYS wait until the memory stick stops flashing (may take several minutes)
The data will be stored in the following folder: **<USBSTICK>RHO\SAMPLE**. In this folder, you will find folders, indicating the day in the format YYMMDD. After day, the last data is assembled in a .CSV file, and a new folder is created for the next day of logging. The .CSV files can be easily opened with Excel. The stored .BIN files are temporary files and cannot be opened, converted or used otherwise.

8.3.3 Procedure to stop logging on USB memory stick

- ▶ Press “Stop & Save Log to USB”
- ▶ Wait until the page “Saving data to USB” is disappeared from the screen, this may take up to 5 minutes
- ▶ Remove USB stick and check the log data with Excel

8.4 Creating diagnostics files

8.4.1 Preparations

IMPORTANT: Please read this section carefully before starting!

Question	**Answer**
The purpose	1. Backup of factory and user settings 2. For remote trouble shooting (by factory)
When to do it	When the factory recommends doing so. Or when you wish to make a backup after adjusting
When NOT to do it	Not applicable
What must be done before	Not related to other procedures
What is needed	A USB memory stick .
What must be done afterwards	Storage of data in a safe location or sending data to factory in a zipped file.

8.4.2 Backup settings procedure

After reading the previous section, you are ready to store the analyzer settings for backup.

1. Insert the USB stick in the USB jack of the display. This jack is located at the rear side, next to the wired jacks.

   NOTE: When the USB stick is blank, wait until the USB-stick stops flashing. This flashing indicates that a folder structure is created on the USB stick.

2. Use the touch screen to change the access level.
3. Use pass word 0856 to get to level 3. This level you access to the store function.
4. Navigate to **[Configuration] [Diagnostics]**
   ►In this menu, press "**Save Settings TO USB**" (old name: **Factory Diagn. to USB"**)
   NOTE: When a **warning** appears, do NOT continue and press the EXIT button. Please try again, while making sure that you press the correct button.
5. Within 10 seconds, data is transferred.
   ►Take out the USB-memory stick
   ►Start the measurement sequence
6. Store all files which are located in the folder **<USBdrive>:\RHO\RECIPE** on your PC for later use.
7. Send all these files (14) to the factory in case this was requested.

9. Optional extensions

9.1 Spare parts

9.1.1 Spares on analyzer

Below there are mentioned several spare parts mounted on the analyzer. The opposite connectors mounted on the cable are related to the below picture and given in figure 3.

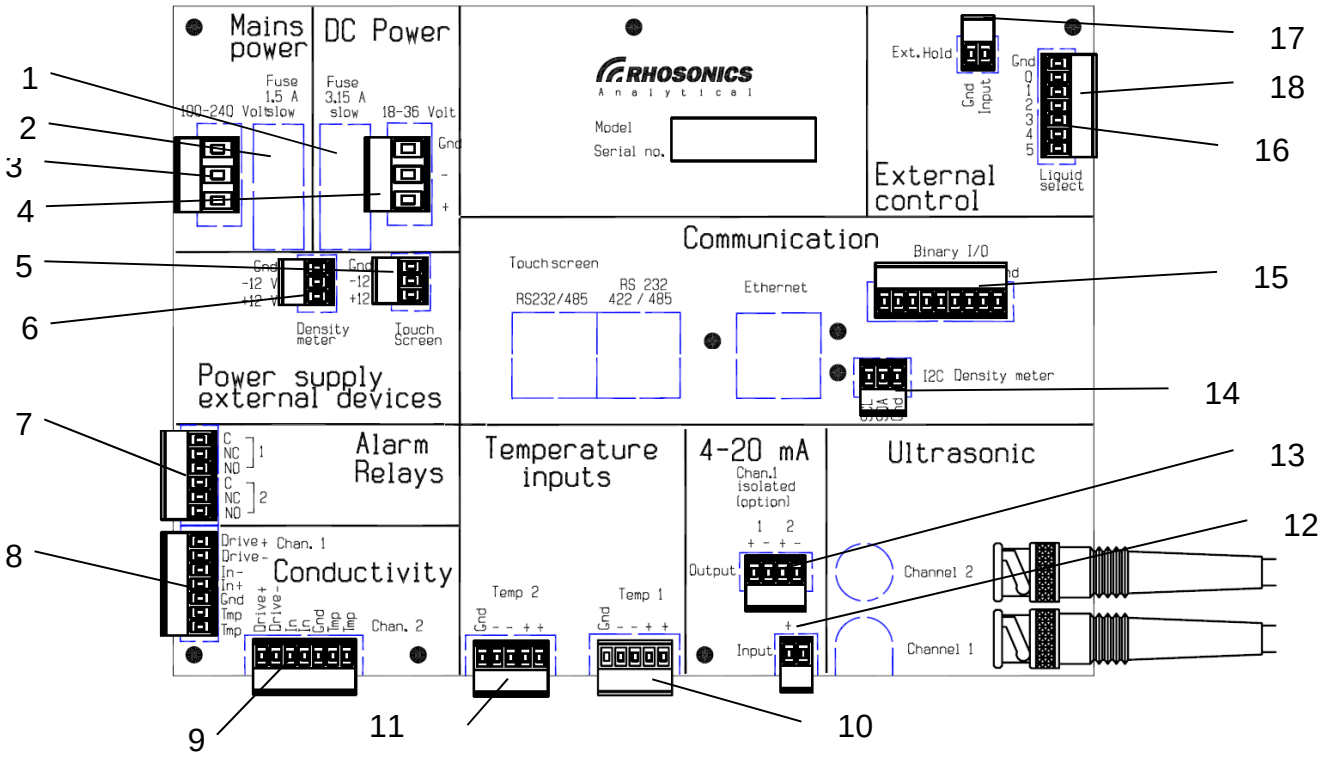
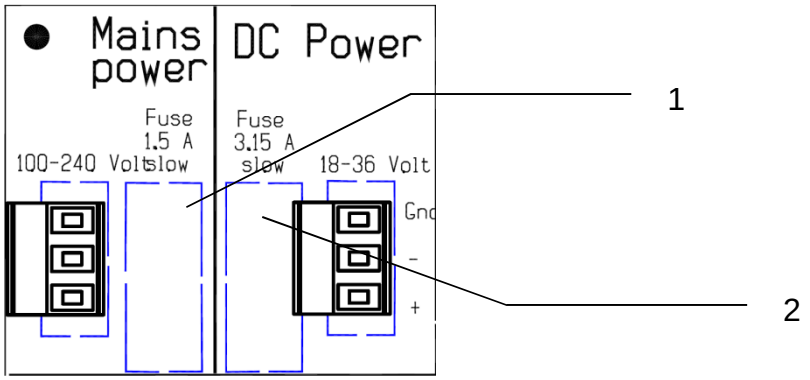


Figure 35: Analyzer board, all connectors, all models

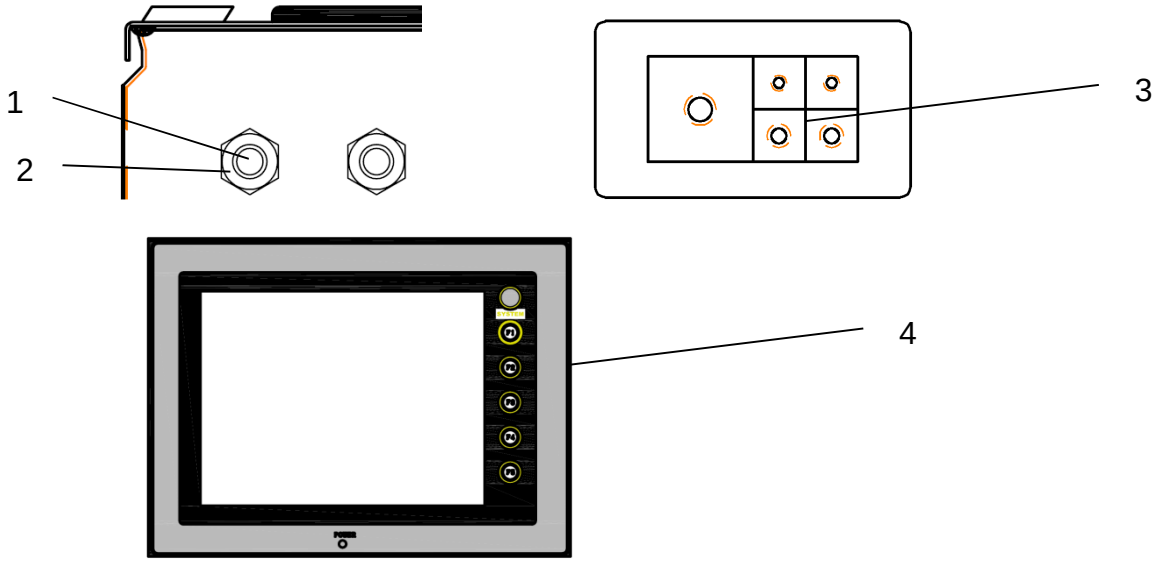
#	Spare part	Article No.	Subscription
1	Fuseholder 1.5 A Voltslow	ZEPC-FUSE-HOUDER	Fuse holder 1.5 A
2	Fuseholder 3.15 A Slow	ZEPC-FUSE-HOUDER	Fuse holder 3.15 A
3	Mains power	ZECO-CON-3P-P-1628150000	3-pins connector 24 DC/230 AC-print, GN
4	DC Power	ZECO-CON-3P-P-1628150000	3-pins connector 24 DC/230 AC-print, GN
5	Power supply Touch Screen	ZECO-CON-3P-P-1597370000	3-pins connector-print, OR
6	Power supply Density Meter	ZECO-CON-3P-P-1597370000	3-pins connector-print, OR
7	Alarm Relays	ZECO-CON-6P-P-1597400000	6-pins connector-print, OR
8	Conductivity Channel 1	ZECO-CON-7P-P-1597410000	7-pins connector-print, OR
9	Conductivity Channel 2	ZECO-CON-7P-P-1597410000	7-pins connector-print, OR
10	Temperature Input 2	ZECO-CON-5P-P-1597390000	5-pins connector-print, OR
11	Temperature Input 1	ZECO-CON-5P-P-1597390000	5-pins connector-print, OR
12	4-20 mA Input	ZECO-CON-2P-P-1597360000	2-pins connector-print, OR
13	4-20 mA Output	ZECO-CON-4P-P-1597380000	4-pins connector-print, OR
14	I2C Density meter	ZECO-CON-3P-P-1597370000	3-pins connector-print, OR
15	Binary I/O	----	Not used
16	Liquid Select	ZECO-CON-2P-P-1597360000	2-pins connector-print, OR
17	External Hold	ZECO-CON-7P-P-1597410000	7-pins connector-print, OR
18	Cover sheet for analyzer	ZEAS-PC-MUA2-F-COVER	Cover for Rev. F and G analyzer

9.1.2 Fuses



1	Fuse 1.5A Voltslow	ZEPC-FUSE-1.6A-5X20-ASLBC	Fuse (T), 250V, 1.6A
2	Fuse 3.15A Slow	ZEPC-FUSE-3.15A-5X20-FFHB	Fuse (T), 250V, 3.15A

9.1.3 Weather proof housing and SPLIT-unit housing



1	Seperate Glands	ZASM-WART-M20L-1209200031	M20X1.5 PA Gland
2	Nut for separate glands	ZASM-WART-M20L-MOER	M20X1.5 PA Nut for Glands
3	Complet set of packing seals	ZASM-SAM1-AFDMODULES-SET	
4	Display for analyzer	ZEAS-DISP-V806ITD-ETH	Analyzer display, TFT, and touchscreen w/ Ethernet option

9.2 Options

9.2.1 Ethernet Connection Module

The Ethernet Connection Module is needed to make a direct link to the analyzer. The optional Ethernet adapter offers the user the opportunity to follow the operation of Rhosonics ultrasonic process analyzers from their office computers without the need to physically be present at the location of installation. This module is only available for displays which already have an Ethernet connection possibility. Below you will find a table which contains displays and their Ethernet availability.

Type	Physical appearance	Ethernet availability
V706MD	Black housing, monochrome touch screen	Ethernet adapter is available as option
V706CD	Black housing, CSTN color touch screen	Ethernet adapter is available as option
V806CD*	Grey housing, CSTN color touch screen	Ethernet is not available
V806CDi*	Grey housing, CSTN color touch screen	Ethernet adapter is installed
V806TD**	Grey housing, TFT color touch screen	Ethernet adapter is not available
V806TDi***	Grey housing, TFT color touch screen	Ethernet adapter is installed

* Models sold in 2010
** TFT screens offer improved readability and viewing angle
***The TDi version is sold with analyzers shipped after March, 2011

Rhosonics can offer you a so called “module” mentioned above which contains a manual, cable and USB-stick. The manual will guide you by instructing a couple of simple steps to install complete the Ethernet application. Please point to your dealer for more information.

9.2.2 Firmware Update Kit

It could be that you would like to update your analyzer with the latest software. This could be needed for better measurement.