hielscher

Ultrasound Technology

Certified according to DIN EN ISO 9001

UP400St
Operating Manual

Imprint

Operation manual
UP400St Ultrasonic Processors

Ultrasonic processors for stationary operation

Purpose and use

This Operating instruction shows you the construction and operation of the UP400St ultrasonic processor.

Please ensure that you read the safety information particularly carefully and comply with it at all times.

Always keep the manual near the areas in which the UP400St ultrasonic processor is used. The Operation manual should always be at hand, to help you solve any questions that may arise.

All rights reserved

The manual has been prepared with all due care, nevertheless errors and omissions cannot be fully precluded.

Hielscher Ultrasonics GmbH reserves the right to make changes to the technical data and specifications during the course of further development of the product, without giving prior notice.

The company and product names mentioned in this manual can be registered trademarks. They are the property of their respective holder and are herewith acknowledged.

We do not accept any liability for damages, which result from failure to observe the information in this manual.

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List of Contents

1 Product Description

The UP400St ultrasonic processor has been developed for use in the laboratory; the areas of use and operation of the two ultrasonic processors are the same.

The ultrasonic transducers use electric excitation to generate ultrasound, which is transferred to the liquid medium via various sonotrodes. The ultrasonic processors are fitted to a stand for operation.

1.1 Designations used in this manual

This Operating instruction applies to the UP400St ultrasonic processor. The following designations are used:

Ultrasonic processor	complete ultrasonic processor with generator inside the housing
Generator	electrical part of the processor
Transducer	mechanical part of the processor; transmits the mechanical vibrations of the sonotrode
Sonotrodes	tools which are screwed to the transducer

1.2 Overall view

The ultrasonic processor is supplied in a portable case, which also contains all accessories and the required tools.

Key

1	Portable case
2	Ultrasonic processor
3	Tools
4	Sonotrodes
5	SD-Card
6	Cables
7	Stand St1
8	Temperature sensor PT100

Figure 1-1 Overall view: ultrasonic processor in portable case

1.3 Areas of use

The UP400St ultrasonic processor has a large range of applications for use in biology, medicine, chemistry and engineering.

Despite their high efficiency, the ultrasonic processors do not have to be artificially cooled and are suitable for continuous operation. The amplitude of the oscillatory system can be stepless adjusted between 20% and 100%; the set value remains constant under all operating conditions. This means that even continuous operation in air is possible.

The sonotrodes are power-adjusted and can therefore be run without amplitude limitation.

You can expose temperature-sensitive samples to high intensity ultrasonic waves in pulse control mode. The pulse mode factor between non-operation and acoustic irradiation can be continuously varied between 10% and 100%.

The UP400St ultrasonic processor shall use for the following tasks:

Sonochemistry

The ultrasonic processors can be used in Sonochemistry in the standard laboratory vessels. Prerequisite for this is the correct choice of laboratory vessels according to the media to be acoustically irradiated and the sonotrode size.

Biology, medicine and chemistry laboratories

The UP400St ultrasonic processor can be used in laboratories, for example to carry out the following tasks:

- Disintegration or homogenization of liquids
- Fine screening granular substances
- Intensive cleaning of flat substrates
- FIA in biochemistry

Further areas of use

Further areas of use are feasible and depend on the sonotrodes available. In case of doubt, please contact the customer service department of Hielscher Ultrasonics GmbH. The address and telephone number are given in Section 11.2 "Service address and telephone number".

1.4 Equipment and accessories (extent of delivery)

The extent of delivery is determined by the order. In particular, the sonotrodes supplied with the ultrasonic processor depend on the planned use.

The electrical connections are specified by Hielscher Ultrasonics GmbH before delivery, depending on those that are typical for the country of use according to the customer's order (see Section 1.6 "Technical data"). The electrical connections must not be changed by the user of the ultrasonic processor!

Basic equipment, standard extent of delivery

The portable case with foam inner lining contains:

- Ultrasonic processor UP400St
- Open jawed spanner 2x SW17, Extension
- LAN cable, Port-Splitter RJ45-HUB, Cross-Link Adapter
- Operation manuals (Processor, Software, Web, Port-Splitter)

Accessories according to the order, possibly supplied separately.

Special equipment

Please note any enclosed separate documentation on the use and installation of the accessories

1.5 Designation

Manufacturer	Hielscher Ultrasonics GmbH
Title	UP400St
Conformity	CE
Year of manufacture	See rating plate

1.6 Technical data

Technical specification

Ultrasonic processors		UP400St
Efficiency	> 90 %	
Working frequency		24 kHz
Control range	± 500 Hz	
Output control	20% …100%, in 1% steps	
Pulse-duty cycle	10% - 100% as related to a second, in steps of 0.1 second - 100% – continuous operation	
Maximum amplitude		up to 200 µm **Pk-Pk** depending on the sonotrode
Maximum energy density		up to 300 W/cm² depending on the sonotrode

Electrical data

Connected loads	230 V AC, 50/60 Hz	
		110 V AC, 50/60 Hz
Fuses (primary, internal)		mains voltage 230 V: 4 A 110 V: 8 A
Mains fluctuations		± 10%
Surge category	2	
Usable/nominal output		400 W depending on the sonotrode

Operational safety

Protection level	1, grounded device	
Overvoltage category		II
Degree of pollution		2
Degree of protection		IP 20

Permissible ambient conditions

Temperature range		+5 ... +40 °C
Relative air humidity		10 … 90 %, non-condensing
Tolerated corrosives		none
Ambient air pressure		700hPa - 1200hPa

Maximum rate of ambient pressure air change: 100hPa/hr

Maximum installation height	< 2000m

Device parameters

Dimensions	(length x width x height): 300 mm × 210 mm × 145 mm
Mass	approx. 3.8 kg

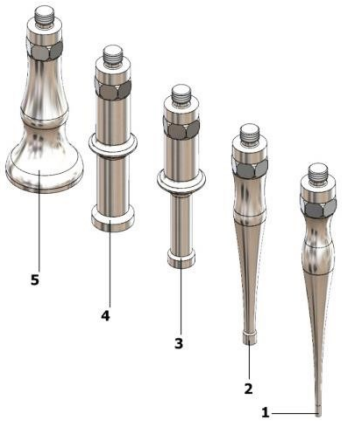
1.7 Available accessories

The following accessories are available as standard products. Please ensure you note the time this Operation manual was issued, if necessary, please ask the customer service department of Hielscher Ultrasonics GmbH for any new additions to the accessories available:

1.8 Sonotrodes

Standard sonotrodes are used for the UP400St ultrasonic processor, depending on their dimensions and acoustic power density.

Please note! The amplitude values listed in the following tables are measured as **Peak-Peak (Pk-Pk) values**.



Key

1 S24d3
2 S24d7
3 S24d14D
4 S24d22D
5 S24d40

Figure 1-2 Selected standard sonotrodes for UP400St

Maximum immersion depth

Please see 6.3 UP400St at the stand or in the SPB-L

Data of standard sonotrodes

Table 1-1 Standard sonotrodes for UP400St – the table shows the performance data for standard sonotrodes for the ultrasonic processor UP400St – Amplitude at horn at 100% - **40µm**

Title	Immersion Depth (mm)	Tip diameter (mm)	Amplitude at 100 % (µm) Pk-Pk	Acoustic power (W)/Net rapeseed oil/ water		radiating surface (cm²)
S24d3	45	3	166	54	22	0,07
S24d7	45	7	164	130	77	0,38
S24d14D	45	14	99	220	170	2,2
S24d22D	45	22	46	250	180	5,4
S24d40	45	40	18	Overscan	245	12,56

Table 1-1 Standard sonotrodes for UP400St

Hielscher Ultrasonics GmbH also develops special sonotrode designs for special applications.

Long versions of the sonotrodes are also available (double the length of the normal design). The designation of these versions is given at the end of the title: Long version means L2

Further components

Flow vessel **FC22K** Usable with Sonotrode S24d14D and S24d22D
stainless steel, autoclavable, with cooling.

Sound control box **SPB-L** Protective box for reducing sound with an adjustable plate inside as a standing area for the acoustic irradiation container.
We recommend that you use the sound control box for continuous operation of the ultrasonic processor.

Stand **ST1-16** Stand made of stainless steel
Footplate 300 mm x 150 mm,
Pole diameter 16 mm

Acoustic irradiation beaker **BB1**
Acoustic irradiation beaker for simultaneous indirect acoustic irradiation of up to 6 test tubes

2 Safety

2.1 Symbols used

Symbols in the manual

IEC		ANSI
	Warns for immediate danger to life and limb (risk of severe injury and death).	
	Warning for a possibly dangerous situation that may lead to body lesions.	
	Warning for possible damage to objects without risk to persons.	
	Electric current!	
	Warning of possible feedback voltage when opening the plug -connection between the generator and transducer!	
	Explosion hazard!	
	Hot surface! Do not touch!	
	Wear protective gloves!	
	Eye and ear protection!	
	Read the Manual!	 

Symbols on the device

	CE Conformity mark
	Hot surface! Do not touch!
	Warning of possibly dangerous situation with the result of injuries.

2.2 Use as prescribed

Serve the ultrasonic processor UP400St

- the acoustic irradiation of liquid media
- or the acoustic irradiation of solid media in a liquid bath
- or the acoustic irradiation of solid media in a special vessel explicitly approved by Hielscher Ultrasonics GmbH according to Section 1.7 "Available accessories".

The following tasks can be solved with the aid of the UP400St ultrasonic processor:

- Disintegration or homogenization of liquids
- Intensive cleaning of flat substrates
- FIA.

Use of the ultrasonic processors in liquids

The ultrasonic processors may only be used in or with liquids so that the sonotrode tip is either dipped into the liquid to a depth not greater than the maximum submerged depth of the respective sonotrode type or stands a few millimeters above the liquid (atomization of the liquid).

Other uses

Any other use than those listed here is outside of the specification and can lead to dangerous conditions. Any use not described here is impermissible and not covered by the warranty arrangements and obligations between Hielscher Ultrasonics GmbH and other parties. Hielscher Ultrasonics GmbH refuses to accept any responsibility for damage, losses and/or injuries or death, which result from use deviating from the information given in this Operating instruction.

2.3 Safety instructions

It will be explicitly pointed out, that only original replacement and accessory parts are to be allowed to use. In case of non-compliance the warranty expires. The operational safety of the devices can be endangered when using other parts.

Safety!	
Please use original replacement and accessory parts, only!	
Warning**!**	

This product can expose you to chemicals which are known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to „P65Warnings.ca.gov".	

General instructions

- Check your ultrasonic processor for any damage before use!
- Lay out the cable in a way that prevents it from being stepped on or stumbled over.
- Do not cover the ventilation apertures in the casing. Prevent liquids from penetrating into the casing!
- Never cover the power unit. Prevent liquids from penetrating into the power unit!

Disconnecting device (mains plug)	
The ultrasonic processor must be set up in such a way that, in an emergency, the processor can be safely disconnected from the mains with the aid of the disconnecting device (mains plug). ***The socket (mains plug) must be freely accessible!***	

Risk of burns

- Do not touch horn and sonotrode during operation. Risk of burns! After a long-time operation, let the ultrasonic transducer cool off before touching its parts. At continuous operation especially the horn and the sonotrode may heat up to 100°C.

Danger of electric current

- Ensure the feed power corresponds with the specifications. See the data plate on the power unit.

Note the supply voltage!	
The ultrasonic processor may only be operated with the supply voltage on the bottom of the power supply unit! ***Any other supply voltage can destroy the device and lead to dangerous situations!***	

- Do not open the ultrasonic processor's casing. Danger of electric shock!
- Never lift a device or its parts by its cable!
- Protect all electrical cables from heat, oil, solutions and sharp edges.

Danger from sound waves

- Never aim a switched-on ultrasonic processor at persons!
- Wear a proper ear and eye protection during operation or operate the ultrasonic processor inside the noise protection box SPB-L.
- Avoid using the ultrasonic processor in the presence of animals. Animals often have a larger frequency reach than people.

Handling of dangerous substances

- The owner is responsible for establishing procedures for the handling of dangerous substances. This includes cleansing of the sonotrodes and specification of admissible detergents (differentiating between those used for cleansing after operations involving dangerous substances and those after other operations). The owner of the ultrasonic system is to bring these procedures to the operators' knowledge and ensure their being observed.

Danger caused by ultrasonic treatment of media

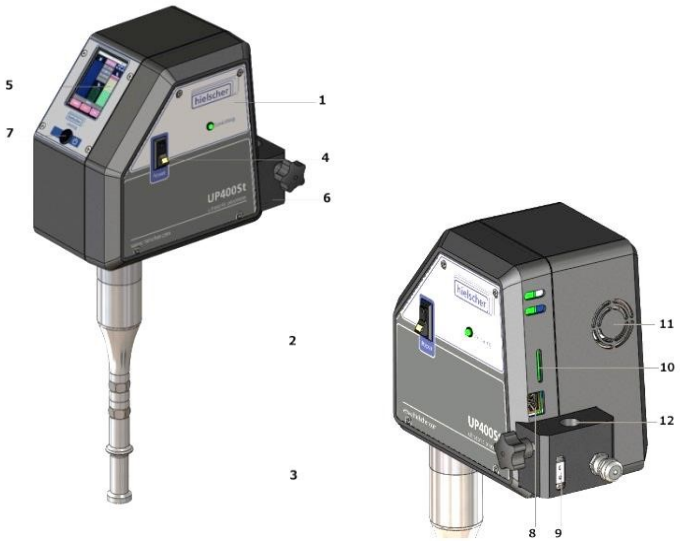
- Please be aware that ultrasonic treatment involves an energy transfer to the medium. This causes the treated medium to heat up.
- Be aware of the risk of bursting containers, especially when glass, earthenware, ceramic and other brittle containers are used.
- Be aware that treating a medium with ultrasound may cause the liquid's squirting, nebulizing (aerosol build-up!) or foaming up.

Attention! Wear ear protection! Sound pressure level up to 100dB possible without protective measures!	
Depending on the used vessel, the sonicated liquid, the volume, the setting of the amplitude and the type of the used sonotrode a sound pressure level up to 100 dB can be occur. *Use suitable sound insulation measures!*	

3 Structure and Function

3.1 Structure

The ultrasonic transducer is integrated in housing. The sonotrode is coupled to the ultrasonic processor via the horn. The ultrasonic processor's housing is designed for stand assembly.



Key

1	Ultrasonic processor
2	Horn
3	Sonotrode
4	Power switch
5	Display
6	Tripod mount
7	Button START/STOP
8	LAN
9	Temperature sensor
10	SD-card
11	Fan
12	Hole for tripod

Figure 3-1 Structure of the ultrasonic processor

3.2 Functional principle

The ultrasonic processor generates longitudinal mechanical vibrations by means of electric excitation (reversed piezoelectric effect) with a frequency of 24 kHz. The power output of the processor can be stepless adjusted between 20% and 100% of the maximum output (see Section 1.6 "Technical data").

The vibrations are amplified by the sonotrode fitted to the horn and formed as a $\lambda/2$ vibrator and transferred via its end face to the medium to be sonically irradiated. If the UP400St ultrasonic processor are used the medium to be acoustically irradiated can be a liquid or a solid/granular substance in a special vessel.

The ultrasound causes cavitation in the liquid, which can be used for various purposes, e.g. for disintegration, homogenization and cleaning (see Section 1.3 "Areas of use").

Solid bodies can be placed in a liquid for acoustic irradiation, whereby the liquid transfer the ultrasound to the surface of the material (e.g., for removing paint). Another possibility for the acoustic irradiation of solid media is to use special vessels and appropriate sonotrodes, e.g., for screening granular substances.

The acoustic power density transferred to a medium depends on the sonotrode shape and the size of the sonotrodes end face area. The various sonotrodes available provide an optimum selection for solving different tasks.

4 Control and display elements

In the following paragraph the structure and function of ultrasonic processor are described. The following Control and display elements are available.

Key

1	Power switch
2	Control panel
3	button START/STOP
4	LED "sonication"
5	Tripod mount

Figure 4-1 Controls and display elements

Power switch ON/OFF at the front side of the processor

Switch for switching on/off the ultrasonic processor.

Green LED "Sonication"

Shows trouble free operation if the ultrasonic processor is switched on.

Control panel

This panel serves for installation and input of all relevant parameters.

SD cards (Backside) see Figure 4-2

On the SD card can be saved parameters and sonification progressions.

LAN interfaces (Backside) see Figure 4-2

LAN interface to connect to a network.

Temperature interfaces (Backside)

Temperature interface to connect a temperature sensor type "PT100".

The individual main menu elements (see figure 8-1) have the following functions:

1. Setting of amplitude by touching the "AMPL" slide control; the set value is shown in the main menu as a percentage; the device will keep amplitude continuously constant.
2. ON/OFF indicator or error messages
3. Change between input amplitude setting (AMPL.) or power setting (POWER)
4. Touching the BIG button will activate extended display. Now the device's power consumption, duration of ultrasound emission, energy input and operation mode are shown. Touching the display surface, it will switch back to main menu.
5. Setting of power by touching the power bar; the device will keep power constant.

6. The status field shows the basic settings
7. Touching the SETTINGS button in the main menu will activate extended setting mode. On this menu level various settings and device pre-settings can be changed. The two arrow buttons above allow for navigation through the various menu levels. Touching the BACK button, you will return to the main menu.

4.1 Interfaces

The ultrasonic processor is provided with an SD-card reader and a LAN-interface (Ethernet) for connecting with a computer.

Using an SD-card you can record in 100ms-steps process-related values, such as amplitude or energy input etc., in a text file.

The ultrasonic processor can be directly connected with, and controlled by, a computer or a network through a LAN connection. The ultrasonic processor supports various browsers such as Firefox, Internet Explorer and Opera. You can assign a network address (IP address) using the display of the device. Inserting the network address in the browser's address list establishes a connection.

The factory-set network address is 192.168.233.233 (see Figure 4-3 Start screen ").

LAN

Transmission rate 10Mbit/s

Factory setting:

IP address: 192.168.233.233

Subnet mask: 255.255.255.0

SD

Memory card
Type SDHC with max. 32GB memory size

Formatted with FAT32 file system

Figure 4-2 SD and LAN interface for memory card

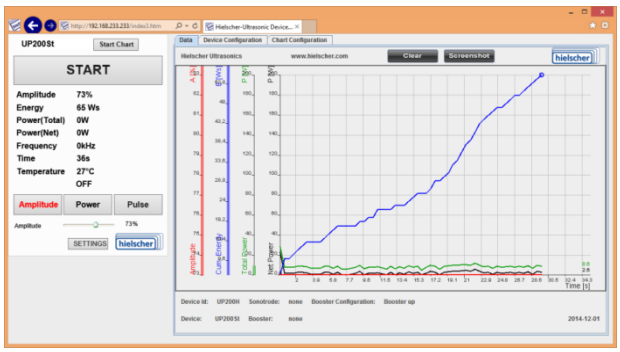


Figure 4-3 Start screen web-application

Using the LAN-interface you can control and monitor the most important ultrasonic processor settings. The most important settings are shown in a diagram.

The ultrasonic processor can be directly connected to a computer's network port or inserted into an existing Ethernet-network.

Minimum conditions for the use of a LAN-interface

Beside a current internet browser, you will need for a correct operation.

Direct connection with a Personal Computer

Avoid being connected with another network using the same subnet-ID, as this may cause network conflicts. In case of doubt, you should also deactivate the wireless LAN (WLAN) in your computer. In some cases, additional firewall or antivirus-software configuration is to be carried out to ensure smooth communication with the ultrasonic processor. To this end, please contact your network administrator or our technical support service.

To ensure correct communication, the network configuration of the operation system used must correspond with the default settings. For a direct connection between a PC and an ultrasonic processor you will need the network cable and network cross-over adapter in your supply package. The cross-over adapter may be connected either to the network port of your computer or that of the ultrasonic processor. Subsequently the adapter port can be connected with the remaining port by means of the network cable. The ultrasonic processor will now be able to exchange data with the computer. Start up your Internet browser. Now you can insert the IP address or NetBios of the ultrasonic processor in the address list in order to enter the website with the device controls. Please take care that when changing e.g., an IP address by means of the ultrasonic processor display, you will have to insert this address instead of the factory setting into the browser.

Factory settings:

IP address:	192.168.233.233
NetBios name:	ULTRASONICS

If you are not able to operate the device using the default values (factory settings), you will have to find the IP address by means of the ultrasonic processor display. When inserting the address into the browser, mind to omit leading zeros in the IP address as read by the ultrasonic processor, as, depending on the way the DNS is read, these zeros could be interpreted as characters, not as figures. For instance, an address read in the display as 192.168.001.050 is to be written as 192.168.1.50. The leading zeros on the device display serve only to enhance insertion on the touch screen.

A guide to menu on the display and reset to factory settings refer to the operation manual supplied separately for integrated software.

In case of technical problems please contacts your administrator or the Hielscher Ultrasonics GmbH technical support service see par 8.1 "Service address and telephone".

Integration into a local network

Network	
In case this knowledge is not available, please contact your network administrator and our technical support service.	

For integrating an ultrasonic processor in a local network, professional knowledge of network processes is indispensable. In case this knowledge is not available, please contact your network administrator and our technical support service. In some cases, additional firewall or antivirus-software configuration is to be carried out to ensure smooth communication with the ultrasonic processor.

When using a network DHCP server, the computer will automatically receive its IP address from the server. This address is subsequently to be inserted into your browser's address list.

Beside integration in a network with a DHCP server, the ultrasonic processor may also be operated in a network with static (fixed) IP addresses. To this end the device is to be configured with a static IP address and proper subnet mask. As described in par. "Direct connection with a Personal Computer" the device is to be connected with a computer and the necessary settings are to be inserted by means of your browser. Besides inserting an unequivocal NetBios name and an IP address together with an appropriate subnet mask, you will also have to activate the option DHCP Server OFF in order to avoid network collisions.

Attention! When using several ultrasonic processors in one network, please be careful to always use different IP addresses and NetBios names. Improper differentiating may cause network malfunctioning that will impede correct functioning of your device.

5 Mains Connection

The ultrasonic processor is to be connected through the power unit to mains inserting a safety plug into the outlet socket. Connection values are country-specific, so please consult the data plate on the ultrasonic processor's casing.

Please pay attention to:

Connection values	
When connecting the ultrasonic processor to mains, please mind the specified connection values! *See the data shield on the power supply.*	
Removable power cable	
Only use the supplied power cable or a tested, approved power cable with the properties required for use. *The use of power cables with insufficient values can lead to dangerous situations!*	

5.1 Selection of sonotrodes

Please select sonotrode according to the following criteria:

- the task to be solved,
- the medium to be sonified, e.g., viscosity, temperature concentration etc.
- required power input
- the use in open or closed systems
- the pressure of medium to be sonified

The standard sonotrodes differ from the diameter of the front area that means from the face transferring approximately 80% of the power. Further differences are the flange systems when use in closed systems.

6 Commissioning

6.1 Room requirements

The ultrasonic processor is designed for normal laboratory rooms or workshops with conditions similar to those in laboratories.

Use in potentially explosive environments	
Do not use the ultrasonic processor in potentially explosive areas! *There is a risk of an explosion and thus a high risk of injury!*	

6.2 Mount and dismount the sonotrode

Prerequisites

To mount or dismount a sonotrode you will require:

- Open jawed spanner 2x SW17
- Extension

  The tools are part of the extent of delivery.

Soiled or damaged contact areas	
The contact areas of the sonotrode and horn must be clean, free of grease, dry and undamaged. Screw the sonotrode very tightly onto the horn of the ultrasonic processor. *Otherwise, the power transmission from the ultrasonic processor to the sonotrode will be disrupted and the processor automatically changes to pulse control mode.*	

Install sonotrode

The sonotrode must be very firmly connected with the horn of the ultrasonic processor. Install the sonotrode to the ultrasonic processor as follows:

1. Turn the sonotrode hand-tight in the tapped hole of the horn.
2. Lay the ultrasonic processor on a solid base (table) so that the sickle spanner also lies on the base and serves as a support.
3. Install the wrench SW17 at the Horn and fix it on the table
4. Place the second wrench with extension on the sonotrode.
5. Press down the wrench in the direction of the base. Tighten the sonotrode with approx. **30Nm**. If necessary, fix the other wrench with your hand.

Damage to the ultrasonic processor	

When fitting the sonotrode, ensure that the horn is not exposed to any torque against the ultrasonic processor! *This can damage the precise and sensitive suspension of the horn in the ultrasonic processor and lead to failure of the ultrasonic processor.*	
	**Key** 1 Ultrasonic processor 2 Horn 3 Sonotrode 4 wrench SW17 5 wrench SW17 6 extension
Figure 6-1 Mounting sonotrode	

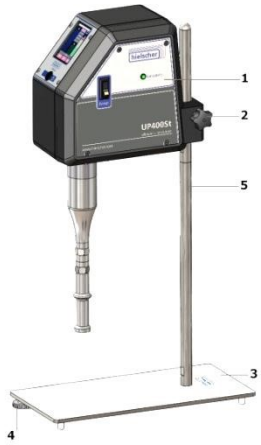
Dismount the sonotrode

The sonotrode is dismantled in the reverse order and direction.

Damage to the ultrasonic processor	
When dismantling the sonotrode, ensure that the horn is not exposed to any torque against the ultrasonic processor! *This can damage the precise and sensitive suspension of the horn in the ultrasonic processor and lead to failure of the ultrasonic processor.*	
	**Key** 1 Ultrasonic processor 2 Open jawed spanner 3 Open jawed spanner 4 Sonotrode
Figure 6-2 Dismount the sonotrode	

6.3 UP400St at the stand or in the SPB-L

The stand holder on the ultrasonic processor fits all stands with a pole diameter of 16mm. The stand pole should be at least 300 mm long.



Key

1 Ultrasonic processor
2 Clamping screw
3 Stand
4 Adjustment screw
5 Stand rod, divisible

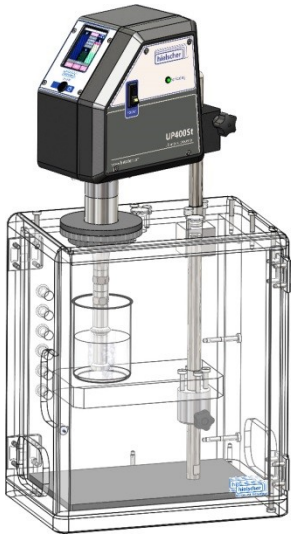


Figure 6-3 UP400St with stand or sound protection box SPB-L

How to fit the ultrasonic processor onto the stand:

1. Loosen the stand holder's clamping screw on the ultrasonic processor.
2. Place the ultrasonic processor with the fitted sonotrode on the stand pole.
3. Slide the ultrasonic processor toward the acoustic irradiation vessel at the optimum working height for the sonotrode fitted.

The submerged depth of the sonotrode can vary depending on the task. All depths less than the maximum submerged depth are possible, including acoustic irradiation above the surface of the liquid for example to atomize liquids or to enrich the sample with air. Please refer to 6.2 "Mount and dismount the sonotrode" for the maximum submerged depth of the sonotrode.

4. Tighten the clamping screw by hand.

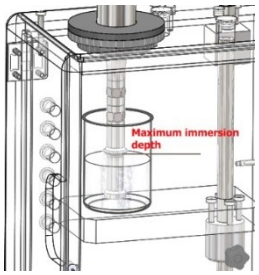


Figure 6-4 Maximum immersion depth

Note the maximum submerged depth

Do not immerse the sonotrode in the medium to be acoustically irradiated further than its maximum submerged depth!

Maximum submerged depth for the sonotrode.

6.4 Electrical connection

Note the electrical connected loads!

Ensure that the electric connection matches the required connection data of the ultrasonic processor!

For the connection data, please see the rating plate auf the device's housing.

The electric connected loads of your device are given on the rating plate of the backside of the ultrasonic processor's housing.

Figure 6-5 Rating plate of an ultrasonic processor UP400St-230V (Electric connected loads are country-typical)

1. Ensure that the ultrasonic processor is switched off before connecting it to the power supply.
2. Connect the power cord of the transducer with the power cord extension.
3. Insert the ultrasonic processor's mains plug in a socket outlet with earthing contact.

7 Operation

When the ultrasonic processor is operating, please refer to the information provided about using the sonotrodes and e.g., when changing the sample, pay particular attention to the maximum submerged depth of the sonotrode just used.

For longer acoustic irradiation periods, we recommend operation of the ultrasonic processor in the sound control box SPB-L (see Section 1.7 "Available accessories").

7.1 Switch the ultrasonic processor on and off

Before switching on the ultrasonic processor, prepare your sample(s).

Switching on with the minimum power	
Always switch on the ultrasonic processor at the lowest power setting. Do not adjust the working parameters for the acoustic irradiation (amplitude, pulse mode factor) to a higher value until the device is running. *In this way, you avoid accidental foaming or splashing of the sample liquid.*	

Prerequisites for switching on

The ultrasonic processor is fitted to the stand at the correct working height; see Figure 6-3 UP400St with stand or sound protection box SPB-L

- The samples to be acoustically irradiated have been prepared.
- The ultrasonic processor is electrically connected (mains plug in the socket) and the main screen is activated.

Switching on and off

Please note the following when operating the ultrasonic processor:

Risk of injury due to glass splinters	
Do not touch glass acoustic irradiation vessels with the vibrating sonotrode! *Pressure and cavitation can cause the glass to splinter and lead to injuries!*	

Risk of explosion	
Only acoustically irradiate easily flammable samples with adequate ventilation under a switched-on extraction hood! *Otherwise, there is a risk of explosion!*	

Risk of burns from hot sonotrode	
Do not touch the sonotrode and horn during operation! The sonotrode and horn can heat up to 100°C. *There is a risk of injury due to the hot surfaces!*	

Wear ear protection!	
When working with the ultrasonic processor for lengthy periods, you should always wear suitable ear protection or run the ultrasonic processor in the sound control box SPB-L. *Otherwise, you could suffer lasting damaged hearing.*	

Vary the working parameters

Vary the amplitude / ultrasonic output

You can regulate the oscillation amplitude (and thus the ultrasonic output) at the touch regulator for the amplitude between 20% and 100%.

The maximum oscillation amplitude (100%) of a sonotrode depends on its design. Please refer in Section 1.7 "Available accessories" the value for your sonotrode.

Adjust pulse control mode

The second duty cycle in pulsed mode set with the middle slider (Figure 8-1 Start screen").

For a permanent sound slide the slider up; any other setting means smaller sound times with appropriate breaks.

7.2 Continuous sonication of samples

For the continuous sonication of samples, it is possible to work with a flow cell. In this case the medium is pumped through the cell by means of a pump. Excessive heating of the medium prevents the integrated cooling cells.

Key

1 processor
2 Stand
3 Flow cell FC22K
4 Button for lock

Figure 7-1 UP400St with FC22K at the stand

8 Start screen of the integrated software

After the ultrasonic processor is connected to the supply voltage, the software is loaded and the main screen appears in the display.
The operation of the software, refer to the **separate** instruction booklet supplied.

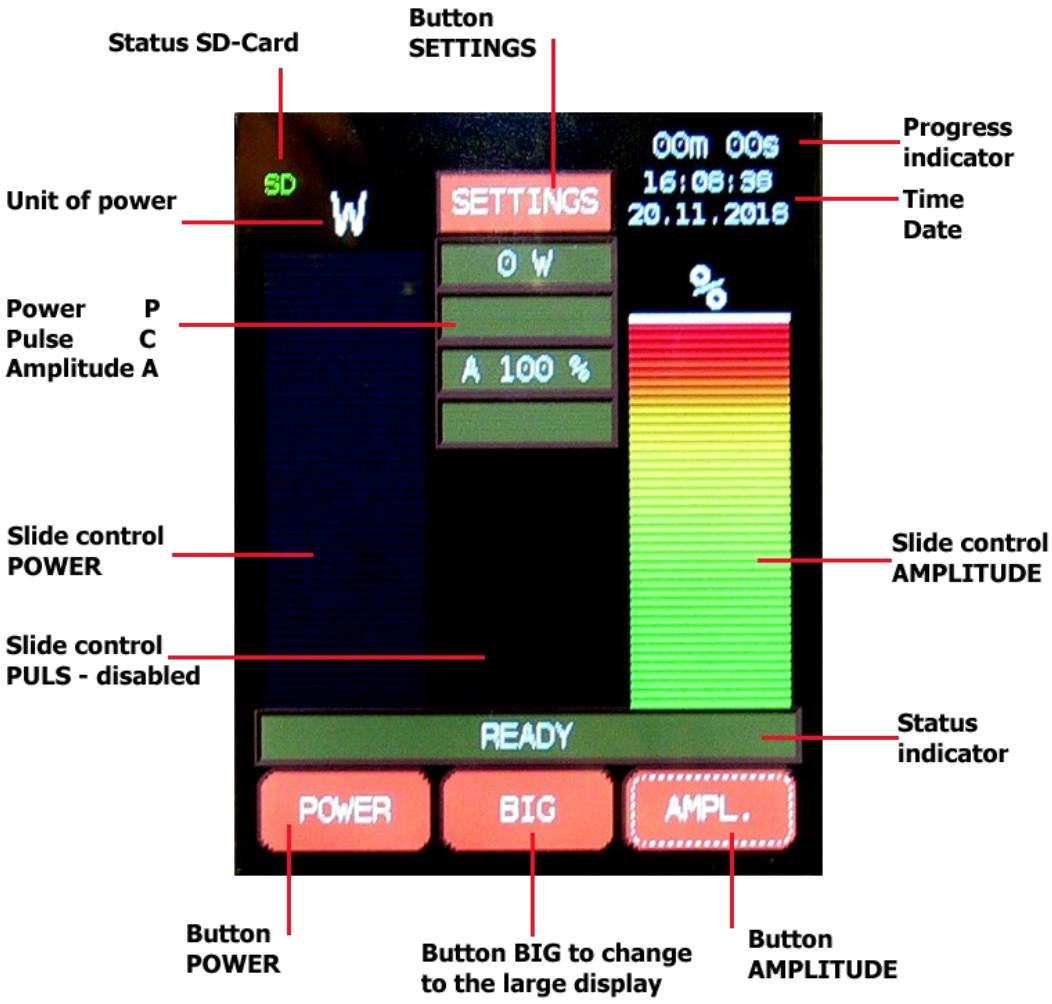


Figure 8-1 Start screen

In case the information given does not help to solve the error, please conta
on the following address.

8.1 Service address and telephone

In case of complications our team can be reached during office hours. Mo. – Fri. from 08.30am to 05.30pm at the service telephone.

Hielscher Ultrasonics GmbH
Oderstrasse 53
D-14513 Teltow
Germany

Tel.: +49 3328-437 420
Fax: +49 3328-437 444
Email: service@hielscher.com

9 Configuration of a LAN connection

This section describes the setting up an Ethernet connection between the ultrasonic processor and a computer. In this case with operational system: Windows 7 © Professional.

Please contact prior to the start of the configuration of your network administrator!

Important! Connect the ultrasonic processor directly with the computer using the supplied Ethernet cable and crossover-adapter. The adapter is indispensable for network cards with less than 1 GBit/s.

Open the network access center in order to check existing network connections and select an appropriate connection for the ultrasonic processor.

You will find similar symbols in XP and Windows 2000
Also the menu levels have a similar layout

Icon of network access center

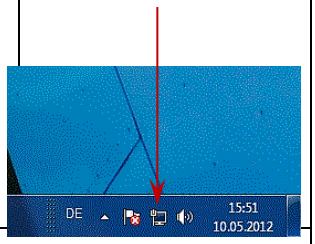


Figure 9-1 Activating the network access center on the Desktop of your computer

Click on the corresponding icon in the task list on Windows Desktop. The window of the network access center will open. Here all network connections of the computer will be shown.

9.1 Check for an existing connection

Check in the network access center whether a network connection between the computer and a network exists and how many network cards have been installed.

To check this, click on "Change adapter settings".

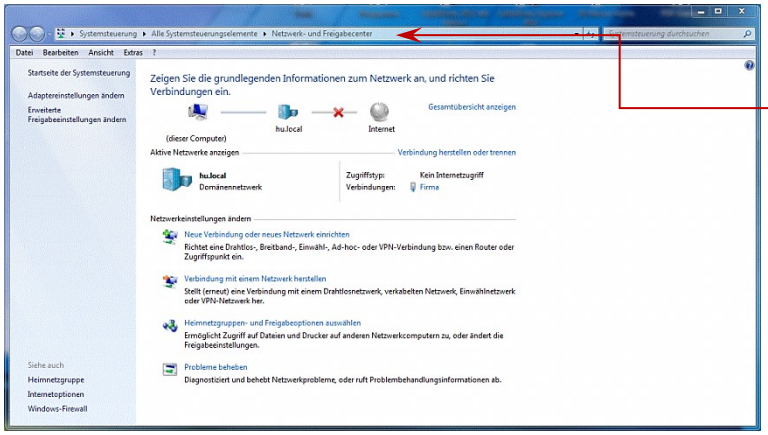


Figure 9-2 Network access centre

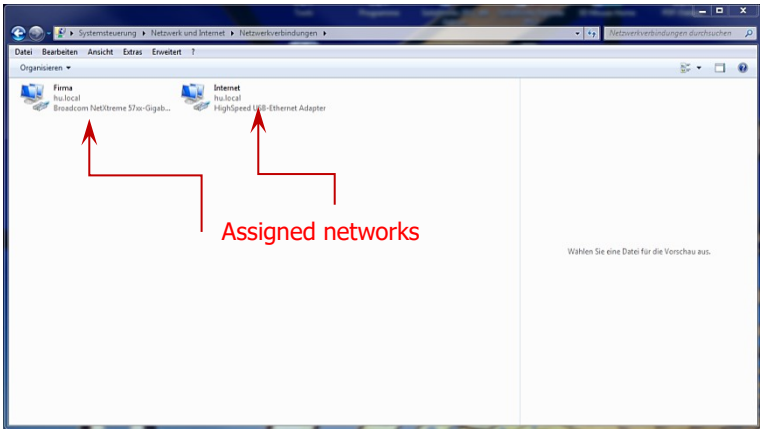


Figure 9-3 Already assigned network connections

In the figure above no unoccupied network connection is available for connecting the ultrasonic processor with the computer.

Disconnect a connection from the computer. The freed connection will now be marked by a red X. You can use this connection for connecting the ultrasonic processor with the computer.

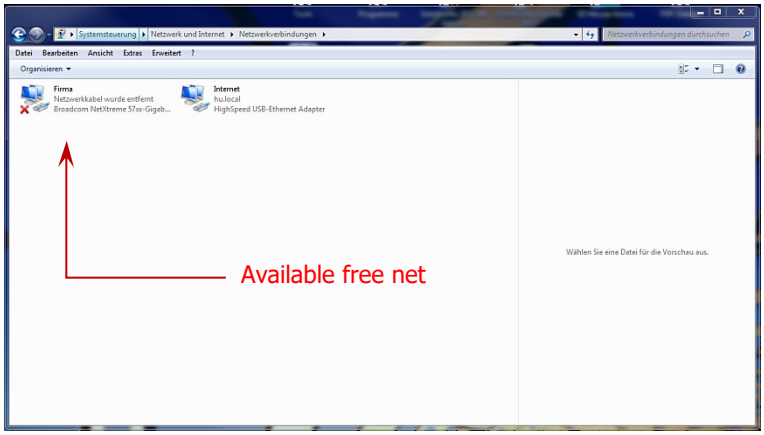


Figure 9-4 Connecting with a free network

9.2 Determining the status of a network connection

In this window you will see properties and status of the selected connection.

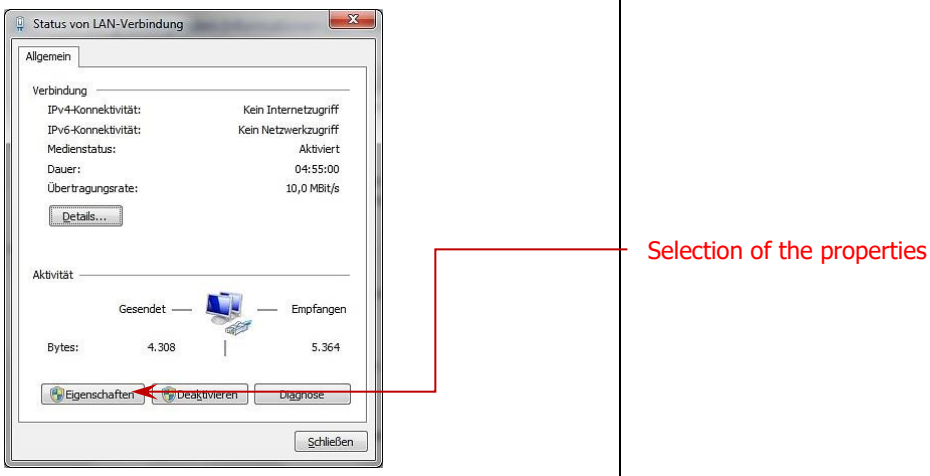
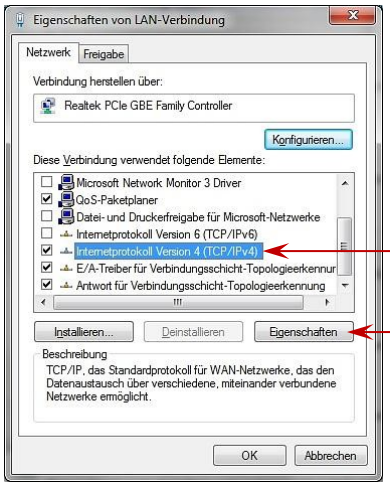


Figure 9-5 Status of the connection

9.3 Selection of TCP/IPv4-protocol

In the property window select Internet protocol Version 4 (TCP/IPv4) and go to the properties button in the next window.



Subsequently you have two possibilities to configure your connection

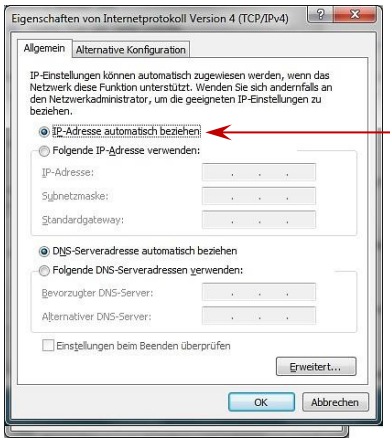
Selection of TCP/IPv4

Selection of the properties

Figure 9-6 Selection of TCP/IPv4

9.4 Connection with dynamic IP assignment

In this window you can determine how the ultrasonic processor's IP address will be generated. You can choose between an automatic (dynamic) address assignment and assignment of a fixed (static) IP address.



Automatic IP address assignment

Figure 9-7 Dynamic IP assignment

With automatic assignment the ultrasonic processor will be assigned a new IP address at each new connection with the computer. This connection is preferable when the computer is not comprised in another network.

9.5 Connection with a static IP address

When the computer is part of a network, you should assign a static address to the connection.

We recommend previously checking with your system administrator in which network your computer has been assigned which address.

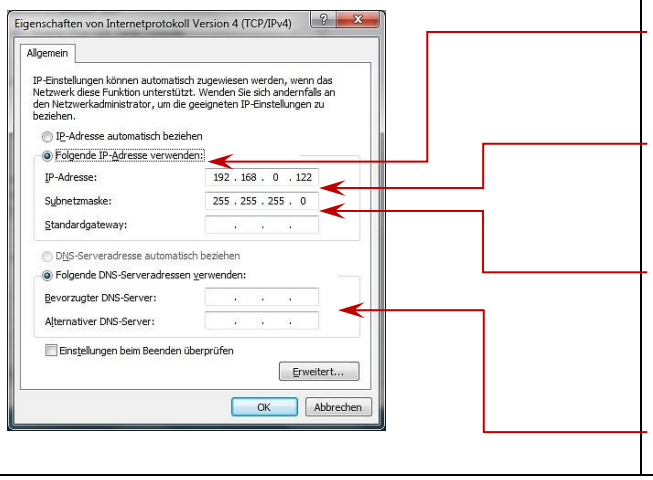


Figure 9-8 Static IP assignment

In case of a subnet mask 255.255.255.000 the first three three-number blocks should correspond with the IP address in the ultrasonic processor memory. The last three-number block must be in the range 1 – 254, but it must not correspond with the ultrasonic processor's IP address as this would lead to an address conflict.

9.6 Working with the browser

Switch on the mains voltage at the ultrasonic processor. Start your browser and enter the address of your device.

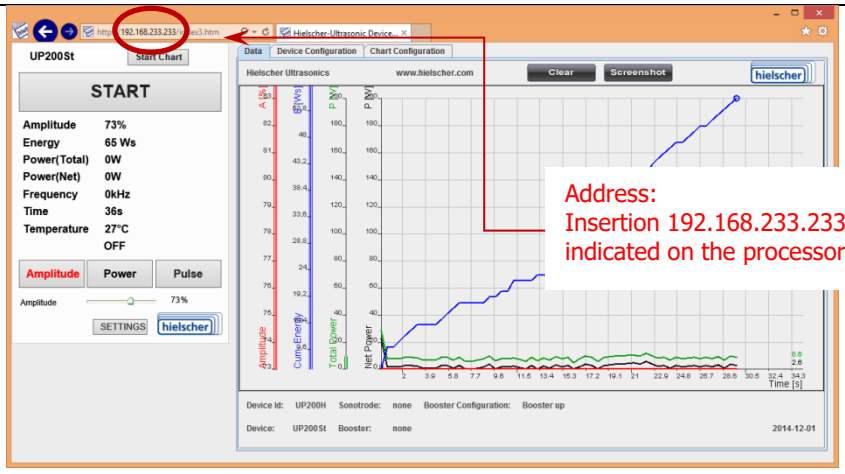


Figure 9-9 Start screen of the Internet application

The surface operation is described in the **separate** software guide.

10 Use of the Port Splitters RJ45-HUB

Usage

The port splitter RJ45-HUB allows you to connect your ultrasonic processor to various additional components and to use all features of your digital ultrasonic processor optimally. At the same time, the functionality of the network is retained. The RJ45-HUB is compatible with all of Hielscher's digital ultrasonic devices (featuring the touch control).

Four ports with the following functions.

UIP port: for the connection to the Ethernet port of the ultrasonic processor

LAN port: for the connection to the user's local network

PS7 port: for the connection of the optionally available pressure sensors PS7, PS70 and PS140. The sensor **has to be** activated in the setting menu of the ultrasonic device.

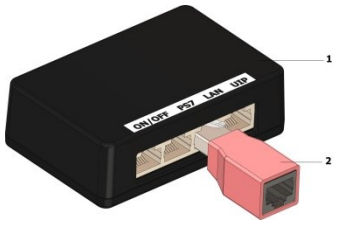
ON/OFF port: for the manual remote control via foot switch or hand switch. The port can be easily activated in the setting menu of the ultrasonic device.

The port splitter RJ45-HUB allows you to connect with various tools and gives you thereby a better process control and a higher working comfort.

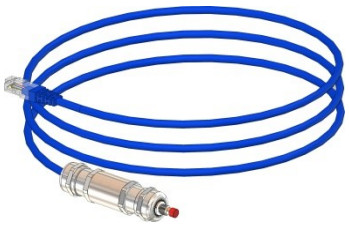
Please note!

*The port splitter RJ45-HUB (1) **must be used** when the device is operated at the network connection (TCP / IP, laptop, PC, LAN, switch, router, company network). For operation with **only** PS7 or **only** foot switch, this is not absolutely necessary.*

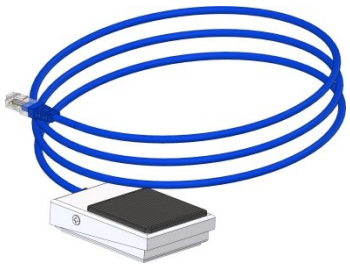
The cross-link adapter (2) is only required for very old network cards (10Mbit).



*Hand switch **RemoteHS1-RJ45***



*Foot switch **RemoteFS1-RJ45***



11 Help with Faults

The UP400St ultrasonic processors are internally secured against the usual operational overload situations. Should problems nevertheless occur; the following overview can help you to find a solution.

11.1 Faults

Case A	**The ultrasonic processor automatically switches into pulse control mode.**
Question	Is the sonotrode securely screwed onto the ultrasonic processor?
Solution	Undo the connection and reinstate. The sonotrode must sit very firmly on the ultrasonic processor. See Section 6.2 "Install and dismantle the sonotrode".
Question	Are the contact surfaces between the ultrasonic processor and the sonotrode really clean, grease free and undamaged?
Solution	Undo the connection, check the contact areas and clean if necessary, then reinstate the connection. If a surface is damaged, please call our service department (see Section 11.2 "Service address and telephone number").
Question	Is the sonotrode tip worn by cavitation?
Solution	Replace the worn sonotrode, because excessive material wear can no longer be compensated for by the control electronics. Contact our service telephone – we will quickly supply a replacement sonotrode.
Case B	**The ultrasonic processor cannot be switched on, although the plug is in the mains.**
Question	Is the mains voltage the same as the specification?
Solution	Check the mains voltage, ensure that the connected load against the information on the rating plate of the ultrasonic processor
Question	Has liquid penetrated the housing?
Solution	Send the ultrasonic processor to our customer service department with as detailed a description as possible of the faults. Please call our service department first.
Question	Did the UP400St ultrasonic processor become very hot during operation?
Solution	The UP400St ultrasonic processor has a thermal switch, which switches off the ultrasonic processor, if the power components reach a temperature of 100°C. If this in case, the UP400St cannot be switched back on until it has cooled.
Question	You still can't switch the device on?
Solution	Call our service department. Our service telephone number and address are given in Section 11.2 "Service address and telephone number".

11.2 Service address and telephone number

Our service telephone team will be pleased to help you in case of difficulties:

Hielscher Ultrasonics GmbH Oderstrasse 53 D-14513 Teltow Germany	Telephone +49 33 28 / 437 420 Fax +49 33 28 / 437 444 Email service@hielscher.com

12 Servicing and Maintenance

The UP400St ultrasonic processor are maintenance free, the sonotrodes are wearing parts.

Cleaning

Clean the ultrasonic processor and the sonotrode as needed using a damp cloth. You can add a mild washing up agent to the water.

Depending on the media in which it is used, the sonotrode can also be cleaned using a cloth moistened with alcohol.

Ensure that no water or other liquid gets into the ultrasonic processor housing!

Replace worn parts

Change the sonotrodes if they are worn due to cavitation. Worn sonotrodes have a rough, damaged surface.

13 Decommissioning and Transport

To decommission the ultrasonic processor:

1. Switch off
2. Remove the mains plug
3. Remove from stand
4. Dismantle sonotrode

Pack the parts of your ultrasonic processor safety for transport and storage, if possible, in their original packaging. Store the device and all the accessories in a dry room.

14 Disposal

If delivered to us with prepaid transport costs, Hielscher Ultrasonics GmbH takes back old devices free of charge. We dispose of them in an environmentally compatible way or recycle the parts.

Please contact our service department before you send your device to us. Our service telephone number and address are given in Section 11.2 "Service address and telephone number".

Materials used:

- Electric and electronic components
- Ceramics
- Titanium alloys
- Aluminium alloys
- Plastics

15 REACH Regulation (EU) No. 1907/2006

Customer Information in Accordance with Article 33 (1) of the REACH Regulation

The "candidate list" in accordance with Article 59 paragraph 1 of Regulation (EC) no. 1907/2006 (REACH) (Candidate List of Substances of Very High Concern for authorization) was last updated on 02/06/2020. To our knowledge, the products (parts, equipments, installations) Supplied to you do not contain substances in concentrations whose placing on the market in the products is prohibited under the legislation relevant to the products. However, currently up in the manner described in the next section, except any substances above the 0.1% that are listed in these "candidate list". We are continuously checking with our suppliers to see whether the delivered products *(parts, equipments, installations)* contain substances on the list above 0.1 mass-%.

In the ultrasonic transducers of our products ceramic components are used, in which PZT (mixed crystals of lead zirkonate titanate, CAS-Nr. 12626-81-2 and lead titanate, CAS-Nr. 12060-00-3) is the main constituent of the ceramic. PZT is thus contained in a concentration of more than 0.1 percent by weight. After the sintering process, however, the PZT is bound in a crystalline and insoluble form. When our assemblies or products are handled properly, PZT will never be released.

Where production is concerned, we are totally committed to compliance with all statutory requirements for occupational safety and health and environmental protection. Our products (*parts, equipments, installations)* are so made that, according to the current state of knowledge, they cause no health risks to the user and no damage to the environment, if used in the intended manner.

All information has been given to the best of our knowledge and belief. It reflects the current state of the art. The information given implies no warranty within the meaning of the warranty law. We hope to have answered your inquiry to your satisfaction. For any further questions you may have, we readily are at your disposal.

Date 03/23/2020

Signature

Thomas Hielscher
Chief Executive Officer

16 RoHS Statement

Restriction of the use of certain hazardous substances in electrical and electronic equipment — RoHS 2011 / 65 / EU Delegated Directive (EU) 2015/863

Since the 08th of June 2011 the Directive 2011/65/EU on the Restriction Of the use of certain Hazardous Substances in electrical and electronic equipment (ROHS) has been in force and thereby replaces the Directive 2002/95/EC of 27 January 2003. Article 4 (1) of the ROHS Directive provides that as of 1 July 2006, new electrical and electronic equipment put on the market must not contain certain heavy metals and brominated substances (Annex Il). Directive ROHS 2011/65 / EU was extended to the delegated Directive (EU) 2015/863 with an amendment to Annex II concerning phthalates with effect from 22 July 2019.
The Hielscher Ultrasonics GmbH corporate group will naturally also observe these directives and thus help to protect the environment.
We would like to inform you that the components and assemblies of Hielscher Ultrasonics GmbH can contain the piezo ceramic PZT (lead zirconate titanate) as their main constituent. This substance compound is exempted from the substance ban in accordance with Annex Ill (7c l) and Annex IV (14) of the current Directives. Otherwise, our products only contain substances or substance compounds that meet the requirements of the Directive 2011/65/EU.
Our products are therefore ROHS compliant.
The ROHS conversion of our piezoelectric components and assemblies is thus not a legal obligation but is done on a voluntary basis.
According to our current knowledge, the functionality and long lifetime guaranteed for our products cannot be achieved with any alternative substance or mixture of substances.
Irrespective of this, we have already been working for a long time and will continue to work with great effort to find alternative solutions.

Date 03/23/2020

Signature

Thomas Hielscher
Chief Executive Officer

17 Declaration of Conformity

Hielscher Ultrasonics GmbH
Oderstrasse 53
D-14513 Teltow
Germany

We declare that the device denoted below – i.e. its basic concept, its type of construction and the design and finish as we put it onto the market – complies with the basic demands on security and health of the EEC directives mentioned in the following, which are all adapted by German Law. Unauthorized modification of the device makes this declaration void.

Type of equipment	Ultrasonic processor for stand operation
Type	UP400St

Applicable EU Directives

2014/30/EU (Electromagnetic compatibility)
2014/35/EU (Low Voltage Directive)
2011/65/EC (RoHS-Directive II)
Exemption permit of the Category 9: Monitoring and control instruments in accordance with article 4 paragraph 3
Device type: industrial monitoring and control instruments
WEEE-Reg. - No.: DE 42652445

Harmonized standards used

EN 55011:2011 (Radio noise)
EN 61000-6-2:2005
EN 61000-6-4:2007+A1 :2011
EN 61010-1:2010 (Safety Requirements)
UL 61010-1:2012
CSA C22.2 No. 61010-1-12
EN 61010-2-051:2016 (Mixing and Stirring)

Date 03/23/2020

Signature

Managing director

18 Protocol sheet

www.hielscher.com

UP400St	**Device no.:**	Date: Company: Contact person:		
Accessory	Sonotrode		Flow cell	
			❑ Yes ❑ No	
Setting amplitude control	%			
Power	W			
Medium				
Volume	L			
Pressure	bar			
Flow rate	❑ Yes L/min ❑ No			
Temperature input	°C			
Concentration				
Chem. Composition				
Process objective	Unit of measurement	Input	Objective	
	1			
	2			
	3			
Process data				
Power output	W/mm²			
Temperature increase	on °C			
Treatment time	min	❑ Constant	❑ Interval	
Result	Unit of measurement			
	1			
	2			
	3			
Energy/volume	E/ V			
Notes:				

19 Figures and tables