

OPCount

OC 1000



Safety and operating instructions

Read safety and operating instructions before use.

Note: The indicated data only serve to describe the product. Information regarding the use of this product are only examples and suggestions. Catalog specifications are no guaranteed features. The information given does not release the user from his / her own assessments and inspection. Our products are subject to a process of natural wear and aging.

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The picture on the title page shows a configuration example. The delivered product may thus differ from the illustration.

Original operating instructions

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1. About this documentation

1.1 Applicability of this documentation

This documentation is applicable for the following product:

- › OPCount Portable Particle Counter

This documentation is written for service engineers, technicians, operators and system operators.

This document contains important information for safe and appropriate assembly, transport, activation, operation, usage, servicing, dismantling and simple troubleshooting.

- › Read this document completely and in particular the chapter, "Safety Instructions", before you work with the product.

1.2 Required and supplementary documentation

	Title	Number of document	Document type
	Data sheet	100.65	Data sheet

Table 1: Required and supplementary documentation

1.3 Presentation of information

So that this document can help you to work quickly and safely with your product, we use standardized safety instructions, symbols, terms and abbreviations. For better understanding, these are explained in the following sections.

1.3.1 Safety instructions

In this documentation, safety instructions are faced with a sequence of actions which would result in the danger of personal injury or damage to equipment. The measures described to avoid these hazards must be observed.

Safety instructions are structured as follows:






SIGNAL WORD

Type and source of danger

Consequences of non-compliance

- › Measures for safety and hazard defense
- › <List>

- › Warning signal: draws attention to the danger
- › Signal word: indicates the severity of the danger
- › Type and source of danger: specifies the type and source of danger
- › Consequences: describes the consequences of non-compliance
- › Measures: describes how to deal with the risk

Warning sign, signal word	Meaning
 DANGER	Indicates a dangerous situation which results in death or serious injury if not avoided.
 WARNING	Indicates a dangerous situation which may result in death or serious injury if not avoided.
 CAUTION	Indicates a dangerous situation which may result in light to moderate injury if not avoided.
NOTE	Indicates equipment damage: The product or surrounding could be damaged.

1.3.2 Symbols

The following symbols indicate notes which are not safety-relevant but increase the intelligibility of the documentation.




Symbol	Meaning
	If this information is not observed, the product cannot optimally be used or operated
	This symbol warns against laser beams.
	Singular, independent action step / instruction
1. 2.	Numbered instruction The numbers indicate that the action steps follow one another

Table 3: Meaning of symbols

1.3.3 Terms

In this documentation the following terms are used:

Term	Meaning
$\mu\text{m(c)}$	Size specification for particles when using ISO-MTD

Table 4: Terms

1.3.4 Abbreviations

Abbreviation	Meaning
MTD	Medium Test Dust
NIST	National Institute of Standards and Technology

Table 5: Abbreviations

2.1 About this chapter

This product was manufactured according to the generally recognized standards of engineering. Nevertheless, there is a danger of injury or damage if you do not observe this chapter and the safety instructions in this documentation.

- ▶ Read this document thoroughly and completely before working with the product.
- ▶ Retain this document and ensure that it is available for all users at all times.
- ▶ Always include the necessary documentation when passing the equipment along to a third party.

2.2 Intended use

This product is a hydraulic component.

The device is a portable particle counter, to monitor the cleanliness of fluids.

It works according to the principle of light extinction (reduction of radiation) and measures particles in the fluid.

The measured values are converted to standardized cleanliness classes and shown on the display. Via different interfaces, the measurement data can be read out and transferred.

You may use the product for the following:

- › Monitoring of cleanliness of a fluid
- › Trend analysis of the contamination degree

The product is intended for professional use only, not for private use.

"Intended use" also includes that you have completely read and understood this documentation, in particular Chapter 2 "Safety Instructions".

2.3 Improper use

Any other use than the intended use described, is improper and inadmissible.

If unsuitable products are installed or used in safety-related applications, unintended operating states can occur in the application, which can cause personal injury and / or material damage. Therefore only use this product in safety-related applications if this use is expressly specified and permitted in the product's documentation, e.g. in explosion protection areas or in safety-related parts of a control system (functional safety).

ARGO-HYTOS GmbH assumes no liability for damages resulting from improper use.
The risks associated with improper use are solely with the user.

2.4 Reasonably foreseeable misuse

The delivery of the following media is forbidden:

- › Others than listed in Chapter 19 "Technical Data".

The operator alone is liable for damages resulting from improper use.

2.5 Qualification of personnel

The operations described in this document require fundamental knowledge of mechanics and hydraulics as well as knowledge of the appropriate technical terms. In order to ensure safe use, these operations may therefore only be carried out by a correspondingly skilled worker or an instructed person under the guidance of a skilled worker.

A skilled worker is someone who can - based on his / her technical education, knowledge and experience as well as knowledge of the respective regulations of the jobs assigned to him / her - recognize possible dangers and ensure appropriate safety measures. A skilled worker must observe the relevant technical regulations.

2.6 General safety instructions

- › Observe the valid regulations for accident prevention and environmental protection.
- › Observe the safety regulations and requirements of the country in which the product is used / applied.
- › Only use ARGO-HYTOS products that are in technically perfect condition.
- › Observe all instructions on the product.
- › People who assemble, operate, disassemble or maintain ARGO-HYTOS products may not do so under the influence of alcohol, other drugs or medications that affect the responsiveness.
- › Only use manufacturer-approved accessories and spare parts, in order to prevent personal danger due to unsuitable spare parts.
- › Observe the technical data and ambient specifications specified in the product documentation.
- › If unsuitable products are used or installed in safety-relevant applications, unintended operating states can occur in the application, which can cause personal injury and / or material damage. Therefore only use the product in safety-relevant applications if this use is expressly specified and permitted in the product's documentation.
- › You may only put the product into operation, when it has been established that the final product (e.g. a machine or system), into which the ARGO-HYTOS products are installed, complies with the country-specific regulations, safety regulations and standards of the application.

2.7 Product and technology related safety instructions

! CAUTION

Laser

The OPCCount Particle Counter contains a laser sensor that is classified for intended use as a class 1 laser according to the standard for radiation behavior of the Department of Health and Human Services (DHHS) of the United States (DIN EN 60825-1:2001-11). In reasonably foreseeable circumstances, the accessible laser radiation is not dangerous.

▶ With direct exposure to class 1 lasers in the upper power range, injury, such as blinding, impairment of color vision and disruption, cannot be ruled out.

2.8 Indications on the product

On the bottom of the device there are 2 labels.
A note for the electrical testing and a laser protection notice. (see Fig. 1)



Fig. 1 Bottom of the device with note for the electrical testing and laser protection notice

In this device, a laser diode of class 3R is used. The laser diode is mounted in a closed sensor inside the unit. The laser beam only occurs in a closed sensor housing and can never leave it as long as the device is being used.

Laser radiation inside the device:

- › Maximum laser radiation: 4.2 mW in the sensor
wavelength: 670 nm

For prevention of material damage and product damage



Danger due to improper handling

Material damage

- ▶ The OPCount Particle Counter may only be used in accordance with Section 2.2, "Intended use".

Leakage or spillage of hydraulic fluid

Environmental pollution and ground water pollution

- ▶ Use oil binding agents in order to bind leaked hydraulic oil.

Contamination due to fluids and foreign bodies

- ▶ Premature wear - malfunction - risk of damage - material damage
- ▶ Pay attention to cleanliness when assembling in order to prevent foreign bodies, such as welding beads or metal chips, from entering the hydraulic lines and leading to premature wear or malfunction.
- ▶ Make sure that connections, hydraulic lines and attachment parts (e.g. gauges) are free of dirt and chips.
- ▶ Check prior to commissioning that all hydraulic and mechanical connections are connected and tight, and that all gaskets and seals of the plug connectors are correctly assembled and undamaged.
- ▶ For removal of lubricants and other contaminants, use residue-free industrial wipes.
- ▶ Make sure that connections, hydraulic lines and attachment parts are clean.
- ▶ Ensure that no contaminants enter when closing the connections.
- ▶ Make sure that no detergents enter the hydraulic system.
- ▶ Do not use cotton waste or faying cleaning rags for cleaning.
- ▶ Do not use hemp as sealing agent.

4. Scope of delivery

The package includes:

- › 1 Portable Particle Counter
- › 1 Minimesse hose 2m
- › 1 Drain hose
- › 1 Adapter Minimesse hose on M10
- › 1 Manual German / English
- › 1 Software CD
- › 1 Power cord cold-device plug
- › 1 USB A to USB B cable
- › 5 Printer paper rolls
- › 1 Waste oil bottle
- › 1 Carrying case

5.1 General description

The OPCount Particle Counter is a portable particle counting system for detecting particle contamination in oils and other hydraulic fluids. Through a touch display and a membrane keyboard, it can easily be used anywhere.

The measurement results are output in the current cleanliness classes ISO 4406 and SAE AS 4059 and GJB 420. Thanks to the 32-bit high-performance control unit, flexible measurements and simultaneous storage of data from different measurement points are possible. By operating the sensor with pressure, blistering is prevented. The measurement results can be output locally on the integrated printer. With the included software, data can be downloaded to your PC and administered there.

The device has hydraulic connections for high and low pressure, a standard power connector for 100VAC up to 240VAC, 50 to 60Hz and a USB port for connection to the computer.

A built-in battery ensures mobility for more than two hours. Furthermore, the device is equipped with a special connector for external power supply (10VDC up to 36VDC).

5.2 Functional description

The OPCount Particle Counter is an optical particle counting system, operating on the principle of light extinction.

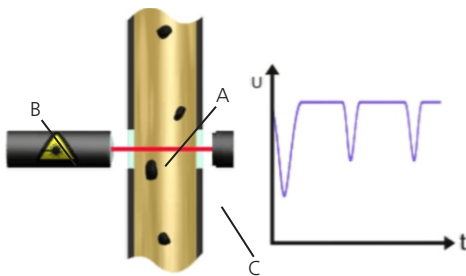


Fig. 3: Design and measuring principle of a particle counter

It consists of a flowed measuring cell (A), a laser (B) and a photo diode (C).

The laser beams through the measuring cell to the opposite photo diode. If a particle passes through the laser beam, the light intensity detected by the photo diode is reduced. The larger the particle, the greater the reduction in intensity.

The volumetric sensor measuring cell and the modern and technically sophisticated components guarantee a high resolution and measuring accuracy. Each particle flowing through the sensor is detected, counted and measured. Up to 32 freely selectable size channels show the particle counts and particle size distribution.

5.3 Component overview

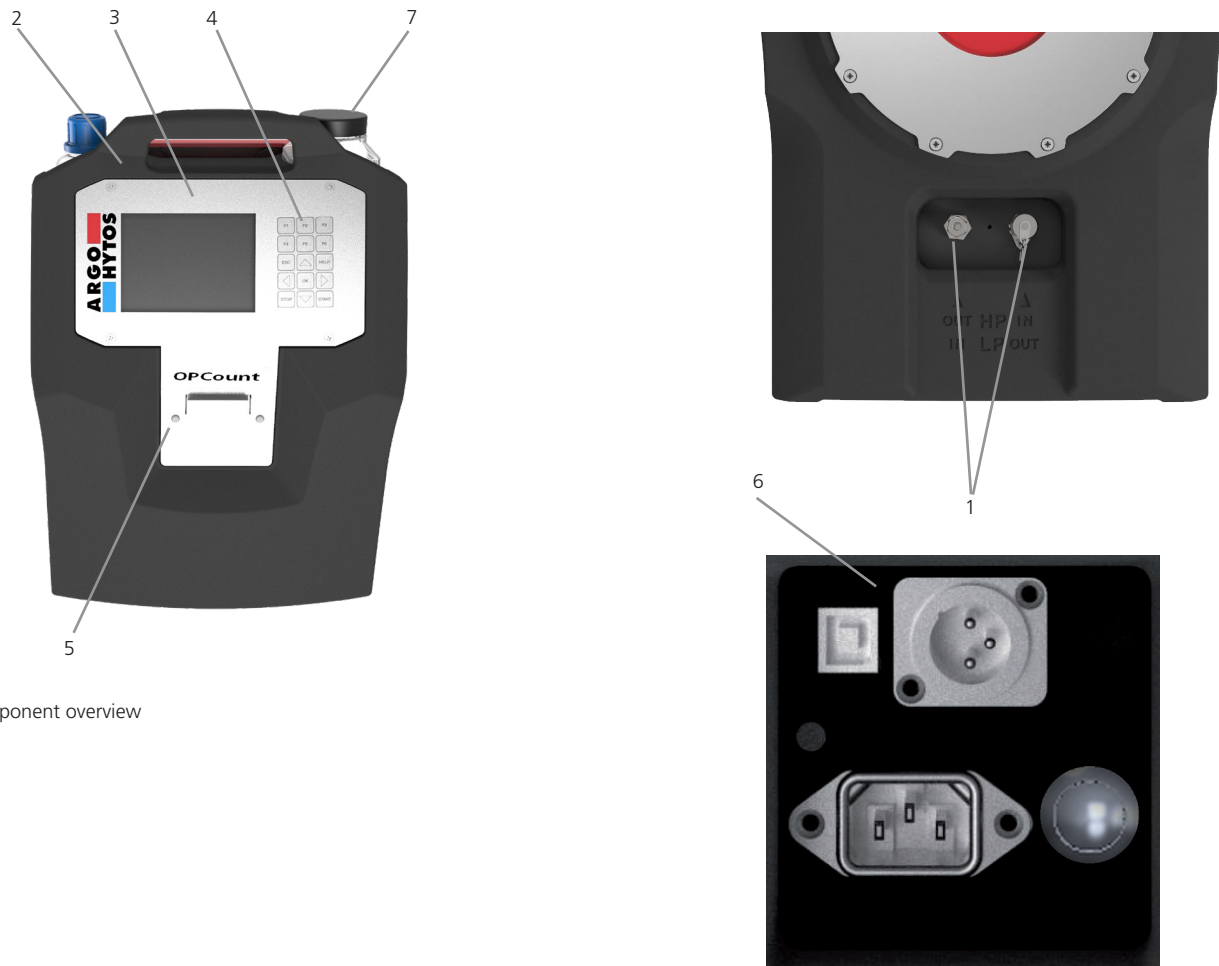


Fig. 4: Component overview

- | | |
|------------------------|----------------------------------|
| 1 Hydraulic connection | 5 Printer |
| 2 Front panel | 6 Electrical connection / ON/OFF |
| 3 Display | 7 Sample bottles |
| 4 Keyboard | |

1 Hydraulic connection fluid

The device is equipped with two Minimesse® connectors M16x1,5 and a DIN 2353 „Ermeto“ – 6L connection. Here, usually two hoses are added with which the particle counter is connected to the fluid guiding system.

2 Front panel

3 Display

By default, the display shows the cleanliness classes. The display can be operated via touch or keyboard.

4 Keyboard

Using the keyboard you can enter values or navigate through the menu.

5 Printer

With the printer, the results can be printed out.

6 Electrical connections / ON/OFF

The unit has a connection for power supply, a connector for an external sensor and a USB port.

5.4 Identification of the product

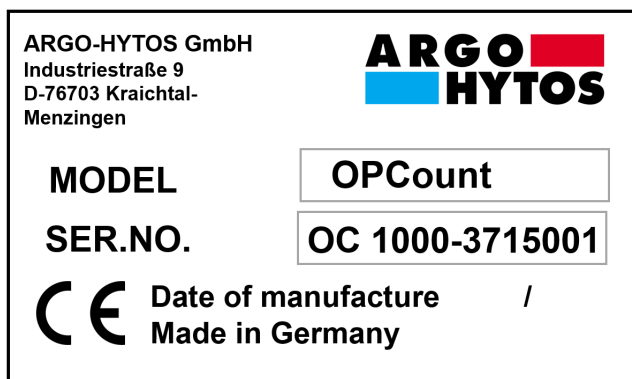


Fig. 5: Nameplate

There are no special transport instructions for this product.

- ▶ However, observe the instructions in Chapter 2, "Safety instructions".
- ▶ For storage and transport, observe the specified environmental conditions stated in the technical data.

7.1 Operating site

Please follow these instructions when determining the mounting location:

- › Select a possible dry and clean place where the device is safe to use.
- › Place the device upright and do not lay it down.
- › Do not place any heavy objects on the device and protect it from direct sunlight, high humidity, strong vibrations, extreme temperatures and explosive or chemical aggressive atmospheric environment.
- › Determine the pressure under which the sample liquid is supplied to the system.



CAUTION

Danger due to improper handling

Low pressure inlet up to 7 bar.

High pressure inlet 4 - 420 bar

- ▶ Do not exceed maximum pressure.
- ▶ Use the correct inlet.
- ▶ Risk of injury by bursting hoses and existing connections.

7.2 Hydraulic connection

The sensor is factory-fitted with a Minimes© connection M16x1,5 (high pressure inlet) and a DIN 2353 „Ermeto“ – 6L port (low pressure inlet).



While exchanging the connection couplings, no dirt, chips or other contaminations shall enter the interior of the device.

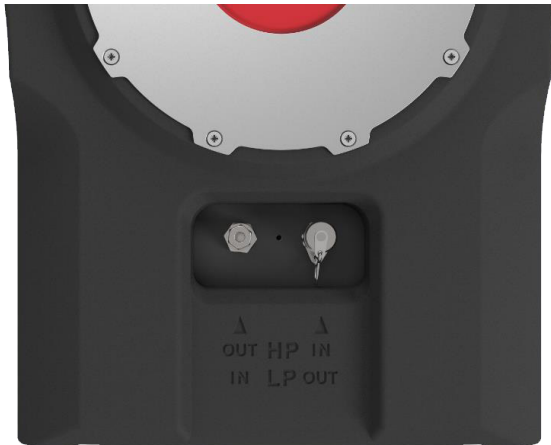


Fig. 6: Hydraulic connections

Depending on the selected measurement profile (setting for high or low pressure measurement), the hydraulic connections must be properly connected to the hoses. For this purpose, the hoses are connected to the ports according to the labeling at the back side. HP stands for High Pressure (high pressure measurement) and LP for Low Pressure (low pressure measurement).

7.3 Sampling

Proper handling of samples is very important in order to obtain representative samples. Only representative samples allow accurate conclusions on the degree of contamination of the examined system. Samples must be taken at a location where the liquid moves.

Note:

If the sample is taken from a "dead end" or at a location with very low flow rate, the sample may not be representative. The hydraulic system should have been operated for at least half an hour prior to the sampling.

Flushing the OPCount is also an important measure in order to obtain meaningful and representative samples. The previously collected sample is still in the PODS. This liquid must be flushed out with a liquid which does not falsify the next sample.

In online mode, the OPCount is rinsed with the liquid to be tested. In order to obtain a sufficient flushing effect, the flushing volume must be about twice as large as the content of the hydraulic hose connecting the OPCount with the system under test.

7.3.1 Sampling with bottles

Common sources of contamination, which are unintentionally added to the liquid samples, are bottles, dip tube and ambient air (airborne particles). Only clean sample bottles must be used and these are to be kept closed at all times.

As with any optical light absorption method, inaccuracies are caused by air bubbles and contamination with water. Both are counted as particles. Ideally, air bubbles should be eliminated by exposing the sample to a vacuum in a vacuum chamber or placing it in an ultrasonic bath for some seconds. Contamination with water affects particle counting when the water content is more than 0.3% of the sample volume. The liquid will appear cloudy.

Particles are deposited within minutes at the bottom of the sample bottle, so that the samples need to be shaken and made bubble free.

7.3.2 Online

If correctly applied, the online sampling is the most reliable method to obtain representative samples from a system. The hydraulic hose, which connects the OPCount with the under examination system, needs to be flushed to remove the previously tested liquid.

The location of the terminal for sampling largely determines whether the samples are representative or not. Before you install this port, an application engineer should be consulted. The sampling hose or system test connection may not be equipped with shut-off valves or additional valves. This can lead to blistering and cause particle accumulation, whereby the samples are falsified.

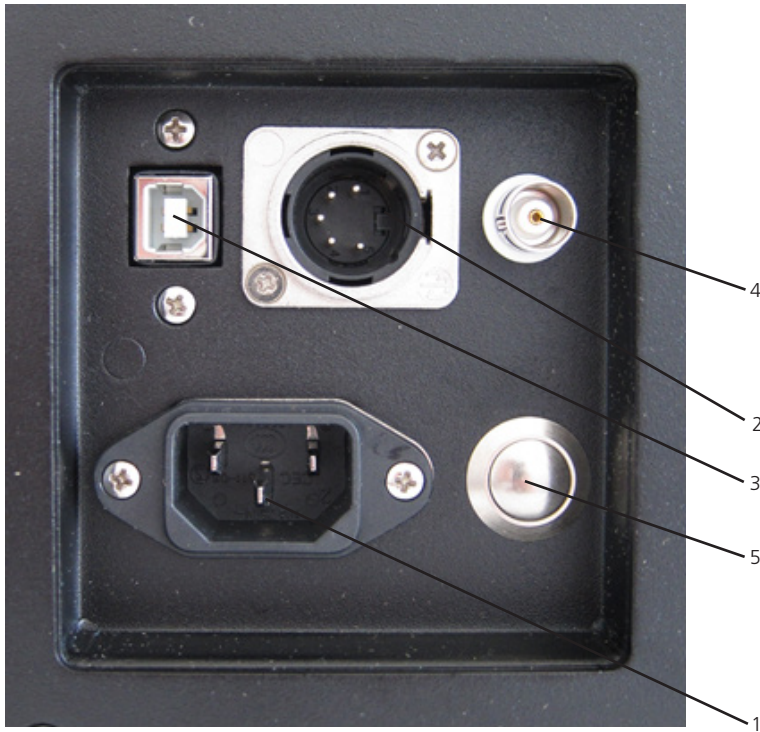


Fig. 7: Electrical connections

1. 100 – 240 VAC; 50 – 60 Hz
2. 10 – 36 VDC (XLR-connector)
No battery charging possible
3. USB-Port
4. BNC-Connector
5. ON / OFF

9.1 Before commissioning

Be sure to read and understand the operating manual before putting the device into operation.

- ▶ The information for intended use, the operating conditions and the technical specifications must be adhered to.
- ▶ Take the samples according to Chapter 7.3, „Sampling“
- ▶ Cables and hoses must be outside of the movement range of the operating personnel (tripping hazard).

10.1 Carrying out particle measurements

The following steps are required for a particle measurement:

- › First, determine which pressure is present at the sample outlet.
- › Use the low pressure inlet for a pressure up to 7 bar, for a pressure of 4 to 420 bar use the high pressure inlet.
- › Connect the hydraulic hoses.

10.1.1 Preparing an oil sample

Use appropriate methods such as shaking the oil sample, sonication, etc., to obtain a homogeneous liquid. Make sure that no air bubbles are present in the sample, as they are counted as particles and would thus falsify the measurement result.

10.1.2 Turning the OPCount on / off

In addition to the power connector there is the button to activate the device. By pressing this button, the OPCount turns on and the display starts to shine and the ARGO-HYTOS lettering appears.

To turn off the device, the same button has to be pressed briefly.

10.1.3 Carrying out measurements

After switching on the following window appears.

NIST	ISO:--/--	Mem:1041136	
Size	Counts	Average	Quality
4	0	0.0	0 →
6	0	0.0	0 →
10	0	0.0	0 →
14	0	0.0	0 →
21	0	0.0	0 →
25	0	0.0	0 →
38	0	0.0	0 →
70	0	0.0	0 →
New Sample	Setup	Printer off	

Fig. 8: Main window

By pressing the button "New Series" in the main window, you return to the screen shown below.

Profile: Std. Low Press.	▣▣▣▣
Serial #:	
Service Hours:	
Comment:	
Remaining Space: 1493 Profiles	
Start	ESC

Fig. 9: User interface

10.1.3.1 Battery level indication

At the top right you can find the battery icon, indicating the charge status of the battery. In Chapter 13.1.6 of this manual you will find a description of how the battery is recharged.

10.1.3.2 Free memory

Here it is also shown how many measurements can be stored depending on the currently selected profile. This depends on the number of measurements specified in the profile.

10.1.3.3 Starting the measurement

The still possible number of measurements, in accordance with the selected profile, is displayed as remaining memory. Make sure that the hoses are properly connected and then press "Start" to start the measurement. With "ESC" you cancel the operation and return to the previous window.

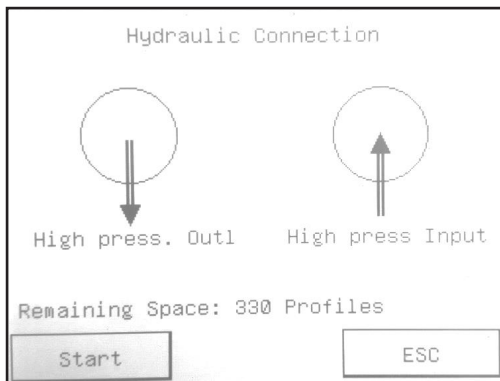


Fig. 10: Start screen for the measurement

During the measurement, the numbers of particles of the current measurement and the mean value of the already finished measurements are displayed.

10.1.3.4 Stopping the measurement

Press the 'Stop' button to stop the measurement and the flow through the system.

10.1.3.5 Termination

Clean up the system and flush out any residue of the measuring liquid, if you do not want to carry out any further measurement. For storage, fill the system with clean low-viscosity oil.

10.2 Setting menus

Upon delivery, you receive the OPCCount with default settings that enable you to perform typical measurements.

In this chapter you will find a detailed description of further possibilities, how you can customize the unit to your needs and requirements.

For more information about this menu item, see Chapter 10.3.5.

10.2.1.1 Selecting menu items

By pressing the corresponding button or the corresponding function key (F1 to F6) on the keypad.

10.2.1.2 Entering numerical values

In the calculator, which opens automatically, when numerical values must be entered.

10.2.1.3 Entering letters

Using the keyboard. It opens automatically when letters must be entered.

› Note:

If you have problems with entering values, calibrate the touch screen to adjust it to your personal "Touch".

10.2.1.4 Correcting values

With the „Back“ button or in the calculator with „CE“ or „C“.

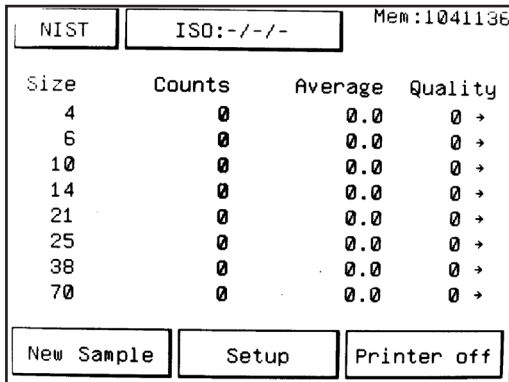
10.2.1.5 Confirming inputs

By pressing the „OK“ button.

10.2.1.6 Leaving the window without saving the changes

By Pressing the „ESC“ button.

10.3 Main window



Size	Counts	Average	Quality
4	0	0.0	0 →
6	0	0.0	0 →
10	0	0.0	0 →
14	0	0.0	0 →
21	0	0.0	0 →
25	0	0.0	0 →
38	0	0.0	0 →
70	0	0.0	0 →

Buttons: New Sample, Setup, Printer off

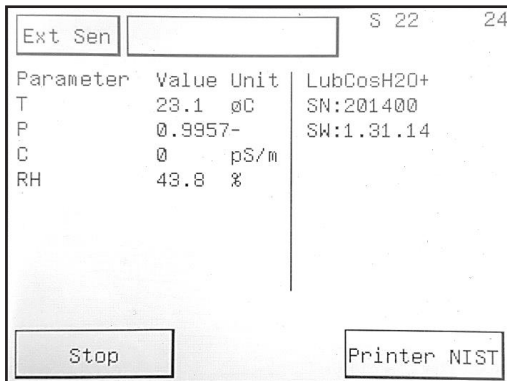
Fig. 11: Main window

10.3.1 NIST/AC/Ext Sen.

Switches the display between the number of measured particles and indication of the ISO classes according to the different calibration requirements NIST=ISO11171 and AC=ISO4402. The button is not active during measurement. Furthermore, the measured values of an externally connected sensor can be viewed here.

10.3.1.1 External sensor

Displays the connected sensor type and the measured values of the last measurement. Will only be displayed after the first measurement with a connected sensor has been performed.



Parameter	Value	Unit	LubCosH2O+
T	23.1	°C	SN:201400
P	0.9957-		SW:1.31.14
C	0	pS/m	
RH	43.8	%	

Buttons: Stop, Printer NIST

Fig. 12: External sensor

10.3.2 Particle class standard

Centered at the top, the desired standard can be selected and displayed.

10.3.3 Sp. (Memory)

Here the remaining available free space on the internal data memory is displayed.

If the memory is completely filled (as a value, 92 is displayed), the oldest data (measurements) are overwritten. To avoid data loss, download the data with the help of the download software and empty the memory when the value has reached about 1000.

10.3.4 New series

This button takes you to a selection box in which you select an existing measurement profile or create a new one. From there you can then go to the start of a new measurement.

10.3.5 Setting

Press the "Setting" button in the main window.

You can find the settings for the

- › System
as e.g. z. B. contrast of the display or language setting
- › Profiles
i.e. Measurement parameter settings
- › Thresholds
Sensor calibration
- › Note:
During measurement, the "Setting" function cannot be activated.

By pressing the keys F1 to F3 you will also reach the corresponding menu items.

10.3.6 Printer

The window „Printer Settings“ opens with the selection „Printer AC“ – prints the particle counts and ISO classes according to the ISO 4402 calibration, „Printer NIST“ - prints according to ISO11171 calibration and „No Print“ - the measurement results will not be printed out.

10.4 System settings

Press the button "Setting" in the main window, then select the "System Settings". Here you have the possibility to adjust the touch screen according to your needs and via the menu item "Advanced Settings ..." after entering a password (default: "argo") to enter the admin mode.

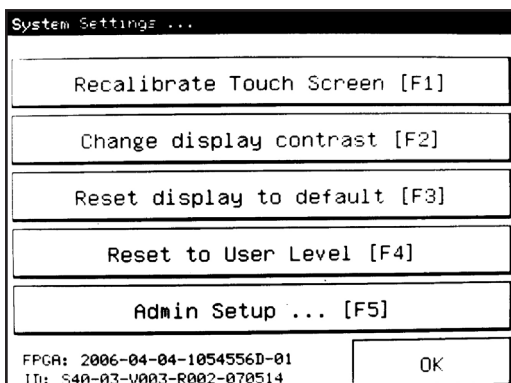


Fig.: System settings

10.4.1 Recalibrating the touch screen

Press each of the five successively appearing squares to calibrate the touch screen according to your habits.

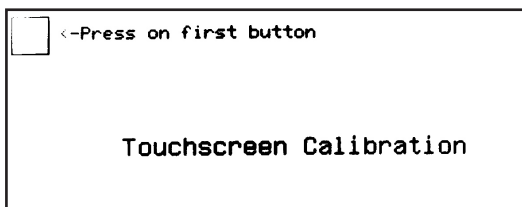


Fig. 13: Recalibrating the touch screen

10.4.2 Changing the display contrast

Reinforce the contrast of the display by pressing the "arrow up" button; by pressing the "arrow down" button the contrast will decrease. If the display is too light, decrease the contrast, with a too dark display the contrast should be reinforced. By pressing the "F6" key, the contrast will be reset to the factory settings. In the lower left corner of the window, the selected contrast is shown in percent. Confirm the adjustment with the "OK" button.

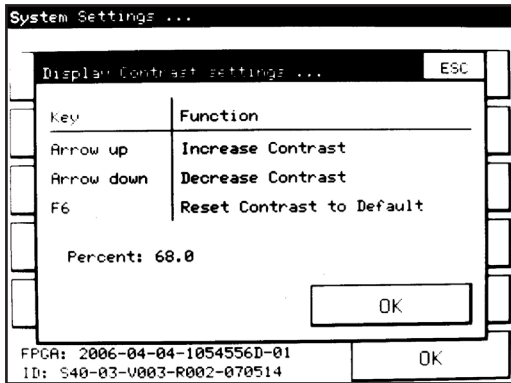


Fig. 14: Changing the display contrast

10.4.3 Resetting the contrast settings

The contrast of the display is reset to factory settings.

10.4.4 Back to protected mode

The system is reset from the admin mode to the normal user level.

10.4.5 Setting the administrator level

The system is set in the "Advanced" mode. You will be asked to enter a password (default is "argo"). However, you have the option to change the password in the "Advanced System Settings" window (only possible in the admin level).

10.4.6 Administration level

The window „Advanced settings“ will open.

The following functions are only accessible to the administrator level. You can find more system settings here.

10.4.6.1 Setting time / date

Press the button for the time or date and then use the displayed numerical keypad to enter the current time in hh: mm: ss (hours: minutes: seconds), and the date in MM / DD / YY (month / day / year).

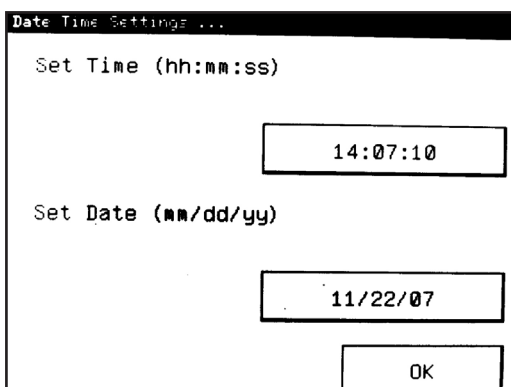


Fig 15: Setting time / date

10.4.6.2 Pump flow

In the bottom left window, you can read the current value in percent. Verify that this value is the default setting of 20%. If this is not the case, you should reset the flow back to the factory settings with "F6" .

If the pump cannot guide a high-viscous sample through the system, do by no means increase the pump flow. Please contact ARGO-HYTOS in order to clarify the issue.

By pressing the button "pump off" you can turn off the pump manually.

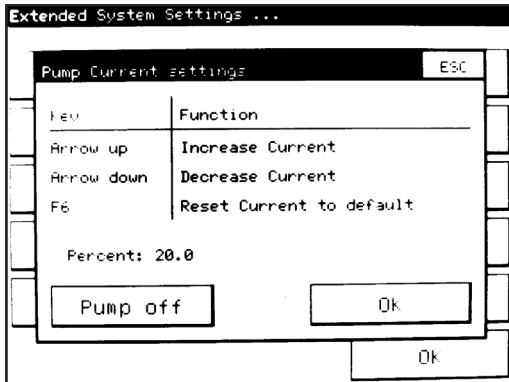


Fig. 16: Setting pump flow

10.4.6.3 Simulation S31/P40, operating the OPCCount with the PMA Software

After pressing this button you can switch the OPCCount to a simulation as system 31. In this case, your system OPCCount can be controlled and operated by the PMA software as a system 31. To return back to the default mode, press the "Return to System 40" button.

10.4.6.4 Changing admin. password

You can change the password for the administrator here.

10.4.6.5 Setting the language

Press the button "Language" to switch between the languages English, German, Finnish, Dutch, French, Spanish, Portuguese and Russian.

10.5 Profile setting

Through „Profile Setting“, the measurement parameters for the measurements can be determined. New measurement profiles can only be created in the administrator level.

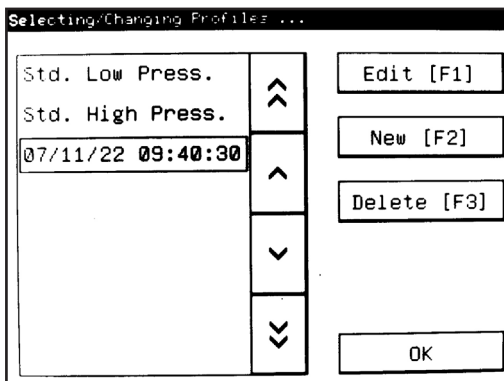


Fig. 17: Profile setting

10.5.1 Changing / viewing measuring profiles

Select the appropriate measurement profile, change the settings and / or the name of the profile. This feature is only available in the administrator level. In the normal user level this button is labeled "View". In this case, the measurement profile can only be viewed, but not modified.

10.5.1.1 Creating a new measuring profile

Pressing the "New" button, you may create a new measuring profile.

Decide if you want to copy an existing profile and modify the preferences or if you like to create an entirely new profile.

The proposed default name for the profile consists of creation date and time. You can still change the name afterwards in the profile properties (see next page).

10.5.1.2 Changing the name of a profile

Click on "Name", the alphanumeric keypad then opens. Enter a name for the measurement profile. The system does not check whether the name already exists. Two profiles with the same name may contain various settings. They will then appear in the list with the same name, one below the other.

10.5.1.3 Measurement settings

The window "Profile flowchart" opens, where you specify the settings for the measurement. The exact settings are described on page 31.

10.5.1.4 Saving measurement results

Decide whether the results are stored as ISO code or number of measured particles in the internal memory of the OPCCount. Select "No" when the measurements shall not be saved.

10.5.1.5 Deleting measuring profiles (only possible in the administrator level)

Select a profile name and press "Delete" in order to delete the measurement profile.

Note: The two default profiles that are already available in the OPCCount (factory settings), and profiles that have already been used for obtaining measurements, cannot be deleted.

10.6 Profile flow chart

Press the button "Measurement settings" in the window „Profile Properties“. You can now change the administrator settings for the measurement.

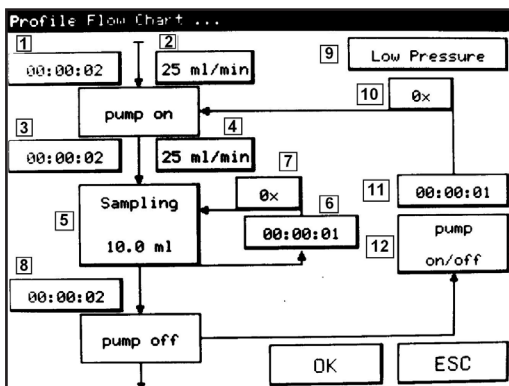


Fig. 17: Profile setting

Below there is a description of the individual settings:

1&2 Flushing time and flushing flow rate

This time before the actual measurement is used to pre-flush the system with the new sample. During this time the pump runs at the speed that is set in "Flow Rate". Since during this time there is no measurement, you may use a higher flow rate, as indicated in the calibration curve. If 0 seconds are set as "Flushing Time", flushing does not apply. If 0 ml / min is set as "Flushing Flow Rate", the system is ready and the pump will be adjusted to "Measuring Flow Rate" after the end of flushing.

3 Lead time

During this time the pump runs at the speed that it set under „Measuring Flow Rate“. If 0 seconds are set as "Lead Time", there is no stabilization of the flow before the measurement.

4 Measuring flow rate

Flow rate during measurement, by pressing the button you can switch between 25 and 10 ml/min.

Note: Make sure that the selected measuring flow rate is identical with the flow rate given in the calibration curve, otherwise the measurements would be incorrect.

5 Measuring volume

Enter here the volume to be measured for a single measurement in 0.1 ml increments.

6 Waiting period measurements

Enter the waiting period between the individual measurements.

7 Number of measurements / mode

Here you can specify how the number of repetitions of the individual measurements is limited. There are available:

- › Manually
i.e. the series of measurements is ended by pressing the "STOP" button
- › Number of repetitions
i.e. you specify how often the measurement is repeated. "Number of Repetitions"=2 means: 3 individual measurements of a sample (one measurement and two repetitions)
- › Tolerance
Description follows in Chapter 10.6.1
- › DQ ISO 11171
Description follows in Chapter 10.6.2

8 Pump follow-up time

Follow-up time of the pump after completion of measurement.

9 Print mode

By pressing the button „Print Mode“ you switch between "Low Pressure" and "High Pressure". The currently selected mode is displayed.

10 Number of repetitions measuring block

The number of repetitions of the measuring blocks, a measuring block usually consists of several individual measurements. 0 means that only one series of measurements is performed, with the specified number of repetitions.

11 Waiting periods between measuring blocks

Waiting time between the individual measuring blocks

- › 2 pump mode

You have the following options for setting:

- › Pump on / off
i.e. the pump turns off between the individual measuring blocks while waiting
- › Pump continuously
i.e. the pump runs continuously within the waiting period between the measuring blocks and turns off after completion of measurement.

10.6.1 Setting for the end of the measurement series: "Tolerance"

The user can adjust the stabilization criterion for the individual measurements in a measuring block (see above, point 7 Number of measurements / mode). The measurements are repeated until the stabilization criterion is met or the specified number of measurements "Max. Num. of Measurements" has been performed.

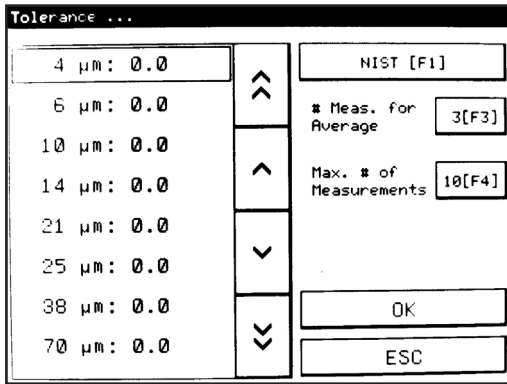


Fig. 19: Setting tolerances

10.6.1.1 Tolerance of individual particle sizes

Maximum allowable deviation of all measurements in % from the mean value. The entry of 0.0 means that for this particle size no indication of tolerance is taken into account.

The criterion is met if the "maximum allowable percentage deviation is less than / equal to 100" (maximum of the last # measurements - minimum of the last # measurements / average of the last measurements #).

10.6.1.2 AC/NIST

Select the kind of calibration for which the stabilization criteria shall apply.

10.6.1.3 # Measurements for the average

Number of individual measurements which must be within the specified tolerance.

10.6.1.4 Max. # of measurements

If the stabilization criterion was not met, the measurement is stopped in any case after the specified number of measurements.

10.6.2 Setting for the end of the measurement series: DQ ISO 11171

Allows the user to choose the stabilization criterion for 5 individual measurements according to ISO11171. (see above, point 7, the D0 criterion is used). The measurements are repeated until the stabilization criterion is met or the maximum number of measurements has been reached.

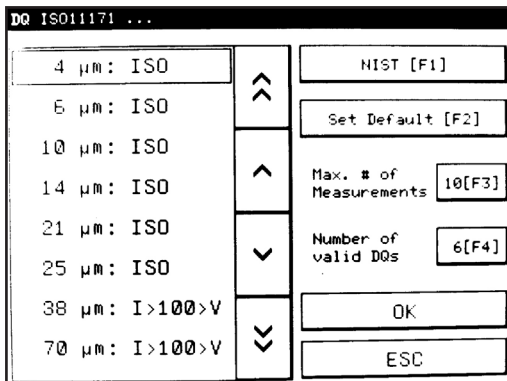


Fig. 20: DQ ISO 11171

10.6.2.1 Particle size

You have the following options to terminate the measurement. By repeatedly pressing the appropriate particle size, you can cycle through the options.

- › ISO:
The last 5 measurements of a channel must meet the DQ criterion.
- › I>100>V
The criterion has to be met only if the average of the counted particles is ≥ 100 . If fewer particles are counted, the criterion for this channel is considered fulfilled.
- › NO MATTER:
The channel is not checked for the DQ criterion.

10.6.2.2 AC/NIST

Select the type of calibration for which the stabilization criteria should apply.

10.6.2.3 Reset

Sets the DQ criterion to "ISO", "Number of Valid DQ" to 6.

10.6.2.4 Max. number of measurements

If the stabilization criterion is not met, the measurement will definitely stop after the set number of measurements.

10.6.2.5 Number of valid DQs

Minimum number of channels that need to meet the criterion. The number of channels with ISO or I> 100 <V must be greater than or equal to "Number of Valid DQ".

10.7 Setting thresholds

The set threshold values for the calibrated diameter (in this case: 4, 6, 10, 14, 21, 25, 38 and 70 μm) of the sensor must not be adjusted by the user. An incorrect measurement may result.

However, switching between different types of calibration (NIST / AC), and measurement under high pressure or low pressure is possible. Settings for threshold values are only possible in the administrator level.

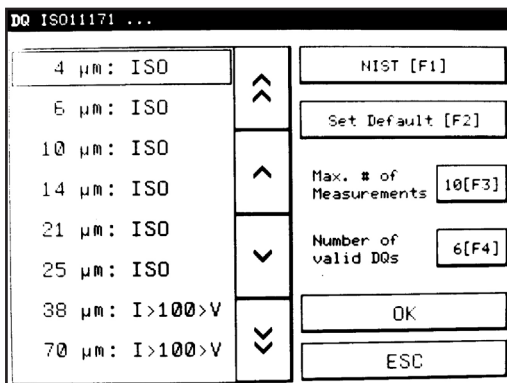


Fig. 21: Setting threshold

The following settings are available:

10.7.1 Particle size/mV

This setting is reserved for service purposes.

10.7.2 Trigger

This setting is reserved for service purposes.

10.7.3 High / low pressure particle size/mV

With this button you can switch between the diameter set for high and low pressure applications. The currently displayed mode can be edited.

10.7.4 Calibration AC/NIST

Use this button to determine the calibration instruction according to which the calibration has been performed.

10.7.5 Flow rate

Depending on the calibration, you can choose a flow rate between 10 to 25 ml / min.

10.8 Menu structure

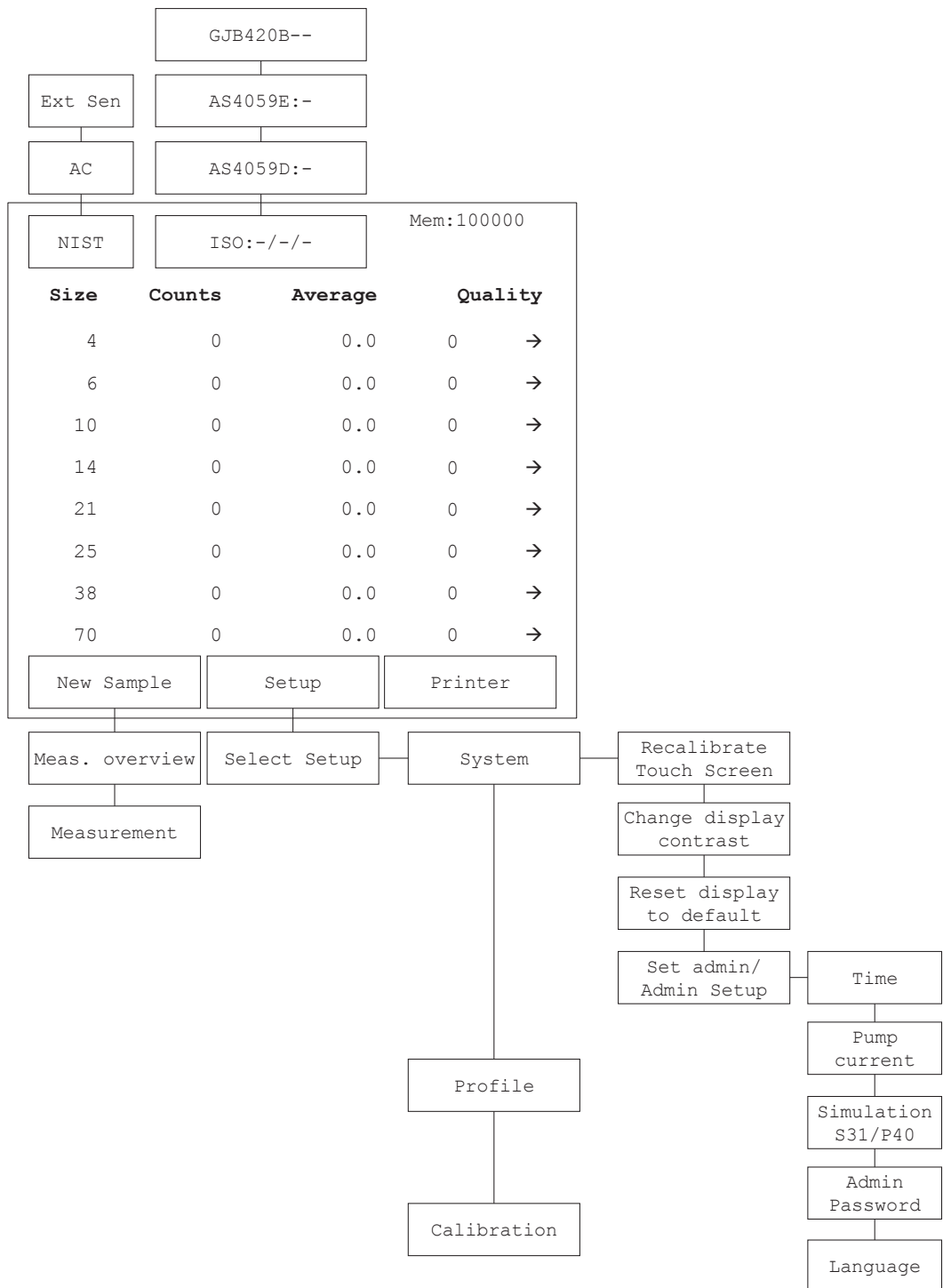


Fig. 22: Menu structure

The OPCount is equipped with a USB interface. For communication with the PC, a commercially available USB cable is used. Commands are entered as upper or lower case ASCII strings. The OPCount responds with an appropriate text or exclamation mark if there is no error. With an unknown command or timeout, a question mark or a single letter is returned.

The following commands can be used:

- › ID<enter>
Quick test to check the communication. The OPCount responds with a text string.

On this purpose, a PC and an appropriate terminal program or a readout software is required.

The particle counter must be connected via a USB cable to a computer.

11.1 Error messages

- › E01: Pump is not running
- › E04: Sensor error

11.2 Interface parameters

- › Baud rate: 57600
- › Data bits: 8
- › Parity: None
- › Stop bits: 1
- › Flow control: None

12. Classification systems

12.1 Definition of particle sizes

In industrial hydraulics, the particle numbers are coded according to ISO 4406: 1999, With the replacement of the test dust ACFTD by ISO MTD, the particle sizes have been redefined,

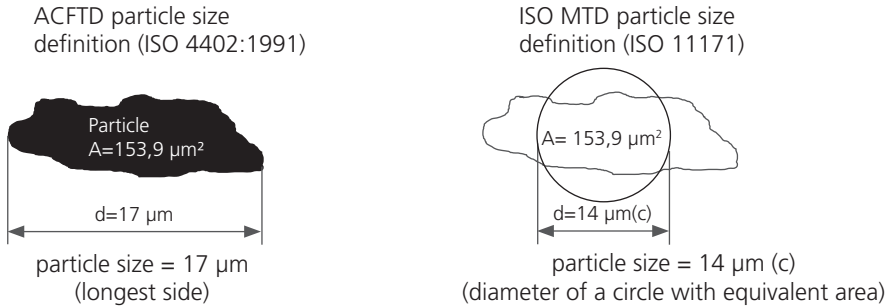


Fig. 23: Particle size definition

The size specification in µm(c) is the diameter of a circle having the same area as the projected area of the detected particle.

The size specifications of ISO-MTD and ACFTD can be converted into each other. See table below.

ISO-MTD	> 4 µm(c)	> 6 µm(c)	> 14 µm(c)	> 21 µm(c)	> 38 µm(c)	> 70 µm(c)
ACFTD	> 2 µm	> 5 µm	> 15 µm	> 25 µm	> 50 µm	> 100 µm

Table 6: Comparison of particle size ISO-MTD-ACFTD

12.1.1 Cleanliness classes according to ISO 4406:99

The values are added in cumulated form (all particles >4 µm, all particles > 6 µm, ...).

Concentration in particles / ml		ISO 4406:99
From	up to and including	
2,500,000.00		> 28
1,300,000.00	2,500,000.00	28
640,000.00	1,300,000.00	27
320,000.00	640,000.00	26
160,000.00	320,000.00	25
80,000.00	160,000.00	24
40,000.00	80,000.00	23
20,000.00	40,000.00	22
10,000.00	20,000.00	21
5,000.00	10,000.00	20
2,500.00	5,000.00	19
1,300.00	2,500.00	18
640.00	1,300.00	17
320.00	640.00	16
160.00	320.00	15
80.00	160.00	14
40.00	80.00	13
20.00	40.00	12
10.00	20.00	11
5.00	10.00	10
2.50	5.00	9

Concentration in particles / ml		ISO 4406:99
From	up to and including	
1.30	2.50	8
0.64	1.30	7
0.32	0.64	6
0.16	0.32	5
0.08	0.16	4
0.04	0.08	3
0.02	0.04	2
0.01	0.02	1
0.00	0.01	0

Table 7: Determination of cleanliness classes according ISO 4406:99

12.1.2 Cleanliness classes according to SAE AS 4059E

The values are added in cumulated form (all particles >4 µm, all particles > 6 µm, ...), comparable to ISO.

Concentration in particles / ml (ISO MTD)				SAE AS 4059E
> 4 µm (A)	> 6 µm (B)	> 14 µm (C)	> 21 µm (D)	
1.95	0.76	0.14	0.03	000
3.90	1.52	0.27	0.05	00
7.80	3.04	0.54	0.10	0
15.60	6.09	1.09	0.20	1
31.20	12.20	2.17	0.39	2
65.20	24.30	4.32	0.76	3
125.00	48.60	8.64	1.52	4
250.00	97.30	17.30	3.06	5
500.00	195.00	34.60	6.12	6
1,000.00	389.00	69.20	12.20	7
2,000.00	779.00	139.00	24.50	8
4,000.00	1,560.00	277.00	49.00	9
8,000.00	3,110.00	554.00	98.00	10
16,000.00	6,230.00	1,110.00	196.00	11
32,000.00	12,500.00	2,220.00	392.00	12

Table 8: Determination of cleanliness classes according to SAE AS 4059E

All data in µm (c)

12.1.3 Cleanliness classes according to NAS 1638

NAS 1638 is divided into different size classes. 5-15µm, 15-25µm, 25-50µm, ... Furthermore, the particles are counted differentially and not cumulatively, as with ISO 4406.

Concentration in particles / ml			NAS 1638
5-15µm	15-25µm	25-50µm	
1.25	0.22	0.01	00
2.50	0.44	0.08	0
5.00	0.89	0.16	1
10.00	1.78	0.32	2
20.00	3.56	0.63	3
40.00	7.12	1.26	4
80.00	14.25	2.53	5
160.00	28.50	5.06	6
320.00	57.00	10.12	7
640.00	114.00	20.25	8
1,280.00	228.00	40.50	9
2,560.00	456.00	81.00	10
5,120.00	910.00	162.00	11
10,240.00	1,824.00	324.00	12

Table 9: Determination of cleanliness classes according to NAS 1638



CAUTION

Ingress of dirt and fluids causes disorders

Premature wear, malfunctions. Risk of damage. Property damage.
The safe function of the OPCount Particle Counter is thus no longer guaranteed.

- ▶ Ensure absolute cleanliness when working at the hydraulic system.
- ▶ Do not use a high-pressure cleaner.

Damage to the surface by solvents and aggressive detergents.

Aggressive detergents may damage the seals of the OPCount Particle Counter and let them age faster.

- ▶ Never use solvents or aggressive detergents.
- ▶ Do not use a high-pressure cleaner.

Damage to the hydraulic system and the seals

The water pressure of a high-pressure cleaner can damage the hydraulic system and the seals of the OPCount Particle Counter.

The water displaces the oil from the hydraulic systems and the seals.

- ▶ Do not use a high-pressure cleaner for cleaning.

Close all openings with suitable protective caps / protections.

Check that all seals and caps of the plug-in connections are secure, so that no humidity can penetrate into the OPCount Particle Counter.

Clean the OPCount Particle Counter only with a dry, lint free tissue.

13.1 Maintenance

After the measurements, or if you do not want to carry out further measurements for some time, clean the system. Rinse any residue.

Then fill the system with low viscosity, clean oil or kerosene.

Close the sample inlet and the sample outlet using the supplied closures.

Attention: Discharge the batteries. Recharge them again just before the next measurement.

13.1.1 Rinsing

Perform a measurement process with rinsing fluid with turned-off printer.

Attention

Use an appropriate and with the device compatible rinsing liquid.

13.1.2 Rinsing fluids

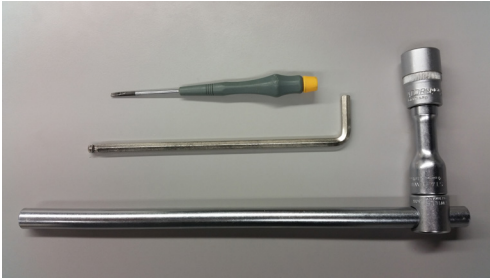
Rinsing fluids must be miscible with the last measured sample liquid. We recommend the use of low viscosity, clean oil or kerosene.

13.1.3 Checking the cleanliness

Perform a measurement process with filtered liquid.

13.1.4 Cleaning the filters

Procedure for cleaning the screw-in filter in the OPCount.



- › Needed tools
- › Socket wrench 19 mm
- › Small screwdriver
- › Allen wrench 6,0

Fig. 24: Tools



- › Remove the high-pressure and low-pressure cap

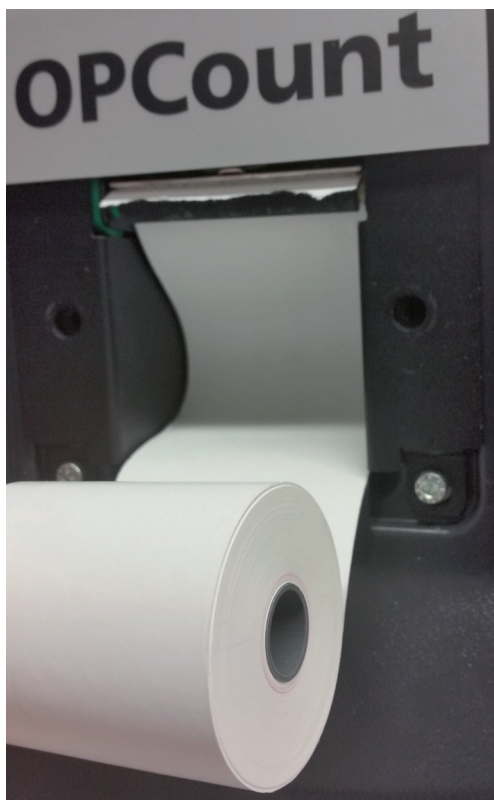
Fig. 25: Caps



- › Please lay the device down and screw out the connections with the socket wrench.
- › Set the device upright again and unscrew the two protective strainers by using the Allen wrench.
- › Clean both filter in reverse flow direction with petrol and compressed air and reassemble in reverse order

Fig. 26: Removing the protective strainer

13.1.5 Changing the printer paper



- › Open the two screws on top of the printer and remove the cover.
- › Also remove the rest of the old paper roll.
- › Hold the beginning of the new paper roll to the rubber roller in such a way that the paper will be loaded automatically.
- › Note the orientation of the roll (see Figure 27).
- › Then fasten the cover with the two screws.

Fig. 27: Changing the printer paper

13.1.6 Charging the battery

To charge the internal battery, turn off the OPCount and plug in the power cord. When connected to 10VDC - 36VDC, the battery is not charged. If the OPCount was permanently connected to the mains for an extended period (1 week or more), it is recommended - prior to use without mains operation - to withdraw the mains plug for about 2 seconds and then reconnect it again. After 3 hours, the battery will then be recharged.

Warning

Disconnect the unit from the mains before carrying out maintenance work.

Even if the device is not connected to the mains, the battery is at a voltage of 12 volts. In an open housing, there is thus a risk of a short circuit. Through the resulting heat, the battery can burst and the device can be destroyed.

13.2 Repair

ARGO-HYTOS offers a comprehensive range of services for repair of the OPCount Particle Counter.

Spare parts are not offered.

Repair to the OPCount Particle Counter may only be carried out by the manufacturer or authorized distributors and subsidiaries. There is no guarantee for self-initiated repairs.

Clean the system. Rinse any residue.

Then fill the system with low viscosity, clean oil or kerosene.

Close the sample inlet and the sample outlet using the supplied closures.

Caution

Discharge the batteries. Recharge them again just before the next measurement.

14.1 Environment

Dispose of the packaging material according to the local regulations.

Careless disposal of the OPCount Particle Counter and the pressure fluid can cause environmental pollution.

Dispose of the OPCount Particle Counter and the pressure fluid in accordance with the national regulations of your country.

Dispose of the pressure fluid residues in accordance with the applicable safety data sheets for these hydraulic fluids.

15.1 Installing the software

Insert the CD ROM into the drive and start the file OPCCount-DL.exe. The program will then guide you through the installation.

15.2 Connecting

Connect the supplied USB cable to the USB interface of the OPCCount and to the corresponding port at your computer. After switching on the OPCCount a message appears on your computer, indicating that a new hardware has been detected. In many cases, the installation of the hardware is carried out automatically. If this does not happen, select the dialog window "Automatic Installation" which opens to install the USB drivers on your PC. The necessary files are located on the supplied download installation CD in the directory "Drivers" and here under the directory of the operating system. After successful driver installation, you may be notified that the system is now ready for operation.

15.3 Used interface

Please check in the device manager under WINDOWS with which interface the OPCCount is connected after installation of the USB driver. This interface must be set in the download program. If the displayed interface is higher than COM 8 (highest adjustable value in the download software), it can be set to a lower value. To do this, click with the right mouse button on the entry of the interface in the device manager and select "Properties, Port Settings" and here "Advanced ...". Now select an available COM between 1 and 8.

15.4 Starting the „Download Software“

Double-click on the entry of the download software in the main program group. The following window opens:

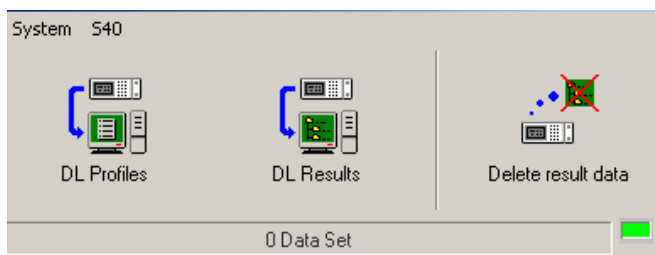


Fig. 28: Starting the software

15.4.1 Setting the serial interface

Select in the menu "System" from the menu bar the menu item "Serial Port ...". The corresponding window will open.

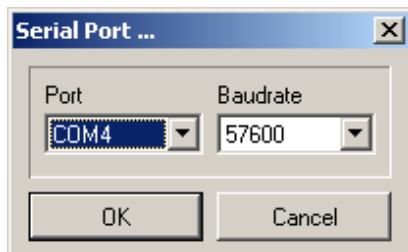


Fig. 29: Serial Port

Unfold in the window the pull-down menu "Port" and select the appropriate interface. Confirm. Close the program and then restart it to connect to OPCCount. The baud rate is fixed at 57600.

15.4.2 Selection „Download“ of measurements with calibration AC and NIST

The OPCount system simultaneously measures the sample according to ISO 4406 calibration (AC) and ISO 11171 calibration (NIST), provided that the built-in sensor has both calibrations. If the sensor has only one of these calibrations, and only the results of the measurements of one calibration should be downloaded, select the desired calibration in the OPCount / Setup menu. It is also possible to select the download for both calibrations.

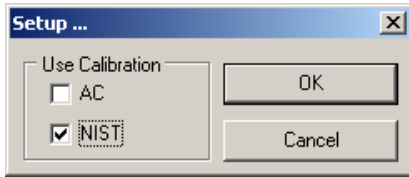


Fig. 30: Setup

15.4.3 Transferring measurement data

Click the "DL Results" button. Select the directory path and name for the file for the stored measurement results.

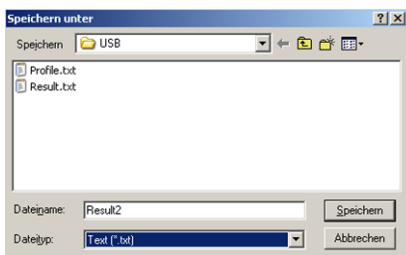


Fig. 31: Download of measurement data

After confirming the saving, the download of the measurement results is automatically started.

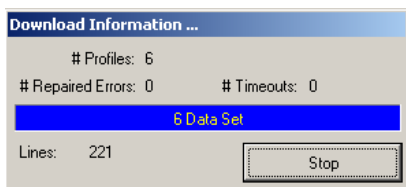


Fig. 31: Download of measurement data

The resulting files can then be loaded into Excel® for further analysis.

15.4.4 Profile download

Click the "DL Profiles" button. Select the directory path and name for the file for the saved profiles

15.4.5 Deleting the internal storage of OPCount

After downloading the saved data, you can clear the internal memory of the OPCount for new measurements by selecting "Delete Results Data". You can also do this with the function "Erase Measured Data2" in the menu 'OPCount'.

16. Troubleshooting

Error	Possible cause	Recommended measures
› High count results, especially at high particle sizes	Air bubbles in the sample	▶ Degas the sample prior to the measurement
› No flow through the system, high count results at high particles sizes	Screw-in filter is contaminated at the inlet / outlet of the system	▶ Disassemble the filter and clean everything thoroughly
› High count results, especially at small particle sizes	Humidity in the oil sample, the sample looks cloudy	▶ Please contact ARGO-HYTOS to clarify whether a meaningful measurement is possible
› Reduced flow rate, air bubbles are visible	Viscosity of the measured oil sample is too high	▶ Dilute the oil with a suitable liquid to reduce the viscosity
› No counting	The used oil is too dark / contaminated. The laser light does not pass through the measuring cell	▶ Dilute the oil with a suitable liquid
› Knocking pump, no flow Error message 04 (sensor error)	Blockage in the system	▶ Use the backflush of the system with clean oil or gasoline
› Pump does not start (error message E 01)	Clogging of the system	▶ Use the backflush of the system with clean oil or gasoline
	The viscosity of the oil is too high	▶ Dilute the oil with a suitable liquid

Table 10: Troubleshooting

WARNING

Never try to repair or modify the device. If you have problems, please contact the service department of ARGO-HYTOS GMBH.

- ▶ In order to avoid damage during transport, please use the original packaging for returns. Attach the completed return form to the return shipment. Your complaint / maintenance can then be processed more quickly.
- ▶ For transporting, remove all flammable liquids out of the system of your device.
- ▶ The unit must be free from contamination, for example by radioactivity, bacteria or toxic substances, when you send it in for service purposes.
- ▶ Close the inlets and the outlet by screwing-on the associated covers.

17. Removal of the battery when disposing of the device

The OPCount contains a built-in battery. Before disposing of the device, this battery must first be removed and recycled. Observe the official regulations.

Pull the power plug and restart the OPCount until the battery is fully discharged. Do not, under any circumstances, plug the power cord again.

You can now open the housing:

- › Open the two screws on top of the printer and remove the cover. Also remove the rest of the paper roll.
- › Loosen the screws of the housing. There are four screws on the left side, four at the bottom and one screw on the front side between the high and low pressure input.
- › Lift up the cover of the housing slightly until you can remove the yellow / green earth wire.
- › After the housing has completely be removed, you have access to the battery. There is the large white or yellow block.
- › On the other side of the device you will find the connector that connects the cable from the battery to the board. Remove this plug.
- › Now loosen the screw on the battery. The battery can now easily be removed from the device.

Question	Answer
What is the measuring principle of the OPCom Particle Counter?	The particle counter operates on the principle of light extinction. The shadow of particles is detected by means of a light source and a recipient.
Which electrical interfaces does the particle counter offer?	USB
Which data loggers are available for this product?	Internal memory, synchronization via PC software
Is the device compatible with LABS?	No, the device is calibrated with oil and can therefore not be used in food processing.
Is the device ATEX compliant?	The basic unit does not meet any ATEX directives, an ATEX version is in development.
To which standard is the device calibrated?	ISO 11171
How can the device be cleaned?	Clean the device with clean oil or with a suitable rinsing fluid. Rinse with clean oil in opposite direction.
How high is the measurement deviation beyond the specified measuring range?	This measurement deviation cannot be specified. The device must be operated within the specified range.
Why is a virtual COM port displayed?	The device has a serial USB converter.
What is the difference between a particle counter and a particle monitor?	A particle counter counts all particles in the oil that flows through it. A particle monitor detects only one defined part of the particles and calculates the total amount.
Can customers calibrate the device on their own?	No. For calibration of the device, sound knowledge is necessary.
Does the device have a real-time clock (RTC)?	Yes, it has got a real-time clock.
How can the device be configured?	The device provides a variety of settings. For further information see the manual.
Is it necessary to monitor the measuring equipment?	Depending on the user / operator. If the measuring data is used for further purposes, mostly yes.
Is the device compatible with diesel fuels?	Yes, the device is compatible.
Is the device compatible with phosphate ester / skydrol?	The standard version of the OPCom is not skydrol resistant. Optional extras are available on request

Table 11: FAQ

19. Technical data

Sensor data		Size	Unit	
Operating pressure	Low pressure	0... 7	bar	
	High pressure	4... 420	bar	
Fluid specifications				
	Fluid temperatures	10...60	°C	
	Viscosity range of fluid	with bottle measurement	up to 200	cSt
		at high pressure	up to 350	cSt
		at lubrication systems	up to 1000	cSt
	Flow rate	25	ml/min	
	Compatible fluids	Compatible with almost all mineral oils. Standard version is not stainless and not compatible with esters or ketones. Optional extras are available on request.		
Wetted materials	Steel 1.0161 (St 37-) and 1.4571 (V4A), aluminum, borosilicate glass, polyamides, FKM			
Technical data				
	Ambient temperatures	5... 40	°C	
	Relative humidity	max. 70	%	
	Number of channels	8	pcs.	
	Size channels	2,5,10,15,20,25,50,100 µm*		
		4,6,10,14,21,25,38,70 µm		
	Calibration	According to ISO 4402* / ISO 11171*		
	Cleanliness classes <small>(*optional)</small>	ISO 4406; NAS 1638*; SAE AS 4059; GJB 420 A; GOST 17216*		
	Light source	Laser diode		
	Weight	9	kg	
	Dimensions	475 x 356 x 225		
	Internal data storage	4000 data records		
Interfaces	USB			
Measuring range	ISO4406 01 - 23 NAS 163800 -12* SAE AS40590D 000A -12F GOST 17216 00 - >17* GJB 420A 000 - >12			
Electrical connections				
	Power supply	100...240 50/60 10...36	Volt Hz Volt	
	Running time of battery	4	h	
Software				
	Download software	for PC safeguarding of the measurements stored in the device		

Table 12: Technical data

20. Spare parts and accessories

Description		Order number
Thermal paper roll	1 roll	OC5310
Sample bottles	Plastic bottle set (5 pcs.)	OC5220
	Glass bottle set (2 pcs.)	SERV 200-1000
Waste oil bottle	Plastic container	OC5250
Drawer	Hose storage red	OC5210
Minimess hose	Hose (1m)	PPCO 100-5270
	Hose (2m)	PPCO 100-5280
Low pressure hose	Plastic	OC5260
Power cord	DEUTSCH	ELANET250VAC
Cable	USB cable	SCSO 900-5060
Vacuum pump	For bottle measurements	OC5240
Sensor cable	For connection of a AH LubCos H2O	OC5430

Table 13: Accessories

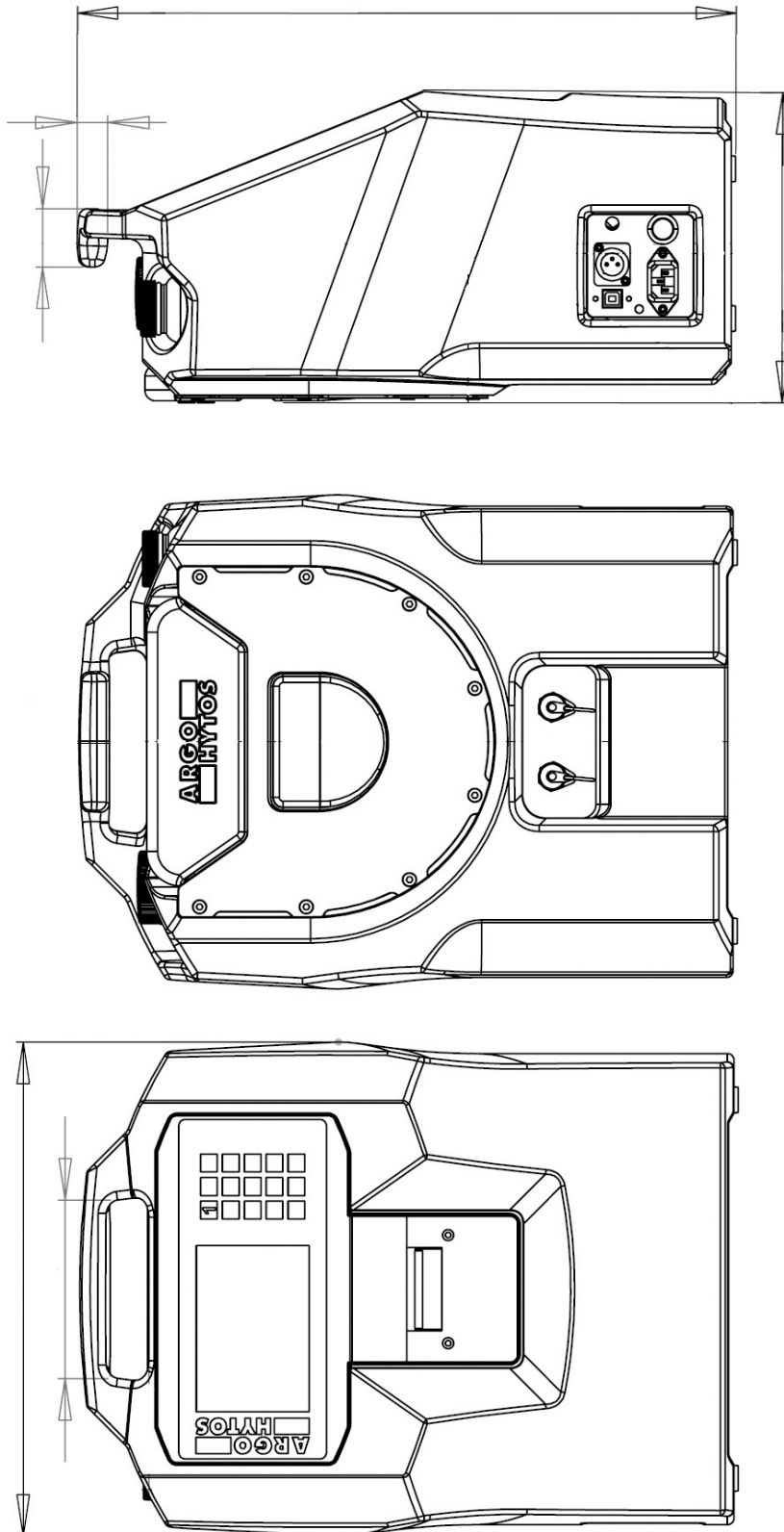


Fig. 33: Dimensional drawing

22.1 Declaration of Conformity

The declaration of conformity will be attached

International

ARGO-HYTOS worldwide

Benelux	ARGO-HYTOS B.V.	info.benelux@argo-hytos.com
Brazil	ARGO-HYTOS Fluid Power Systems Ltda.	info.br@argo-hytos.com
China	ARGO-HYTOS Fluid Power Systems	info.cn@argo-hytos.com
Czech Republic	ARGO-HYTOS s.r.o ARGO-HYTOS Protech s.r.o	info.cz@argo-hytos.com info.protech@argo-hytos.com
France	ARGO-HYTOS SAS	info.fr@argo-hytos.com
Germany	ARGO-HYTOS GMBH	info.de@argo-hytos.com
Great Britain	ARGO-HYTOS Ltd.	info.uk@argo-hytos.com
Hong Kong	ARGO-HYTOS Hong Kong Ltd.	info.hk@argo-hytos.com
India	ARGO-HYTOS PVT. LTD.	info.in@argo-hytos.com
Italy	ARGO-HYTOS S.r.l.	info.it@argo-hytos.com
Poland	ARGO-HYTOS Polska spz o.o.	info.pl@argo-hytos.com
Sweden	ARGO-HYTOS Nordic AB	info.se@argo-hytos.com
Turkey	ARGO-HYTOS Hidrolik Ekip. San. ve Tic. Ltd. Şti.	info.tr@argo-hytos.com
USA	ARGO-HYTOS Inc.	info.us@argo-hytos.com

