



# Online Particle Counting System **PAMAS S50**

## User Manual



PAMAS Partikelmess- und Analysesysteme GmbH

## User Manual PAMAS S50

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REV 20080625SB:complete revised version  
REV 20090414SB remount of nozzle  
REV 20091209SB flowrate range changed  
REV 20110831SB serial analog data transmission  
REV 20141110SB new firmware v. 2.035  
REV 20150129SB Certificate RoHS & REACH Compliance  
REV 20160430JK USB memory stick  
REV 20160615SB new Declaration of CE Conformity

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## **About this manual**

This manual gives a description what has to be done to use and run the PAMAS S50 in a way that gives the best safety and makes the best use of its properties. We encourage you to read thoroughly all the instructions given in this manual.

Please pay special attention to all safety instructions. Make sure that you have understood the meaning of what is written herein and that you are able to follow the instructions. Take care of all governmental or administrative regulations and safety precautions.

Please, do not abuse the instrument in a way that it is not in compliance with the descriptions given herein or in special written agreements with PAMAS.

In case of any problem you face when using a PAMAS S50 system, and if all description given in this manual is insufficient to solve the problem, or you are in doubt, please feel free to contact your local PAMAS dealer or PAMAS headquarter.

PAMAS is running a continuous improvement process. Improvements only can be done when knowing about the problems that come from applications or the use of certain equipment. Please, give us support in improving our products: Tell us what we can do better in future.

Please, be aware that only well calibrated measurement systems can give reliable results. We are ready to give you the needed support for doing all the service and calibration you need for your instrument.

PAMAS offers service on demand as well as service contracts. Feel free to ask us what we can do for you. We will supply you with the needed information if possible. This ensures you that your PAMAS particle counter will give good service for the longest possible period.

## 1 Safety Precautions



This symbol highlights WARNINGS for dangerous situations with risk of personal injury or damage.



This symbol highlights important information, which may make life easier for you.

Any person who will be allowed to work on this instrument, perform any repair, installation, or calibration need to be trained well and need to have the appropriate tools available. Otherwise there is the risk of injury or damage to the system.

Whenever you want to perform actions on that instrument, please make sure that you checked possible risks first. You must satisfy yourself that your planned actions are safe for you and others. We only can give you advice in cases where tools, actions, and procedures are defined by us. Make sure the product or its environment will not be damaged or be made unsafe by any action you perform.

If any doubt arises about the correct, safe method of performing any action on the instrument, do not proceed! Seek out expert assistance or supervision from a qualified person. If needed, feel free to contact PAMAS headquarter directly.

The safety information provided in this manual serves as a basic guide in an attempt to prevent injury or death. Please, be aware that PAMAS cannot anticipate every possible risk or circumstance that might involve a possible hazard. This makes it impossible to give warnings for every possible risk in this manual or on the product.

All warranty is void in case of any other use than described in this manual.

There is the risk of severe injury to man and even death in case of abuse of the instrument.

There is the risk of damage to the instrument and any installation in case of abuse of the instrument.

PAMAS will not be liable in case of any use other than described in this manual and without written agreement from PAMAS.



Avoid injury caused by slipping or falling. Do not allow tools or parts lying around the work area. Remove and clean up spilled fluids immediately.

Check hydraulic oil lines, tubes and hoses carefully. Follow basic safety precautions when doing that. Do not use your bare hand to check for potential leaks. Use a cardboard or some paper when checking for a leak. Escaping hydraulic fluid under pressure may penetrate your body tissue, causing serious injury, and possible death. If fluid is injected into your skin, it must be treated immediately by a doctor familiar with this type of injury.

Personal injury can result from hydraulic oil pressure or hot oil. Relieve all pressure in a hydraulic system before any caps, lines, fittings are disconnected or removed. Exceeding the maximum fluid temperature

and pressure can cause an explosion, resulting from bursting hoses and/or failed connectors.



Personal injury or death can result from a fire. Flammable liquids may cause fire hazards, especially when spilled on hot surfaces or electrical components.

Do not smoke while working on or near any flammable fluid.

Clean up all leaked or spilled flammable fluid immediately.



Make sure you use all necessary protective equipment required to do the job. Prevent sparks, flames, and smoking around dangerous substances. Do not eat or drink around dangerous substances.

### ESD Protection

Water and other liquids conduct electric current and can create a short circuit resulting in injury or death. Keep all liquids away from electrical components and other sources of electricity.

Do not create a short circuit between a source of electricity and a liquid by being in contact with both simultaneously.

Ground the product using the appropriate grounding connectors, and verify grounding periodically to minimize shock hazard.



Electrostatic Discharge (ESD) can cause immediate or latent damage to electronic circuits. PAMAS products are adequately protected against ESD for their intended use. However, it is possible to damage the system by delivering electrostatic discharges when touching, removing, or inserting any objects inside the equipment housing.

To make sure you are not delivering high static voltages yourself: -

Handle ESD sensitive components on a properly grounded and protected ESD workbench.

When this is not possible, ground yourself to the equipment chassis before touching the boards. Ground yourself with a wrist strap and a resistive connection cord.

When neither of the above is possible, touch a conductive part of the equipment chassis with your other hand before touching the boards.

Do not remove any components from the housing.

## 2 Laser Safety Information

For your own safety take note of the following safety precautions.

### Laser Safety

This product incorporates a sensor which operates by means of a laser. There is no possibility of danger from the laser, provided that the product is operated according to the instructions in this manual.

Since radiation emitted by the laser is completely confined within protective housings and external covers, the laser beam cannot escape from the device during any phase of user operation.

This product is certified as a Class 1 laser product under U.S. Department of Health and Human Services (DHHS) Radiation Performance Standard according to the Radiation Control for Health and Safety Act of 1968. This means that the product does not produce hazardous laser radiation.

### Internal Laser Radiation

Maximum Average Power: 4.2 mW inside the sensor  
Wavelength: 670 nm

This product employs a Class 3R laser diode that has a visible beam. The laser diode is incorporated in a closed sensor unit. The sensor unit is in the interior of the product. The laser beam is emitted inside the long tube of the sensor unit and cannot escape from the sensor housing during any phase of operation.

**Warning!** The sensor unit, which is incorporated inside the product, should not be opened under any circumstances.

### Laser Caution for United States Users

CDRH-Regulations: This product is certified as a Class I laser product under the Regulation Performance Standard according to the Food, Drug and Cosmetic Act of 1990. Compliance is mandatory for laser products marketed in the United States and is reported to the Center for Devices and Radiological Health (CDRH) of the U.S. Food and Drug Administration (FDA) of the Department of Health and Human Services (DHHS). This means that the product does not produce hazardous laser radiation. The label shown below indicates compliance with the CDRH regulations and must be attached to laser products marketed in the United States.

### Laser Safety Label



The laser safety label is located at the rear panel of the product.

**CAUTION:** Use of controls, adjustments or performance of procedures other than those specified in this manual may result in hazardous radiation exposure.

This is a semiconductor laser. The maximum power of the laser is 5 mW and the wavelength is 670 nm.



### **3 Unpacking**

Report packing damage of your S 50 immediately to your handling agent and PAMAS GmbH. Also, on removing the instrument from the packaging, note and advise any instrument damage.

Keep the packaging. It will be useful to you should you need to send the instrument back for service or re-calibration.

Please check that the all items specified on the packing list have been included.

## 4 Description

### 4.1. Basic Features

- The S50 is a modern microcontroller driven automatic particle counter that is intended to be used as an online system. The S50 is combining a high performance laser based sensor with a high power digital signal conditioning and a 32bit CPU.
- It can be ordered with a variety of options to fit the unit into every application.
- If the application supplies any pressure, the unit can be operated without internal pump. It can determine the flow rate through the sensor to achieve precise results regardless of the input pressure.
- The S50 is fully suitable for industrial environment. It's high protection grade make it insensitive against mechanical, environmental and electrical threats

### 4.2. Product Overview

The S50 can be opened by untightening the 4 screws at the corner of the box. Remove the cover carefully. Please note that the front display is connected with a ribbon cable. Please do not remove the ribbon cable and do not hang the cover at the cable.

Inside the box is:



- The sensor on its mounting bracket (right side on the picture). Please do not manipulate the sensor. Do not apply any force to the sensor or the calibration may be invalidated.
- The electronic PCB with all necessary connectors (left side on the picture). Make sure that there is no power applied to the system before you connect or disconnect any cables to the system.



### 5.3. Hydraulic Installation

Next step is to connect the S50 to the hydraulic circuit. Please make sure that the current configuration of the S50 is compatible to the actual hydraulic circuit. Too high system pressures may damage the S50.

Make sure that the system pressure is compatible with the S50. The S50 may burst and spill liquid with high pressure if too high pressure is applied.



Please connect the S50 with the correct flow orientation. The “upper” connector labelled “IN” shall be connected with the system to be monitored.

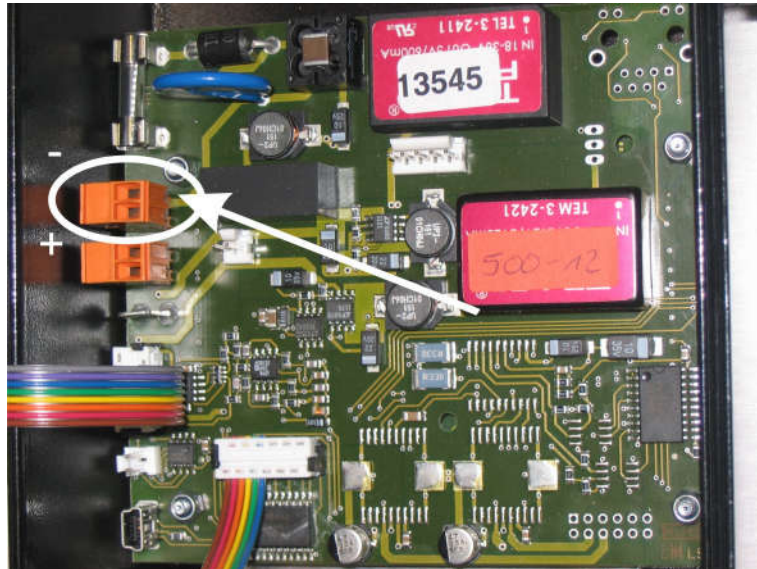
The “lower” connector labelled “OUT” shall be connected with the return line to the system reservoir. Make sure that the “IN” port is accessible for service. There is a screen filter (**only for standard S50, not for S50P**) below the outer connector that keeps very large particles away from the S50. It may be necessary to clean this screen filter if it blocks the flow through the S50. Easy access simplifies this task significantly.



The S50 is made to run for a long period of time without maintenance. If you are not sure about the contamination with very large particles in your circuit. Please put a filter upstream of the unit that removes very large particles > 140µm. Please consider to have shut off valves in front of the filter and after the S50. The internal screen filter is considered as a last chance filter. It doesn't have the capacity to filter out many particles. The S50 may deliver wrong (too low) results or the flow through the unit may stop totally.

#### 5.4. Electrical Installation (Power Supply)

The S50 has many options that require special wiring. Nevertheless, the standard power supply connectors always need to be connected. You find the 24VDC-terminals on the main PCB:



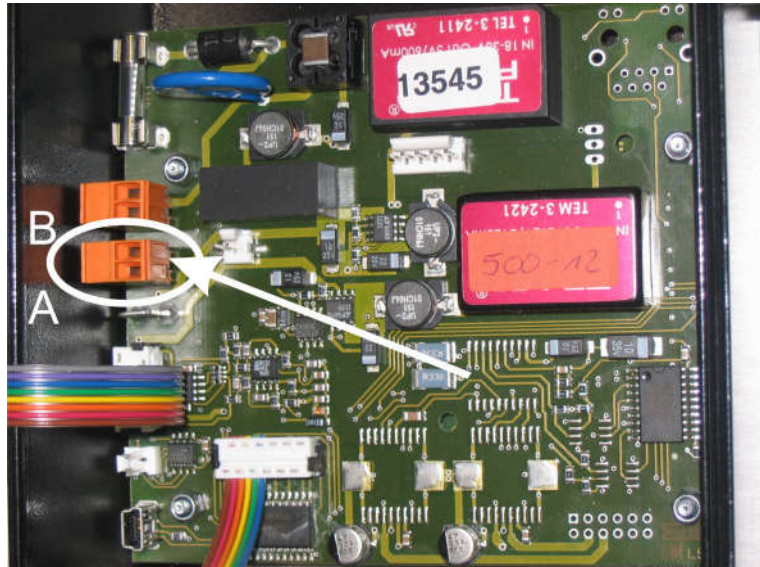
The power supply connector is one of the orange connectors on the main PCB, the one close to the fuse. Connect the (-) cable to the connector close to the fuse and the (+) cable to the other pin of the connector. The connectors may be pulled off the PCB for easier access. Please note that the power connectors may be hidden below the AUX-PCB, if you order that as an option.



The S50 power supply connectors tolerate wrong polarity connection. However, the system will not operate, if the terminals are connected with wrong polarity.

### 5.5. Electrical Installation (Computer Data Transmission)

The S50 can transmit its results to a remote PC for presentation and storage. The physical data transmission uses the RS485 interface. The RS485 connectors are located side by side at the power supply connectors. The RS485 terminals do not require an termination resistor, the resistor is already integrated into the S50.



Please connect the terminal labelled “A” with the same label on the transmitter side. The “A” terminal may also be labelled “+” or “1”. Connect the “B”-terminal to the connector with the label “B”, “-” or “2” on the transmitter side.



The S50 RS485 data transmission link is a point to point link. You cannot connect more than one S50 on the same RS485 cable.

See the appendix for the logical data transmission format.

**5.6. Electrical Installation  
(Analogue Data  
Transmission) (Option)**

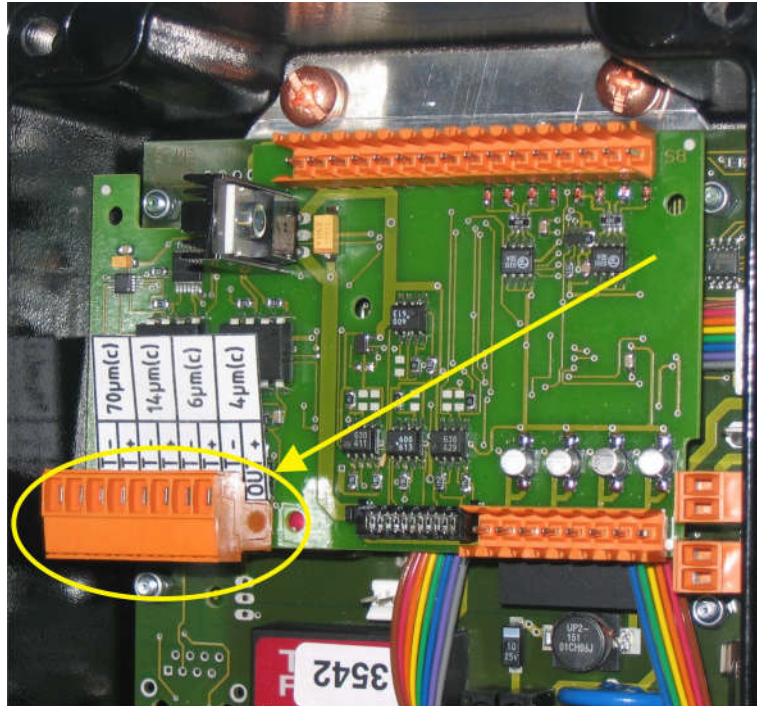
The S50 can transmit its results to PLCs and other devices that can read 4-20mA current loops. These devices can simply check the current that is flowing through the circuit. The current flowing through the S50 is proportional to the corresponding contamination in the channels 4µm(c), 6µm(c), 14µm(c) and 70µm(c).

Output current vs. ISO-Code			
ISO	Current (mA)	ISO	Current (mA)
0	4	13	12.66
1	4.66	14	13.33
2	5.33	15	14
3	6	16	14.66
4	6.66	17	15.33
5	7.33	18	16
6	8	19	16.66
7	8.66	20	17.33
8	9.33	21	18
9	10	22	18.66
10	10.66	23	19.33
11	11.33	24	20
12	12		

If the PLC wants to set an alarm level at an ISO-code of 18/15/13, it needs to set the appropriate input thresholds to 16mA, 14mA and 12.66mA.

The precise conversion formula from ISO-codes to current and from particle number to current can be found in the Appendix.

These outputs are realised as variable resistors. Each output is galvanically separated from the S50 and from the other outputs. The receiving side of the link needs to supply the voltage for the loop. The S50 will not be damaged at reversed polarity. It will not be damaged with unconnected outputs.



Please connect the wires to the respective signals. The connectors are labelled to identify the size and the polarity for every loop. "OUT + 4µm(c)" labels the wire, that is to be connected with the positive terminal at the 4µm(c) receiver port etc.



## 6 Operation

The S50 is a fully automated particle counting system. Normally, it does not require any programming. As soon as liquid is flowing through the unit, it starts operation. The S50 detects and calculated the flow automatically. In its standard configuration, it can be operated at any flow range between 0.2bar and 20bar (3-290psi). The S50 results are always incorporating the flow rate into the result, even if it is altered continuously.

As soon as the S50 is powered, it starts to analyse the flow. If the flow is within the acceptable range, it starts to deliver results. If the flow is too low or too high, it shows --/--/-- ISO-codes. The S50 may be continuously operated, even if there is no flow through the unit.

### Setup of Flowate

Behind the Inlet-Port fitting of the S50 you have a filter and two nozzles each with orifice of 300 µm.

The nozzels are there to maintain the flowrate between 5 ml and 50 ml/min.

After installation of system please measure the actual flowrate with a measuring cylinder and a stop watch.

The default setup should not allow a flow rate bigger than 50 ml / min. In case the flowrate is lower than 5 ml/min one or both nozzle have to be removed. In order to do this please

- Remove the Inlet-fitting using a 17 mm wrench
- Use an Allen key 6mm and remove firstly the filter and then one or both of the nozzles.
- Remount filter and fitting: **Insert the nozzle until it is flush with the circular surface and turn the Allen key not more than 30 times to fix the nozzle! Do not insert the nozzle as long as possible!**
- Check flowrate (must be between 5 ml/ min and 50 ml/min)



### Option S50P

The S50 may be equipped with in internal pump. This configuration allows operation even if there is absolute no pressure available to press oil through the unit. The S50P has a max. pressure of 7bar (100psi).

## 7 Serial analog Data Transmission via 4-20mA Port

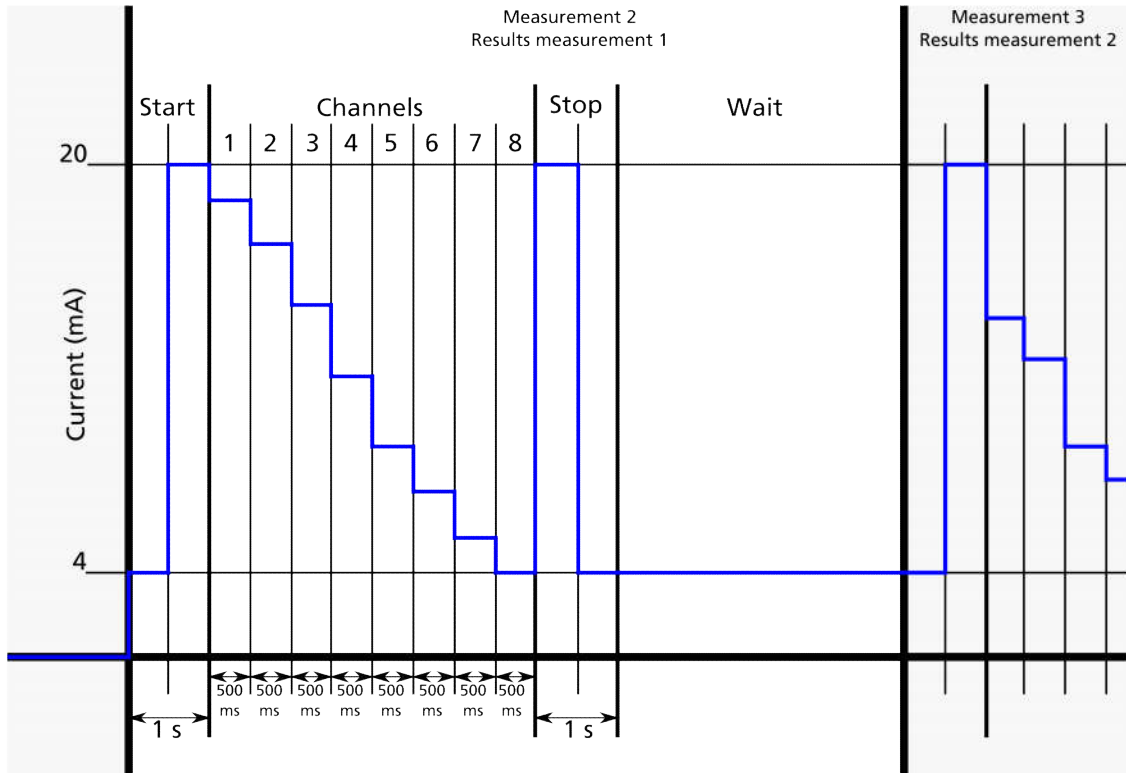
### Firmware Version up to 2.035

The measurement results can be sent via the AUX board serial or parallel to the analog 4-20 mA output. The serial data transmission supports all of the available channels.

Example for 8 channels: 4/6/10/14/21/25/38/70  $\mu\text{m}$  (c).

Please note that for serial data transmission only the 4  $\mu\text{m}$ -current output is used (see photos on page 16 and page 23)

During the measurement no data transmission will be done. Then after the measurement the Start-signal will be sent (4mA and 20 mA, total time: 2 x 500 ms). This is followed by the results of the 8 channels (the sequence is as follows: 4, 6, 10, 14, 21, 25, 38 and 70  $\mu\text{m}$  (c) particle size in 500 ms time intervals). Then a Stop-signal will be sent (20 and 4 mA, total time: 2 x 500 ms). In the remaining time until the start of the next measurement a constant 4 mA will be sent (Wait-signal). At the end of the next measurement the Start-signal will be send again, then the values of the 8 channels, followed by the Stop-signal and finally the Wait-signal until the end of the next measurement. This procedure is continued until the power of the device is switched off.



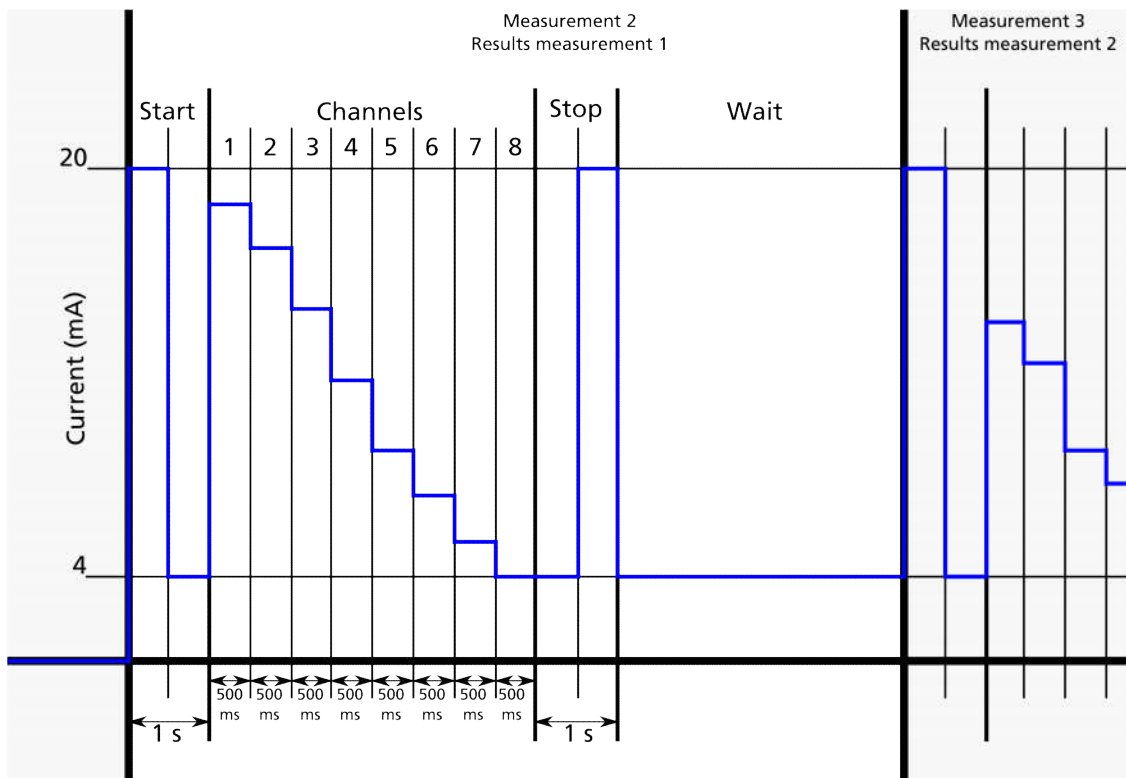
**Firmware Version  
2.035 and higher**

The measurement results can be sent via the AUX board serial or parallel to the analog 4-20 mA output. The serial data transmission supports all of the available channels.

Example for 8 channels: 4/6/10/14/21/25/38/70  $\mu\text{m}$  (c).

Please note that for serial data transmission only the 4  $\mu\text{m}$ -current output is used (see photos on page 16 and page 23)

During the measurement no data transmission will be done. Then after the measurement the Start-signal will be sent (20 for 500 ms, followed by 4 mA for 500ms, total time: 2 x 500 ms). This is followed by the results of the 8 channels (the sequence is as follows: 4, 6, 10, 14, 21, 25, 38 and 70  $\mu\text{m}$  (c) particle size in 500 ms time intervals). Then a Stop-signal will be sent (4 and 20 mA, total time: 2 x 500 ms). In the remaining time until the start of the next measurement a constant 4 mA will be sent (Wait-signal). At the end of the next measurement the Start-signal will be send again, then the values of the 8 channels, followed by the Stop-signal and finally the Wait-signal until the end of the next measurement. This procedure is continued until the power of the device is switched off.



## 8 Troubleshooting

	<b>Cause</b>	<b>Remedy</b>
Occuring of high counts, especially in bigger size channels	Air bubbles at the sample point or in the bottle	Degassing of the sample before the measurement
There is no flow through the system, high counts in bigger size channels or --/--/-- display as a result	The last chance filter of the S50 is completely covered with large particles	Please remove the connector from the "IN"-port. After removing the connector, remove the LCF using a 5mm Allan-key. The LCF can be flushed using mineral spirit and pressurised shop air. Reassemble the unit in opposite order.
Occuring of high counts, especially in smaller size channels	There is humidity in the oil sample, the sample looks cloudy.	Please contact Pamas to check if a measurement of this sample is possible

## 9 Service

Warning! Do not attempt to repair or rebuilt the instrument. If you have problems consult the service department of PAMAS GmbH.



**Warning!** For transport the system should be free of any flammable liquids. The instrument must be free of all contamination; e.g. radioactive, poisonous or bacteriological substances.

Before shipment close all in- and output ports with the covers. Use the original packaging for return consignment and attach also the filled shipping instructions.

## Appendix A: Technical Specification

<b>Features</b>	<p>Fully automated optical particle counting system with LASER-diode light source for continuous presentation of cleanliness codes.          Simple integration in industrial data managing systems          Measurement principle: single particle detection using light extinction with a highly focussed laser beam. The whole measurement cell is illuminated hence very clean liquids can be measured.          The system determines the flow rate continuously to achieve a precise calculation base for the precise calculation of cleanliness classes. Every system is calibrated and certified individually.</p>										
	<table border="0"> <tr> <td>Measurement range (ISO11171)</td> <td>4µm(c) to 70µm(c)</td> </tr> <tr> <td>8 channels:</td> <td>4/6/10/14/21/28/38/70µm</td> </tr> <tr> <td>Flow rate:</td> <td>5ml/min to 50ml/min</td> </tr> <tr> <td>Max. particle concentration (ISO11171)</td> <td>0-24000p/ml (ISO-class 0-22)</td> </tr> <tr> <td>Reproducibility:</td> <td>5%</td> </tr> </table>	Measurement range (ISO11171)	4µm(c) to 70µm(c)	8 channels:	4/6/10/14/21/28/38/70µm	Flow rate:	5ml/min to 50ml/min	Max. particle concentration (ISO11171)	0-24000p/ml (ISO-class 0-22)	Reproducibility:	5%
Measurement range (ISO11171)	4µm(c) to 70µm(c)										
8 channels:	4/6/10/14/21/28/38/70µm										
Flow rate:	5ml/min to 50ml/min										
Max. particle concentration (ISO11171)	0-24000p/ml (ISO-class 0-22)										
Reproducibility:	5%										
<b>Environmental Conditions</b>	<p>Temperature:              operation: -10-50°C              storage: -25-80°C              oil temperature 5-80°C</p> <p>Condensation not acceptable</p> <p>Option: cooler for oil temperatures up to 200°C</p> <p>Pressure range: 0-15 bar</p>										
<b>Mechanical Specification</b>	<p>Size: B220 x H120 x T120 mm<sup>3</sup>          Weight: 3700g          Case material G-AlSi12          Case surface: powder coating PA          Case sealing: PUR          Protection: IP64</p>										
<b>Display</b>	<p>LED-seven-segment-display red 15mm size          6-digits for ISO-class display          LED for „measurement OK“          3 LED green/yellow/red configurable</p>										

**System Integration**

Connection to the hydraulic system: ISO228 G1/4"  
max. pressure 200bar

Variant: The flow rate of 5-50ml/min will be provided from the customer  
Variant: adaptation to various pressure ranges possible. (e.g. 1-10bar)

Option: adaptation to high pressure systems e.g.. 30-350bar

Option: highly precise constant flow pump for pressure less systems up to 7bar (100psi)

Compatibility: all mineral and synthetic oil (sealing material FPM)

Option: Skydrol compatibility (sealing material EPDM)

**Input / Output**

Operating voltage: nom. 24V, 22-28V  
Current consumption: 200mA at 24V

Option: external power supply 100-240V / 10W

Data transmission via RS485

Option: external protocol converter RS485/RS232 for PC connection

Option: Profibus

Internal USB-interface for device configuration.

Option: 4 current loop outputs 4-20mA

Option: 4 current loop inputs 4-20mA

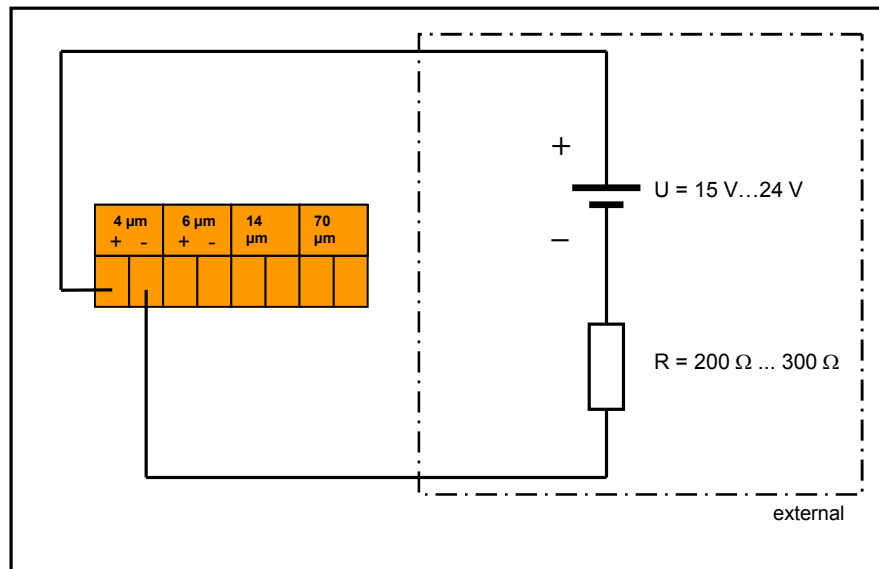
Option: 8 digital inputs 0-24V as interface to PLC or external signal sources

Option: 8 digital outputs 0-24V as interface to PLC. (24V/100mA)

Option: Ethernet network-connection 10MBIT (on request)

## Appendix B Wiring of the 4 – 20 mA Current Loop Outputs

- The four 4 – 20 mA Current Loop outputs are passive Outputs so they have to be powered externally.
- The Voltage to power the outputs has to be between 15 V and 24 V.
- The wiring has to be done as shown in the figure.
- To get proper results the Value of the load resistor R has to be between 200  $\Omega$  and 300  $\Omega$ . The value of R must not be smaller than 20  $\Omega$  and bigger than 400  $\Omega$ .
- The four outputs are galvanically separated from each other and from ground of circuit.





## Appendix C: Calculation of Floating Point ISO Codes for S-50

x	Cumulative particle counts per 100 ml
I	ISO code for x according to ISO 4406:1999
$i_f$	Floating point representation of ISO code
$\varepsilon$	$1,192092896 \times 10^{-7}$ , smallest such that $1,0 + \varepsilon \neq 1,0$
$k_n$	Premultiplier for particle counts

$$i_f(x) = \log_2(x \times k_i) + 1 - \varepsilon$$

If  $i_f$  is less than 0  $i_f$  is set to 0.

### Pre-Multipliers for Particle Counts

$k_0 = 1; k_1 = 1; k_2 = 1; k_3 = 1; k_4 = 1; k_5 = 1; k_6 = 1; k_7 = 0,984615385; k_8 = 1,024; k_9 = 1,024; k_{10} = 1,024; k_{11} = 1,024; k_{12} = 1,024; k_{13} = 1,024; k_{14} = 1,024; k_{15} = 1,024; k_{16} = 1,024; k_{17} = 1,008246154; k_{18} = 1,048576; k_{19} = 1,048576; k_{20} = 1,048576; k_{21} = 1,048576; k_{22} = 1,048576; k_{23} = 1,048576; k_{24} = 1,048576; k_{25} = 1,048576; k_{26} = 1,048576; k_{27} = 1,032444062; k_{28} = 1,073741824$

### Example:

If x is 9600 particles per 100 ml.

The ISO code according to ISO 4406:1999 is 14.

$k_{14} = 1,024$

$$i_f(9600) = \log_2(9600 \times 1,024) + 1 - 1,192092896 \times 10^{-7}$$

$$i_f(9600) = 14,263$$

The ISO-code for 9600p/100ml is 14,263

### 4-20mA Output of ISO Code on Pamas S-50 AUX Board

$I_{\min} = 4 \text{ mA}$

$I_{\max} = 20 \text{ mA}$

$I_x$  – Electric current for output on S-50 AUX board.

$x_{\min} = 0$

$x_{\max} = 24$

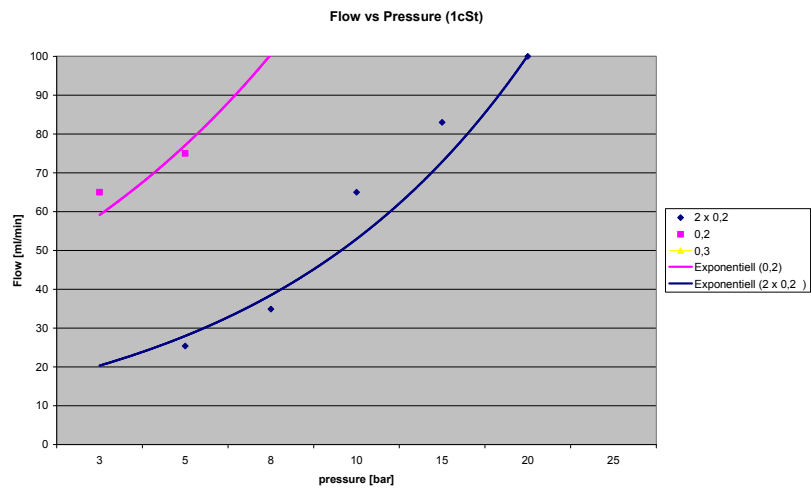
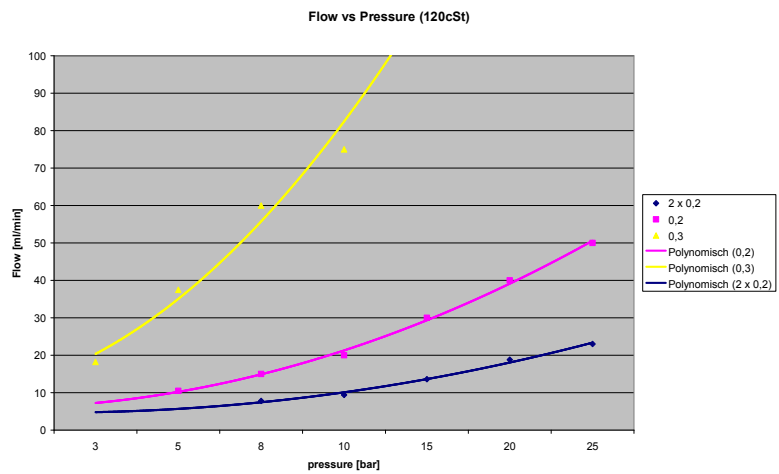
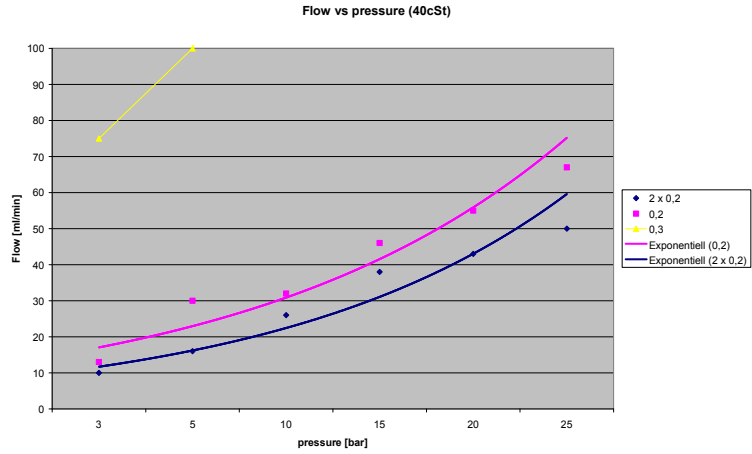
x - Currently measured ISO class (floating point representation).

$$I_x = I_{\min} + (I_{\max} - I_{\min}) \times \frac{(x - x_{\min})}{(x_{\max} - x_{\min})}$$

$$(x_{\min} \leq x \leq x_{\max})$$

## Appendix D: Estimation of Flow at various Oils

The flow through the S50 may vary with various oils. Here are some tables to estimate the flow:





PAMAS GmbH • Dieselstraße 10 • 71277 Rutesheim • Postfach 1162 • 71273 Rutesheim

## Declaration of CE Conformity

**Manufacturer:** PAMAS GmbH  
Dieselstr. 10  
71277 Rutesheim

**Product description:** online particle counter  
**Product part number:** PAMAS S50

On behalf of PAMAS Partikelmeß- und Analysensysteme GmbH, we do hereby declare that the above product complies with the following standards:

Elektromagnetische Verträglichkeit 2014/30/EU  
Maschinenrichtlinie EG-RL 2006/42/EU  
Niederspannungsrichtlinie 2014/35/EU  
RoHS Richtlinie 2011/65/EU

The following national Standards, Rules and Specifications are in use:

6.GPSGV  
EMVG  
9.GPSGV  
1.GPSGV  
DIN EN ISO 12100  
DIN EN 60204-1

This product must be serviced regularly by PAMAS and/or their approved agent for the declaration to remain effective after shipment.

Rutesheim, 10.06.2016  
Gerhard Schreck  
Geschäftsführer  
PAMAS GmbH  
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Handelsregister B Stuttgart: HRB 252024  
Geschäftsführer: Gerhard Schreck • Ust-IdNr.: DE 153 503 924

Kreissparkasse Böblingen 5 120 318 (BLZ 603 501 30)  
IBAN: DE31 6035 0130 0005 1203 18, BIC: BKKRDE68  
Dresdner Bank Leonberg 3 902 456 (BLZ 600 800 00)  
IBAN: DE94 6008 0000 0390 2456 00, BIC: DRES DE FF 600  
US \$ Konto Valley National Bank Tulsa, OK 74136,  
USA Account No. 1032763



Management  
System  
ISO 9001:2008  
www.tuv.com  
ID: 9105550019  
Zert.-Reg.-Nr.: 871831206



## CERTIFICATE OF COMPLIANCE- RoHS Declaration RoHS & REACH Compliance

PAMAS Partikelmess- und Analysesysteme GmbH hereby certifies that all our systems are in compliance with the European Union Directive, 2002/95/EC & 2011/65/EU on the Restriction of the use of certain Hazardous Substances in electrical and electronic equipment (RoHS).

Our RoHS compliant products do not contain Lead (Pb), Mercury (Hg), Cadmium (Cd), Hexavalent Chromium (Cr+6), Poly Brominated Biphenyls (PBB), Poly Brominated Diphenyl Ethers (PBDE) including Deca-BDE, and proposed ROHS2 chemicals (Hexabromocyclododecane (HBCDD), Bis(2-ethylhexyl)phthalate (DEHP), Butylbenzylphthalate (BBP) and Dibutylphthalate (DBP) above the allowable MCV.

PAMAS Partikelmess- und Analysesysteme GmbH supports the basic aim of REACH in improving the protection of human health and the environment through the better and earlier identification of the intrinsic properties of chemical substances. PAMAS Partikelmess- und Analysesysteme GmbH will meet all REACH requirements and is committed to provide our customers with information about substances in our products according to future REACH requirements.

All PAMAS Partikelmess- und Analysesysteme GmbH products are free of the currently listed Substances of Very High Concern (SVHC) under REACH.

PAMAS Partikelmess- und Analysesysteme GmbH is committed to meeting the needs of our customers as they transition to RoHS compliance.

### PAMAS

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