Instruction and operation manual

S 130

Laser particle counter

.SUTO

Dear Customer,

thank you for choosing our product.

The operating instructions must be read in full and carefully observed before starting up the device. The manufacturer cannot be held liable for any damage which occurs as a result of non-observance or non-compliance with this manual.

Should the device be tampered with in any manner other than a procedure which is described and specified in the manual, the warranty is cancelled and the manufacturer is exempt from liability.
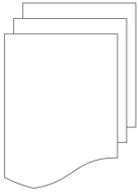
The device is destined exclusively for the described application.

SUTO offers no guarantee for the suitability for any other purpose. SUTO is also not liable for consequential damage resulting from the delivery, capability or use of this device.

Table of contents

1. Safety instructions

Please check if this instruction manual accords to the product type.

Please observe all notes and instructions indicated in this manual. It contains essential information which have to be observed before and during installation, operation and maintenance. Therefore this instruction manual has to be read carefully by the technician as well as by the responsible user / qualified personnel.

This instruction manual has to be available at the operation site of the laser particle counter at any time. In case of any obscurities or questions, regarding this manual or the product, please contact the manufacturer.

WARNING!

Compressed air!

Any contact with quickly escaping air or bursting parts of the compressed air system can lead to serious injuries or even death!

• Do not exceed the maximum permitted pressure range.

• Only use pressure tight installation material.

• Avoid that persons get hit escaping air or bursting parts of the instrument.

• The system must be pressureless during maintenance work.

WARNING!

Voltage used for supply!

Any contact with energized parts of the product, may lead to a electrical shock which can lead to serious injuries or even death!

• Consider all regulations for electrical installations.

• The system must be disconnected from any power supply during maintenance work.

• Any electrical work on the system is only allowed by authorized qualified personal.

WARNING!

Permitted operating parameters!

Observe the permitted operating parameters, any operation exceeding this parameters can lead to malfunctions and may lead to damage on the instrument or the system.

- Do not exceed the permitted operating parameters.

- Make sure the product is operated in its permitted limitations.

- Do not exceed or undercut the permitted storage and operation temperature and pressure.

- The product should be maintained and calibrated frequently, at least annually.

General safety instructions

- It is not allowed to use the product in explosive areas.

- Please observe the national regulations before/during installation and operation.

Remarks

- It is not allowed to disassemble the product.

- Always use spanner to mount the product properly.

ATTENTION!

Measurement values can be affected by malfunction!

The product must be installed properly and frequently maintained, otherwise it may lead to wrong measurement values, which can lead to wrong results.

Storage and transportation

- Make sure that the transportation temperature of the device is between -30°C... 70°C.

- For transportation it is recommended to use the packaging which comes with the device.

- Please make sure that the storage temperature of the device is between 10°C... 40°C.

- Avoid direct UV and solar radiation during storage.

- For the storage the humidity has to be <90%, no condensation.

2. Application

The S 130 is a laser particle counter which is designed to measure particle in compressed air and gases within the permissible operating parameter. These parameter can be found in the technical data section.

The measurement values represent the particle counts per ft^3, l or m^3 or alternately in $\mu g/m^3$. Settings can be done through the optional integrated display (option), an external display or through the service kit.

The S 130 laser particle counter is not developed to be used in explosive areas. For the use in explosive areas please contact the manufacturer.

The S 130 laser particle counter is mainly used in compressed air systems in industrial environment.

3. Features

- Measures particle content in compressed air and other gases.

- Easy connection trough sampling hose and quick connector.

- Can be used for permanent or in portable applications.

- Measures particle sizes from 0.1... 5.0 µm (depending on model).

- Measures according to ISO 8573-4.

- Service and alarm indication through LED.

- Connectable to display and data logger of the manufacturer as well as third parties displays and control units.

- IP65 casing provides robust protection in rough industrial environment.

- Optional display directly on the sensor, showing the actual values.

4. Technical Data

4.1 General

CE	
Parameters	Particle counts per ft^3, l or m^3, selectable concentration µg/m^3
Principle of measurement	Laser detection
Sensor	LED-laser
Measuring medium	Compressed air and gases free of corrosive, aggressive, caustic and flammable constituents
Measuring range	A: 0.3... 0.5 µm; > 0.5 µm
	B: 0.2... 0.3 µm; 0.3... 0.5 µm; 0.5... 1.0 µm; > 1.0 µm
	C: 0.5... 1.0 µm; 1.0... 3.0 µm; 3.0... 5.0 µm; > 5.0 µm
	D: 0.5... 5.0 µm; > 5.0 µm
	E: 0.3... 0.5 µm; 0.5... 1.0 µm; 1.0... 5.0 µm; > 5.0 µm
Flow range	2.83 l/min
Sample rate	One sample per minute
Operating temperature	10°C... 40°C
Humidity of the meas. medium	< 40% rel. humidity, no condensation
Operating pressure	0.2... 0.8 MPa
Housing material	PC, Al alloy
Protection class	IP65
Dimensions	See dimensional drawing on the next page
Display (optional)	5" graphic display, 800 x 4800 pixels with touch interface
Weight	1.9 kg

4.2 Electrical Data

Power supply	24 VDC, 5 W

4.3 Output-Signals

Analogue output	4… 20 mA
Digital output	RS-485, Modbus/RTU
Alarm output	Relay, NO, 60V, 1A

4.4 Accuracy

Accuracy	A: 0.3 - 50% per JIS; > 0.3 - 100 % per JIS
	B: 0.2 - 50% per JIS; > 0.2 - 100 % per JIS
	C: 0.5 - 50% per JIS; > 0.5 - 100 % per JIS
	D: 0.5 - 50% per JIS; > 0.5 - 100 % per JIS
	E: 0.3 - 50% per JIS; > 0.3 - 100 % per JIS

5. Dimensional drawing
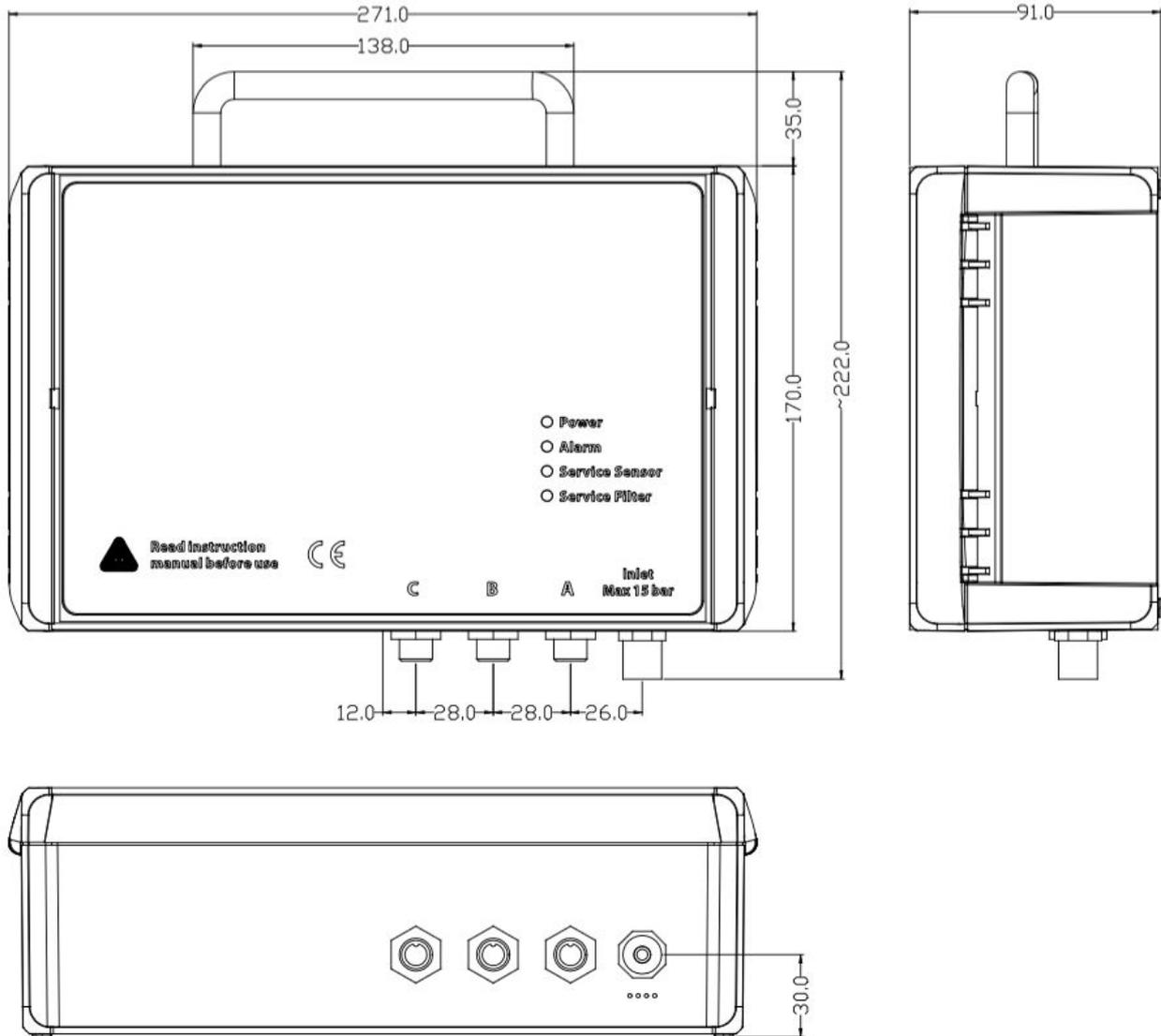
6. Installation

Please make sure that all components listed below are included in your package.

Qty	Description
1	S 130 laser particle counter
3	M12 connectors
1	1.5 m teflon hose with fast connector
1	Mounting brackets

1   Instruction manual

1   Calibration certificate

6.1 Installation Requirements

There is two versions of the S 130:

- S 130 for stationary use. The stationary version comes with four mounting brackets which can be mounted from the backside of the instrument at each corner. This allows an easy installation at a wall.

- S 130-P for portable use. The portable version comes in a transport case.

6.2 Installation Procedure

The following steps explain the procedure of an appropriate installation.
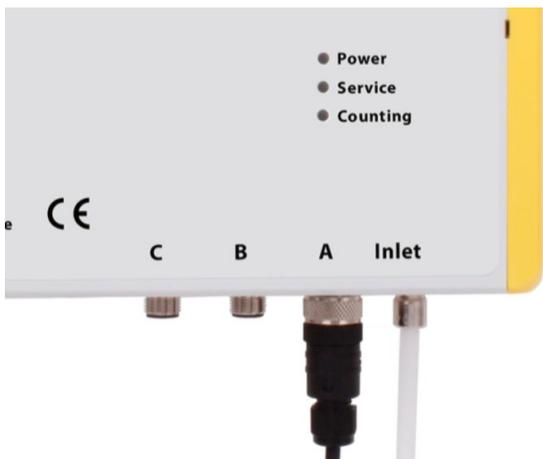
1. Connect the teflon hose with the inlet of the S 130 like shown in the picture.

2. Connect the other end of the teflon hose with a quick connector. The teflon hose with quick connector is used to connect the S 130 to the process.

Please consider the following recommendations for a successful measurement result:

- All components from the sampling point to the S 130 must oil and grease free.

- Ambient and gas temperature must be within the specified ranges.

- The inlet gas must be pressurized with the valid ranges.

- The sampling gas mus be dry (< 40% RH) and clean.

- Ensure that valves at the sampling point are not lubricated.

ATTENTION!

Avoid contamination with oil or grease!

It will lead to very slow measurement or impossible measurement results!

6.3 Electrical connection

Connection to the following external display units

S 130		Colour code	S 330 / 331		S 320	
Pin	**Signal**		**Terminal**	**Pin**	**Terminal**	**Pin**
A.1	SDI	brown	A	1	G	6
A.2 / B.2	$-V_b$	white		2		7
A.3 / B.3	$+V_b$	blue		3		8
A.4 / C.4	+D	black		4		
A.5 / C.5	-D	grey		5		
B.1	PE	brown		GND		
A.1	SDI	brown	B	1		
A.2 / B.2	$-V_b$	white		2		
A.3 / B.3	$+V_b$	blue		3		
A.4 / C.4	+D	black		4		
A.5 / C.5	-D	grey		5		
B.1	PE	brown		GND		

Connection to third party displays and control units

Connector	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5
A	SDI	$-V_b$	$+V_b$	+D	-D
B	PE	$-V_b$	$+V_b$	+I	-I
C	Relay	Relay	GND	+D	-D
	brown	white	blue	black	grey

Legend to pin assignment

SDI   Digital signal (internal use)

$-V_B$ Negative supply voltage

+V$_B$ Positive supply voltage

+I   Positive 4...20 mA signal

-I   Negative 4...20 mA signal

+D   RS-485, modbus / RTU

-D   RS-485, modbus / RTU

Rela   Alarm output
y

PE   Earth connection

GND Communication ground

7. Configuration

The S 130 is delivered with standard ex-work configuration or with specific customer settings according to the order.

Standard ex-work configuration

Scalin   : 4 mA = ?
g   20 mA = ?

Alarm   : NO, 32 VDC / 500 mA

Modbu : Device address = 130
s   Baudrate = 19200
           Framing/parity/Stop bit = 8, N, 1
           Transmission mode = RTU

7.1 Configuration without display

Other configurations as the ex-work configuration can be programmed by the service kit.
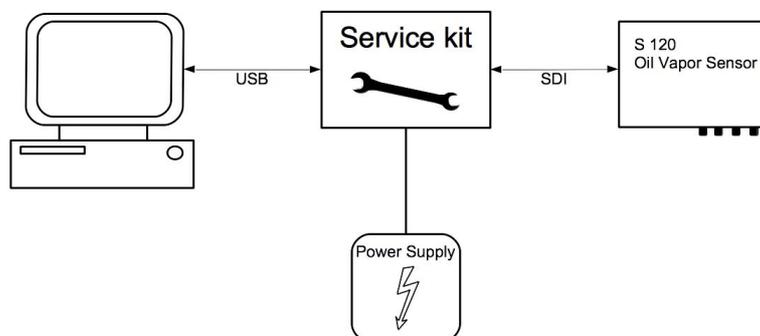
7.2 Configuration with external display

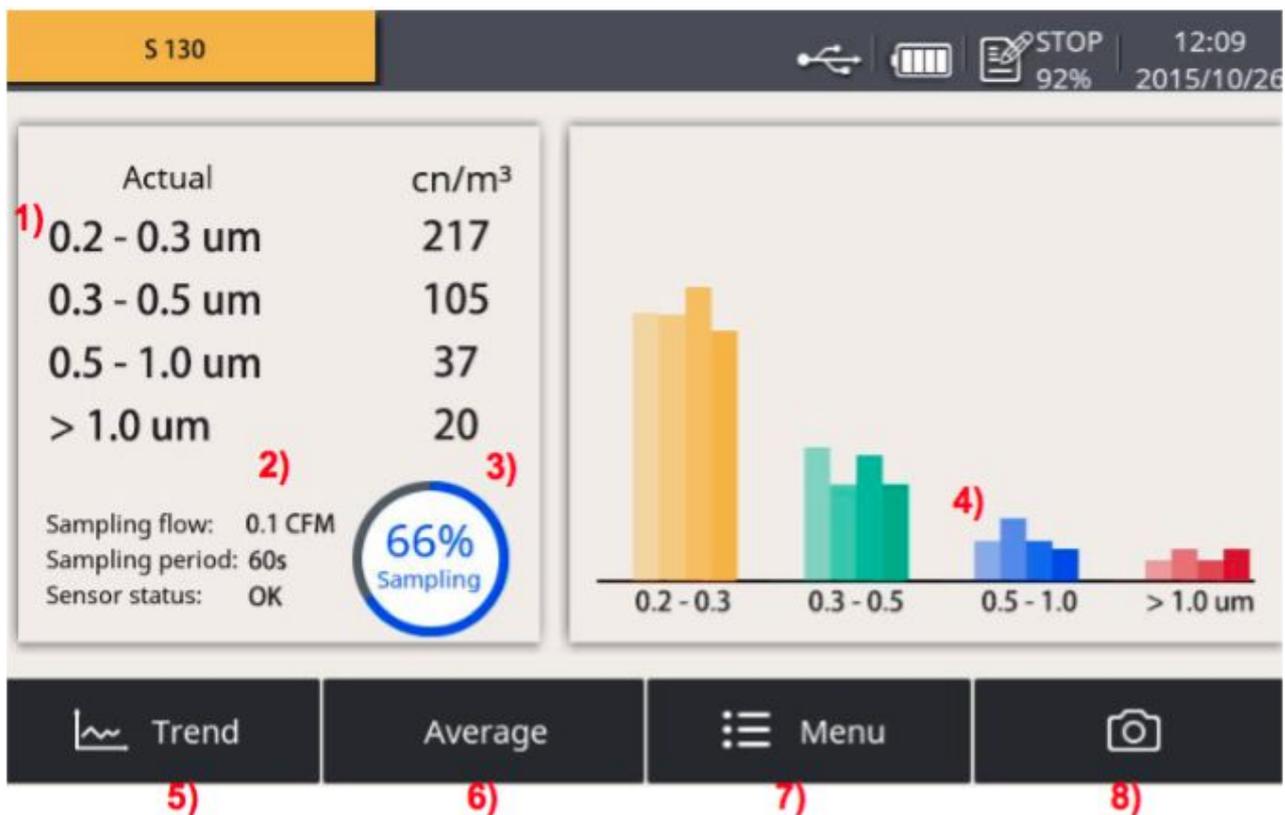Please see the instruction manual of the S 330/331.

7.3 Configuration with internal display

Please see sensor settings in the next chapter.

8. Operation with internal display

8.1 User interface

The screen below shows the user interface of the S 130.

1. On the left side the online measuring result is shown:
   - All sizing channels are listed with the actual sampling result.
   - The sampling status is displayed in terms of
     - **sampling flow** (0.1 CFM = 2.83 l/min)
     - **sampling period** (programmable between 10 sec to 10 min)
     - **sensor status**
   - Count down timer for the sampling period.
2. On the right side, the bar graph indicate the last 4 samples of each channel.
3. Press the "**Trend**" button to switch to the graphic screen

displaying the 4 channels and its values in a line diagramm.

4. Press the "**Average**" button to show the average value of the actual value.

5. Press the "**Menu**" button for further operations. Please see main menu in the next chapter.

6. Press the screenshot button to create an image of the current screen which is stored inside of the memory and can be read out through CSM-S software.

8.2 Main menu
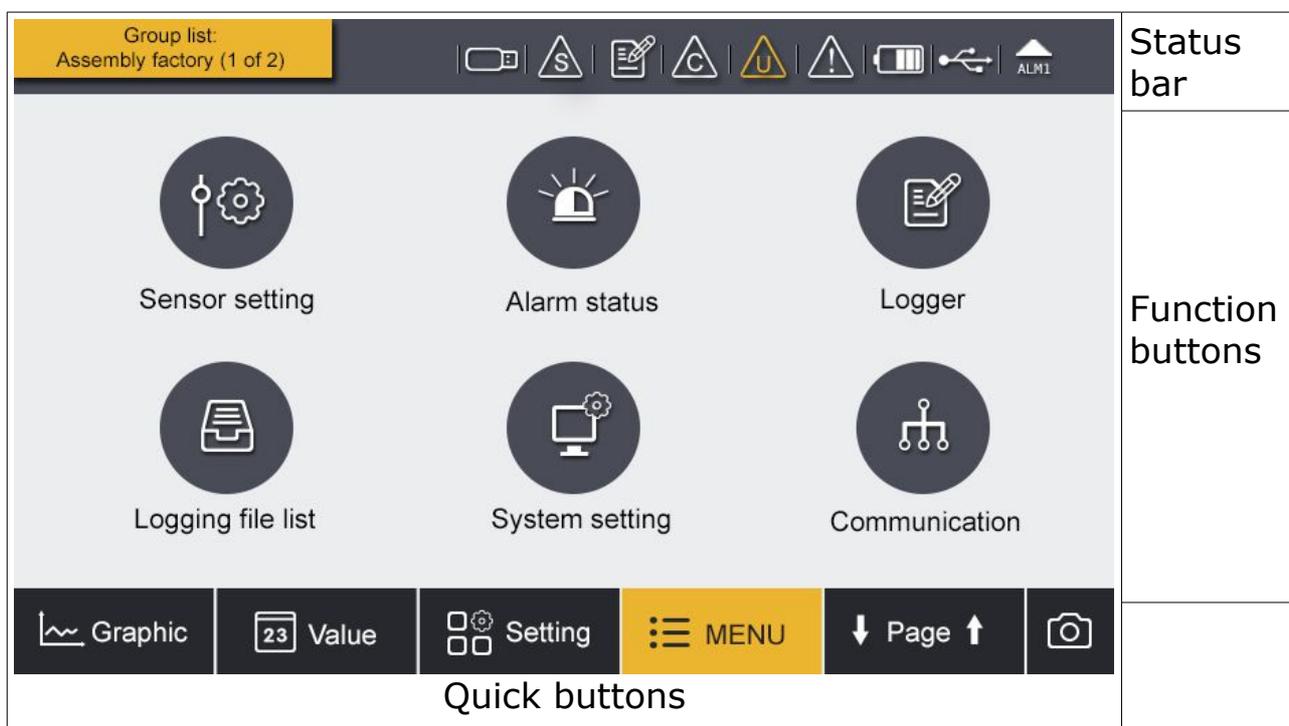
The menu consists of the following sub-menus:

Sensor settings	Settings related to the connected sensors.
Alarm status	Alarm settings and status.
Logger	data logger settings.
Logging file list	All recorded files and the memory status can be checked.
Service setting	Many different settings are under this menu.
Communication	Modbus master, field bus RS-485

8.3 Description of display icons in status bar
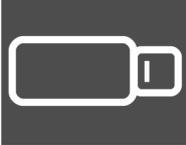
	USB stick connected
	Sensor connection has changed, not matching with configuration
	Logger version S 331
	Sensor calibration is expired
	Alarm triggered
	System error
	Sensor unit is not matching with configuration
	RTC backup battery status
	USB to PC connected
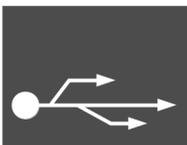
9. LED indication at front panel
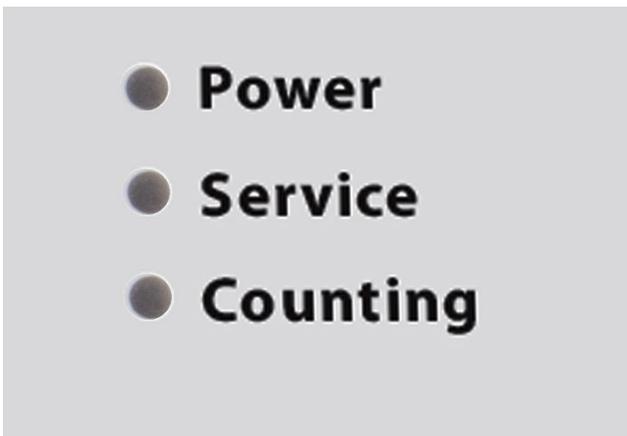
- Power LED on, indicate power supply is connected well.

- Service LED on, indicated the device needs to be serviced.

- Counting LED on, indicate the device is counting particle.

Please contact your retailer or the manufacturer in case of the Service LED is on.

10. Signal outputs

10.1 Analog output

The S 130 has an analog output range of 4... 20 mA. This output is scaled to:

- 4 mA = ??
- 20 mA = ??

10.2 Digital output

Modbus operation

Index	Channel description		Unit	Res.	Format	Length	Modbus address
0	Device status			1	UNIT32	R	6
1	Count channel	Channel 1	cn/m^3	1	FLOAT	R	8
2		Channel 2	cn/m^3	1	FLOAT	R	10
3		Channel 3	cn/m^3	1	FLOAT	R	12
4		Channel 4	cn/m^3	1	FLOAT	R	14
5	Weight channel	Channel 1	µg/m^3	0,001	FLOAT	R	40
6		Channel 2	µg/m^3	0,001	FLOAT	R	42
7		Channel 3	µg/m^3	0,001	FLOAT	R	44
8		Channel 4	µg/m^3	0,001	FLOAT	R	46
9	Original channel	Channel 1	Cn/2.83 l	1	UNIT32	R	80
10		Channel 2		1	UNIT32	R	82
11		Channel 3		1	UNIT32	R	84
12		Channel 4		1	UNIT32	R	86
13	Size of channel 1				ASCII string*	R	100
14	Size of channel 2				ASCII string*	R	102

15	Size of channel 3			ASCII string*	R	104
16	Size of channel 4			ASCII string*	R	106
17	Unit of count channel			ASCII string*	R	110
18	Unit of weight channel			ASCII string*	R	114
19	Unit if original channel			"cn/2.83 l"	R	118
20	Analog output scaling, 4mA			**	R / W	124
21	Analog output scaling, 20 mA			**	R / W	126
22	Analog output routing		1	UNIT16 **	R / W	128
23	Alarm threshold			**	R / W	130
24	Alarm routing		1	UNIT16 **	R / W	132

* The size of channel and the unit of channel is depending on the model (e.g. size: "0.3", "0.5".... , unit: "cn/m^3", "cn/l"....) . If the channel is not available in the model the string is null.

* The format is depending on routing.
*

* Program modbus address of wanted channel. For example if channel
* 2 with unit of µg/m^3 is selected as output, integer 42 should be
* write in.

Interpretation of system status

Bit	Description
0	Laser alert status: 0 = laser is good, 1 = laser alert
1	Flow alert status: 0 = flow rate is good, 1 = flow rate alert
2	Particle overflow status:

   0 = no overflow, 1 = instrument malfunction detected

3   Instrument service status:
   0 = working correctly. 1 = threshold exceeded

4   Particle threshold exceeded status:
   0 = threshold not exceeded, 1 = threshold exceeded

5   Alarm status
   0 = normal, 1 alarm triggered

10.3 Alarm output

The sensor has a relay output with a 60 V / 1 A rating. It is possible to monitor e.g. the particle content and give an alarm at a particular value.

11. Optional extra accessories

11.1 Sensor display (optional)

With the Sensor display it is possible to show the actual values, to change settings and it shows error messages.

11.2 Service kit

The diagram below shows the connection when using the optional service kit. Please ensure that also in this case the power supply of either S 130 or of the service kit is connected because the USB port is not supplying enough power.

12. Calibration

It is recommended to calibrate respectively adjust the sensor annually. For this please contact the manufacturer. Please check the date of the last calibration in the attached calibration certificate.

13. Maintenance

To clean the device and its accessories it is recommended to use moist cloth only.

ATTENTION!

Do not use isopropyl alcohol to clean the display!

14. Disposal or waste

Electronic devices are recyclable material and do not belong in the household waste.
The laser particle counter, the accessories and its packings must be disposed according to your local statutory requirements. The dispose can also be carried by the manufacturer of the product, for this please contact the manufacturer.

15. Warranty

SUTO provides a warranty for this product of 24 months covering the material and workmanship under the stated operating conditions from the date of delivery. Please report any findings immediately and within the warranty time. If faults occurring during the warranty time SUTO will repair or replace the defective unit, without charge for labour and material costs but there is a charge for other service such as transport and packing costs.
Excluded from this warranty is:

- Damage caused by:

  - Improper use and non-adherence to the instruction manual.

  - Use of unsuitable accessories.

  - External influences (e.g. damage caused by vibration, damage during transportation, excess heat or moisture).

The warranty is cancelled:

- If the user opens the measurement instrument without a direct request written in this instruction manual.

- If repairs or modifications are undertaken by third parties or unauthorised persons.

- If the serial number has been changed, damaged or removed.

Other claims, especially those for damage occurring outside the instrument are not included unless responsibility is legally binding.

Warranty repairs do not extend the period of warranty.

ATTENTION!

Batteries have a reduced warranty time of 12 month.

SUTO iTEC GmbH

Werkstr. 2

79426 Buggingen

Germany

Tel: +49 (0) 7631 936889-0

Fax: +49 (0) 7631 936889-19

Email: sales@SUTO-itec.com

Website: http://www.SUTO-itec.com

SUTO iTEC Co., Ltd.

Room 10, 6/F, Block B, Cambridge Plaza

188 San Wan Road, Sheung Shui, N.T.

Hong Kong

Tel: +86 (0) 755 8619 3164

Fax: +86 (0) 755 8619 3165

Email: sales@SUTO-itec.asia

Website: http://www.SUTO-itec.com

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