



# INSTRUCTION MANUAL

Particle measuring system

## pSYS

Version 1.6 / 30.06.2023

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# 1 Legal notice

## Warning concept

This manual contains information that you must observe for your personal safety and to prevent damage to property. Warnings are presented in decreasing order of hazard level as follows:

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### **DANGER**

Indicates a direct hazard for humans. Irreversible injuries or death will result if not observed.

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### **WARNING**

Indicates a recognizable hazard for humans. Irreversible injuries or death may result if not observed.

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### **CAUTION**

Indicates a recognizable hazard for humans or possible damage to property. May lead to reversible injuries or damage to property if not observed.

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### **ATTENTION**

Information on potential damage to property. May cause damage to property if not observed.

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**NOTE:** Under “Note”, you will find tips, recommendations, and useful information on specific actions and facts.

If several hazard levels occur, the warning for the highest level is always used. If the triangle warning against personal injury is used in a warning, then a warning against property damage can also be added to the same warning notice.

## Qualified personnel

The product associated with this documentation may only be handled by personnel qualified for the respective task. Furthermore, the product may only be handled in compliance with the associated documentation and the safety and warning instructions contained therein. Due to their training and experience, qualified personnel are equipped to recognize and avoid potential hazards when handling these products.

## Basic knowledge required

Knowledge of personal computers, operating systems, and programming is a prerequisite. General knowledge in the field of automation technology is recommended.

## Safety instructions

Before commissioning the product, be sure to read the safety regulations carefully and observe the corresponding information in the manual. Always keep the Instruction Manual within reach.

## Intended use

[in.hub](#) products may only be used for the applications specified in the corresponding technical documentation.

If third-party products and components are used, they must be recommended or approved by [in.hub](#).

Proper storage, setting up, assembly, installation, commissioning, operation, and maintenance are essential for the correct and safe operation of the product.

The permissible environmental conditions must be complied with. Information in the associated documentation must be observed.

## Trademarks

All names marked with the symbol “®” are registered trademarks. Other names in this document may be trademarks whose use by third parties for their own purposes may infringe on the rights of the owners.

## Disclaimer

The content of this publication has been checked for conformity with the hardware described. Nevertheless, discrepancies cannot be ruled out, so we do not assume any liability for its completeness and correctness. The information in this publication is reviewed on a regular basis. Any corrections needed will be included in the subsequent editions.

## 2 General information

This Instruction Manual contains all the information you need for commissioning and using the respective version of the pSYS particle measuring system.

The manual is intended for persons who commission the device themselves and connect it to other units (automation systems, mobile terminals, personal computers, etc.), as well as for service and maintenance technicians who install extensions or perform fault analyses.

### 2.1 Scope of delivery

1 x pSYS particle measuring system with  
5 sensor connections



5 x Particle sensors



5 x Cable for particle sensor (10 m)



1 x Temperature and humidity sensor  
with cable (10 m)



1 x Cold device cable



1 x Instruction Manual (PDF)

Optional: 5 x Sensor holder for particle sensor  
(13,25 € per sensor holder)



## 2.2 General instructions for use

in.hub GmbH assumes no liability for malfunctions of the device resulting from improper handling, mechanical damage, incorrect application, and use other than for the intended purpose. Improper handling of the device can significantly reduce the service life of the product.

## 2.3 Intended use

The devices are intended exclusively for use in the industrial sector and are used to monitor and control machines, systems, and processes. With the help of the connection options provided, process data can be recorded, processed, controlled, and analyzed.

## 2.4 Safety requirements

The product should be handled in accordance with the following DIN standards:

- DIN EN 61340-5-1:2017-07 Electrostatics – Part 5-1: Protection of electronic components against electrostatic phenomena – General requirements
- DIN EN 61010-1:2020-03 Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements
- DIN EN 60664-1:2008-01 Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements, and tests

## 2.5 Network Security

The LTE modem sends encrypted to the Telekom cloud. There is no connection to your internal network.

## 2.6 Disposal



The device must be disposed of properly. It does not belong in the normal household waste.

## 2.7 Service & Support

If you have any questions about specific use cases or about technical parameters, please contact us.

Mail: [service@inhub.de](mailto:service@inhub.de)

Phone: +49 371 335 655 00 (Technical Sales Staff)

These details will connect you with the appropriate contact.

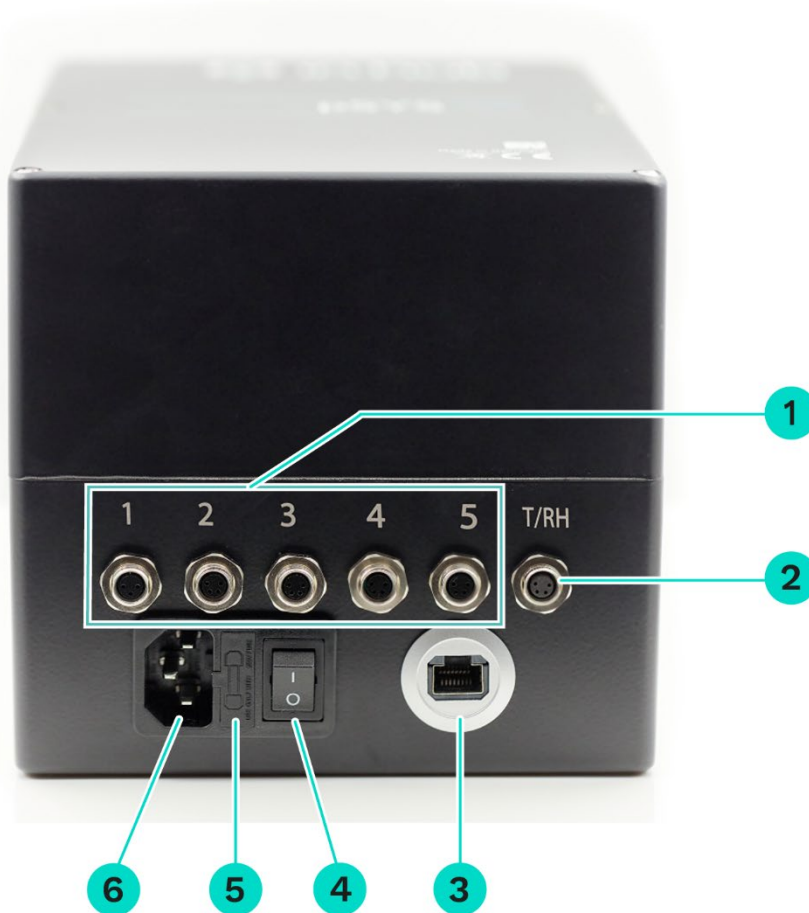
### 3 Product information

The particle measuring system pSYS is a plug & play solution for continuous and gapless detection and evaluation of dust concentrations of dust classes PM 1 to PM 10 at up to 5 measuring points.

Coordinated hardware and software components enable real-time data acquisition to interpret the values recorded from the sensor system with the integrated evaluation software and to illustrate the data in a dashboard for analysis purposes. Particle readings are recorded in PM 1.0, PM 2.0, PM 4.0 and PM 10.0 concentration and frequency. Furthermore, an additional sensor for temperature and relative humidity provides you with important information for the analysis of environmental conditions.

The data is transmitted wirelessly to a cloud environment. An intuitive user interface is available for visualization. Both live and historical data can be accessed in the cloud.

#### 3.1 Hardware - construction and connections



**Fig. 1: Front view of the pSYS measuring system**

<b>1</b>	Connection sockets for particle sensor 1 to 5
<b>2</b>	Connection socket for temperature and humidity sensor
<b>3</b>	Service interface
<b>4</b>	ON/OFF switch
<b>5</b>	Fuse
<b>6</b>	Connection socket for cold device cable (power supply) Supply voltage of 24 V ± 10 %

### **3.2 Software**

The pSYS particle measuring system is equipped with [in.hub's](#) own operating system SIINEOS. All necessary settings are already configured for you. Further adjustments can only be made by [in.hub](#).



## 4 Assembly and commissioning

The pSYS particle measuring system is designed for mounting in indoor industrial environments.

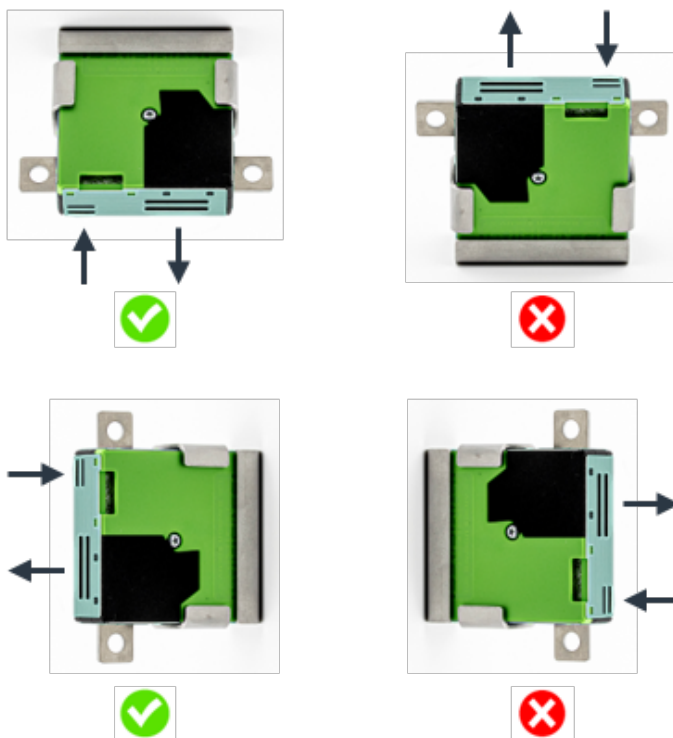
### ATTENTION

Mount the unit horizontally or vertically with the mounting tabs located on the housing above floor level to ensure safe use.

### 4.1 Mounting particle sensors in the measuring range

**NOTE:** For optimal measurement, mount the sensors close to the particle sources so that particle entrainment can occur through the intake duct.

1. Take a sensor bracket and press the sensor into the bracket with slight force. Observe the specified installation position when doing so:



**Fig. 2: Installation positions of the particle sensor**

The sensors hold due to the contact pressure of the sensor.

2. Plug the cable into the sensor to enable data transmission and power supply.



**Fig. 3: Connection of sensor cable to particle sensor**

The coding pins on the sides of the connector allow only one correct installation position.

#### 4.2 Mount a temperature and humidity sensor in measuring range

**NOTE:** Make sure that the sensor with the probe has free access to the environment and is not covered.

1. Attach the combination temperature and humidity sensor to the mounting holes provided diagonally on the housing:



**Fig. 4: Installation positions of the combination sensor for temperature and humidity**

2. Plug the cable into the sensor to enable data transmission and power supply.

### 4.3 Connecting sensors to the pSYS

**NOTE:** Screw the plugs of the sensor cables onto the connection sockets hand-tight to ensure error-free and continuous recording of the measured values.

1. Connect the cables of the particle sensors to the connection sockets **1** to **5**.
2. Connect the cable of the combination sensor for temperature and humidity into the **T/RH** connection socket.

### 4.4 Connecting pSYS to the power supply

1. Plug the power cable into the appropriate socket.
2. Switch on the device.

After 30 seconds, the device is ready for operation and starts recording and transmitting the measured values.

After successful commissioning, all measurement data are sent to the cloud at a time interval of 1 minute.

### 4.5 Accessing the cloud and displaying measured values

The data is transferred wirelessly to the cloud environment using the integrated LTE modem.

1. Enter the following cloud address: <https://inhubcloud.ram.m2m.telekom.com>

A login window opens.

2. Enter the access data included with the device.

The start page of the cloud, the cockpit, opens.

3. On the left side, click on **Groups (Gruppe)**.

The **Groups (Gruppe)** entry contains at least one folder for the site (i.e., multiple folders if there are multiple sites) and in this folder each particle measuring system is present as one entry.

4. Select the particle measuring system.

A standard dashboard opens with diagrams (so-called widgets) already preconfigured by [in.hub](https://in.hub), e.g., for the mean values. With correct commissioning, it takes approx. 2 minutes until the measured values are displayed.



**Fig. 5: Example of a dashboard in the Telekom Cloud (in German)**

You can edit the dashboard and, for example, change the name, customize the view, but also delete the dashboard or add more dashboards.

**NOTE:** For extended functionalities, e.g., the data explorer, you need special access rights that are not included in your standard user account. Contact us if you want to use additional functionalities.

**NOTE:** All functionalities and settings in the cloud, including dashboard customization, are provided by Telekom. For more information, please view the relevant instructions and tutorials provided by Telekom.

## 5 Technical data

<b>Data</b>	<b>Particle measuring system pSYS</b>
Memory	8 GB buffer memory for up to 48 h data security
Power supply	230 V $\pm$ 10 %, 24 V internal power supply unit
Measuring interval	Internal 1 x per second
Interfaces	1 x service interface, 1 x temperature and humidity sensor with 10 m cable length each, 5 x particle sensor
HMI	Cloud dashboard, characteristic curves, alarms, limits, reports, data storage 12 months in the cloud
Temperature range	Operation: 0 °C to 50 °C Storage: -40 °C to 85 °C
Humidity	Operation: 20 % to 90 % RH non-condensing Storage: 10% to 95% RH non-condensing
Operating system	SIINEOS
Housing	Plastic (ABS, polyurethane), flammability class according to UL 94 V0
Protection class	IP65
Dimensions (L x H x W)	250 mm x 160 mm x 150 mm
<b>Data</b>	<b>Temperature and humidity sensor</b>
Working range relative humidity Accuracy at 20 °C	10 ... 90 % RH $\pm$ 3 % rH (30...70 % rH), otherwise $\pm$ 5 % rH
Working range temperature Accuracy at 20 °C	-5 ... 55 °C $\pm$ 0,3 °C
Housing	Plastic (polycarbonate), flammability class according to UL 94 V0
Protection class	IP65

Data	Particle sensors
Mass concentration range	0 - 1000 $\mu\text{g}/\text{m}^3$
Particle classes and particle sizes	PM1.0 / PM2.5 / PM4.0 / PM10 0.3 $\mu\text{m}$ - 1.0 $\mu\text{m}$ / 2.5 $\mu\text{m}$ / 4.0 $\mu\text{m}$ / 10 $\mu\text{m}$
Mass concentration accuracy for PM1.0 and PM2.5	0 - 100 $\mu\text{g}/\text{m}^3 \pm 10 \mu\text{g}/\text{m}^3$ 100 - 1000 $\mu\text{g}/\text{m}^3 \pm 10 \%$ .
Accuracy of mass concentration for PM4.0 and PM10	0 - 100 $\mu\text{g}/\text{m}^3 \pm 25 \mu\text{g}/\text{m}^3$ 100 - 1000 $\mu\text{g}/\text{m}^3 \pm 25 \%$ .

**NOTE:** Also consider the operating instructions and data sheets of the respective sensors.

Particle sensors: <https://sensirion.com/de/produkte/katalog/SPS30/>

Humidity and temperature sensor:

<https://www.epluse.com/de/produkte/feuchtemesstechnik/hlk-messumformer/ee150/>

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