Datasheet Evaluation Kit EK-H4
For SHTxx Humidity and Temperature Sensors

- Ready to use Hard and Software
- Suitable for data-logging experiments
- Programmable Interface
- Dew Point and Energy Calculation
- Multiple Multiplexer boxes with Sensors

Product Summary

The evaluation kit EK-H4 is made for running Sensirion's humidity and temperature sensors and to display measured values. It is able to communicate with SHT1x, SHT7x, SHT2x, SHT3x, SHTC1 and SHTW2. The measured values will be displayed on the display of the EK-H4. The main purpose of the evaluation kit is to demonstrate the unique performance of Sensirion's humidity and temperature sensors without any own hard or software design work. Together with a computer and a dedicated

Viewer software (see sensirion.com/ek-h4) it may also be used as a data-logger for simple experimental measurements. The EK-H4 is connected to the computer via USB interface. The software may record and display humidity and temperature values as well as calculated values of dew point and absolute humidity. It is possible to connect multiple EK-H4 to different USB ports on the same computer and operate them through the same Viewer Software.
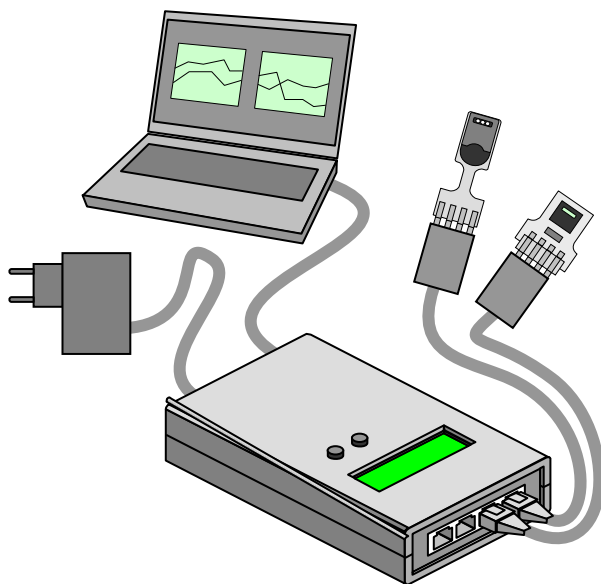

Figure 1 Schematic of the Evaluation Kit EK-H4. The Evaluation Kit works without connection to a computer it only needs a connection to the power socket. Optionally, the EK-H4 can be connected to a computer and operated through the Viewer Software.

Device Certification

The Evaluation Kit EK-H4 is RoHS and WEEE compliant.

EK-H4 Material Contents

The EK-H4 contains the following components, enclosed in a handy suitcase:

EK-H4 (Order no. 1-100661-02)	EK-H4 Flex (Order no. 1-101068-03)
4 x SHT31 sensors on **PCB** with connector	**4 x SHT31** sensors on **FPCB**
4 x SHT21 sensors on **PCB** with connector.	**4 x SHTC1** sensors on **FPCB**
4 x SHT71 sensors	**4 x SHTW2** sensors on **FPCB**
4 x sensor cables with RJ45 plug and **pin-type connector** for connecting sensors with multiplexer box of 3m length.	**4 x sensor cables** with RJ45 plug and **FPCB connector** for connecting sensors on FPCB with multiplexer box of 3m length.
1 EK-H4 multiplexer box: to connect up to 4 SHTxx Sensors	
1 USB cable for connection to computer.	
1 Power supply unit with US, EU, AU adapter	

EK-H4 Viewer Software is available from Sensirion's Webpage (www.sensirion.com/ek-h4).

Specification

Electrical specification:

Parameter		min	typ	max	Unit
External Supply	Input Voltage	8	9	10	V
	Input Voltage Ripple			0.5	V
	Supply Current		170	280	mA
USB Supply	Input Voltage	4.75	5	5.25	V
	Supply Current		170	280	mA
Sensor Supply Voltage	Range	1.8	3.0	3.6	V
	Resolution		0.1		V
	Accuracy		2	5	%
	Output current		40	110 [1]	mA
Temperature Resolution		11		14	Bit
Humidity Resolution		8		12	Bit
Measurement interval		1		1440	s
Communication	USB (via Virtual Com Port (VCP))				
Operating Temperature	0 to 50°C (multiplexer box) -20 to 70°C (cables, sensor)				

Default Configuration

After power-up two different voltages ranges (2.1V to 3.6V & 1.8V) can be chosen through the push button on the top of the evaluation kit.

Parameter		Default value
Sensor Supply Voltage		3.0 V
Temperature Resolution		12 Bit
Humidity Resolution		12 Bit
Measurement interval		1 s
Heater		off
OTP reload	SHT7x	on
	SHT2x	off

Power Supply

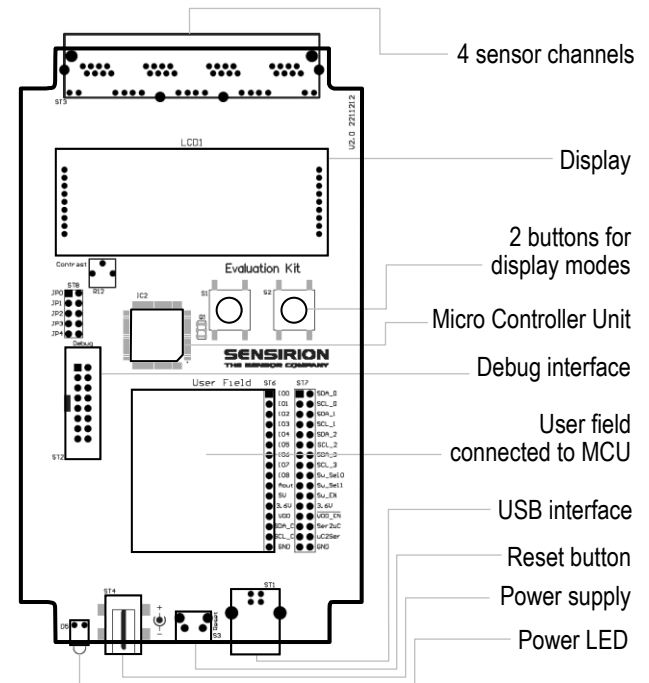| Used Connection	EK-H4 supplied from
DC	DC (9V)
DC and USB	DC (9V)
USB	USB (5V)

The EK-H4 may be supplied by DC Power Supply Unit at 9V or USB connection at 5V. Power supply by USB is only possible if USB driver is installed correctly.

	Pin	Name	Comment
	-	GND	Ground
	+	Positive Voltage	9V Supply

[1] short circuit current

Table 1 DC Power Supply: Pin Diagram

EK-H4 Circuit Board

- 4 sensor channels
- Display
- 2 buttons for display modes
- Micro Controller Unit
- Debug interface
- User field connected to MCU
- USB interface
- Reset button
- Power supply
- Power LED

EK-H4 Pin Assignment
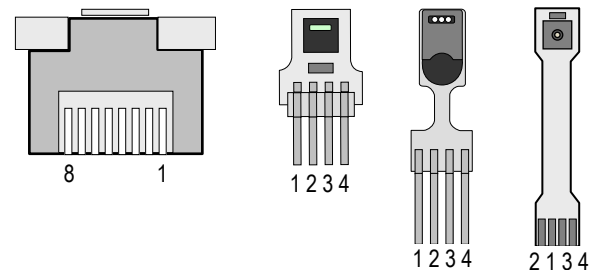
RJ45 Pin	Sensor Pin	Name	Description
1	3	VSS	Ground
3	1	SCL	Serial clock
5	2	VDD	Supply voltage
7	4	SDA	Serial data

Table 2 Pin Assignments: Female RJ45 pin diagram on the left – SHTxx on PCB, SHT71 and SHTxx on FPCB sensors on the right of the upper panel.

LED Functions

LED		Function
Power LED		LED off denotes low supply voltage (DC < 8V, USB < 4.75V) or not connected.
RJ45 Connector	Green LED	Sensor detected
	Orange LED	Measurement is in progress

EK-H4 Users Guide

1   Evaluation Kit Features

The Evaluation Kit EK-H4 may be used as a stand-alone device, displaying measured values on the screen on the multiplexer box or – connected to a computer – as a data-logger run by the Sensor-viewer software.

The stand-alone device displays temperature and humidity values of each connected sensor plus dew-point derived from the two measured values.

Besides the above mentioned values the data-logger software displays calculated absolute humidity and power consumption. Furthermore, it is possible to change the acquisition interval (see section 4.7), switch the in-built heater on and activate a fast conversion mode (see section 4.9). Eventually measured data can be exported for data processing.
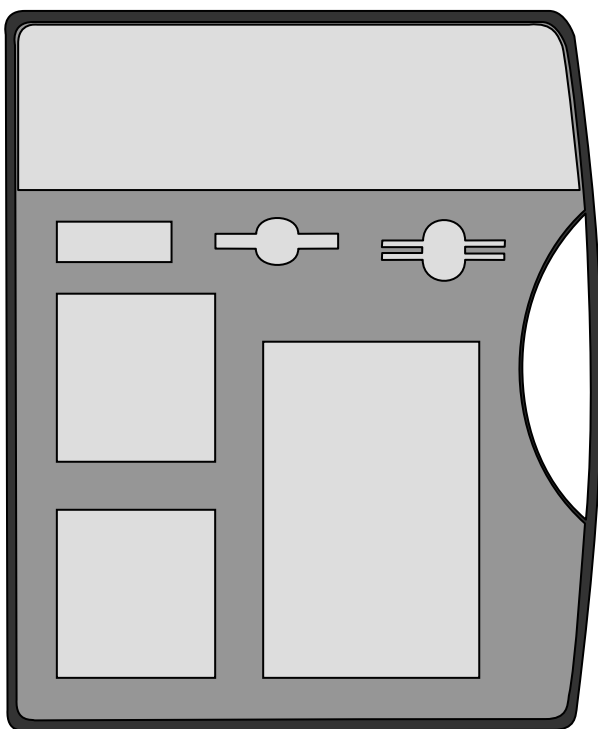
2   EK-H4 Suitcase

Figure 2   Schematic of the EK-H4 suitcase highlighting its content

3   Stand-Alone Evaluation Kit

3.1   Getting Started

Set up and application of the stand-alone device is straight forward:

1. Select multiplexer box, power supply cable, sensors with sensor cables as many as needed.

2. Connect sensors via sensor cables to the multiplexer box.

3. Choose appropriate voltage range for the connected sensors

4. Connect multiplexer box via power supply cable to power (voltage supply also may occur via USB cable from a computer). Please note: The specific plug needs to be connected to the power supply cable – the plastic protection cap on cable side must be removed before connecting the plug.

5. As soon as the green LED light is shining, the measurement starts automatically.
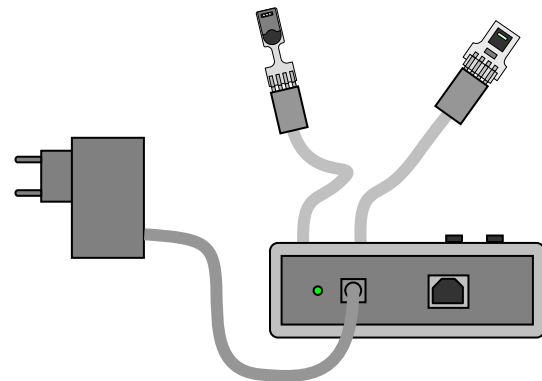

Figure 3   Stand-Alone Evaluation Kit. Voltage supply to be set in the range of AC 80 … 250V.

3.2   Display Information

After powering the EK-H4 as standalone measurement tool the screen shows following information:

```
        Sensirion
     Evaluation Kit
       for SHTxx
       EKH4 V3.0
```

The first screen shows an overview over the connected sensors. The second screen (accessed through the push buttons) shows a detailed information of the connected sensor. In the first row the sensor number, which can be matched with the printed number on the cover, is visible. In the second column the temperature is displayed in °C. The third column shows the relative humidity. Not connected sensor ports are displayed with "--.-- ".

```
1       25.45°C      45.32%RH
2       --.--°C      --.--%RH
3       24.98°C      46.27%RH
4       25.71°C      45.46%RH
```

Figure 4   Overview Screen of the EK-H4 multiplexer box

By pressing the buttons the displayed information can be switched from all sensors to the respective single sensors:

Right button: Sensor 1 → 2 → 3 → 4 → all → 1

Left button: Sensor 4 → 3 → 2 → 1 → all → 4

The displayed information by choosing only one sensor is as following:

```
Sensor 1:        SHT7x
Temperature:     25.45°C
Humidity RH:     45.32%
Dew Point:       16.76°C
```

Figure 5   Individual screen for each connected sensor

If no sensor is connected to the chosen port, the sensor designation is replaced with "no sens".

To execute a self test for testing the sensor ports and voltage supply both buttons must be pressed for longer than one second. For a successful self test each port requires a sensor to be connected. If no sensor is connected the corresponding port will show an error.

```
Sens 1: OK       3: OK
Sens 2: OK       4: OK
Sensor Supply      : OK
EKH4 Supply        : OK
```

By pressing one of the buttons the display information will switch back to the measurement.

4   Data-Logger with Software

Using the EK-H4 system as a data-logger requires the installation of the read-out software on a computer and connecting multiplexer box and computer via USB cable. Prior to this a driver installation may be necessary.

4.1   EK-H4 Driver Installation

Connect the EK-H4 multiplexer box to the computer via USB cable. EK-H4 uses a Silicon Laboratories CP210x USB to UART bridge controller. If a driver for this controller is not installed yet, a dialog pops up which helps you to search for a driver on the internet. Alternatively, the driver software may be installed from the EK-H4 memory stick.

4.2   Read-Out Software Installation

EK-H4 read-out software requires the .NET framework 4.5.2 or later. If it is not already installed on the computer, it may be downloaded from

Microsoft .net Web Installer Version 4.5.2.

To install the EK-H4 software, simply copy the EK-H4 folder from the memory stick to the hard drive of the computer.
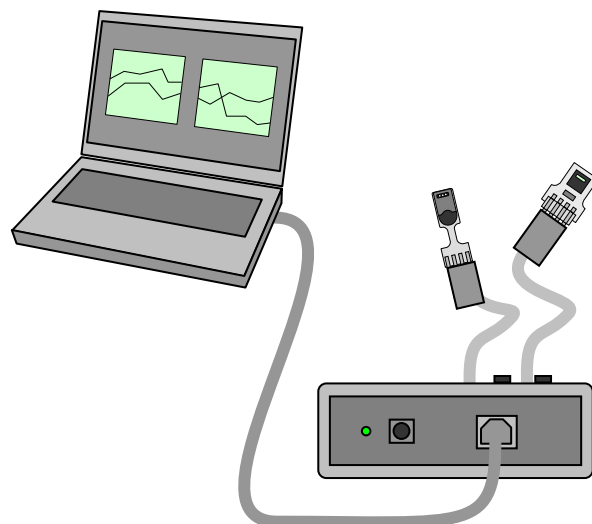

Figure 6   EK-H4 configuration with connection to read-out software on computer. No additional power supply is needed.

4.3   Starting a Measurement

Connect the EK-H4 multiplexer box with a USB cable to the computer and then start the software by double-clicking on **EK-H4_Viewer_VXY_Installer.exe**. The connect dialog displays the COM ports to which EK-H4 multiplexer boxes are connected – see Figure 7.

After clicking OK, a connection to the multiplexer box is established and the sensors are listed in the *Sensor Select* and *Measurement Data* sections – see Figure 8.
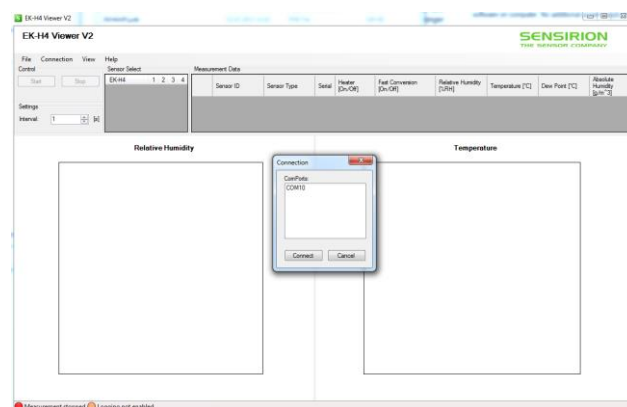

Figure 7   Connect dialog of read-out software. Window in the center displays COM ports with multiplexer boxes connected.

4.4   Multiple EK-H4 Devices

EK-H4 read-out software is able to read sensors from various EK-H4 multiplexers. The different systems are selected via connect dialog at start-up or using the menu item *Connection*. To disconnect EK-H4 systems use the menu item *Connection/Disconnect*. The connected Evaluation Kits are displayed under the Sensor Select section.
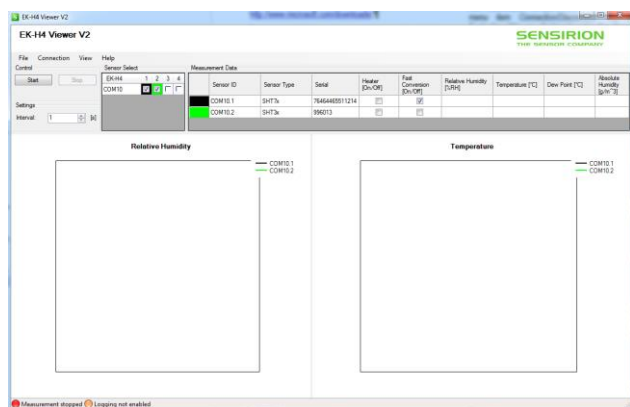
Figure 8 EK-H4 software window before measurement starts. Sensors are displayed in different colors.

4.5 Temperature and Humidity Measurement

Measurements are started and stopped by the *Start/Stop* button. The measured data are displayed in the *Measurement Data* table. The measurements which are displayed in this table can be selected in the context menu which appears when the right mouse button is clicked on the table.

Two plots are available, which display the progress of a measurement over time. The measurement can be selected in the list below the plot. The scale of the axes can be altered by pressing the left mouse button on the axis and moving the mouse. The plot can be dragged using the left mouse button. The right mouse button can be used to display a context menu, which offers functions to print or copy the plot, or to set auto-scale options for the axes.
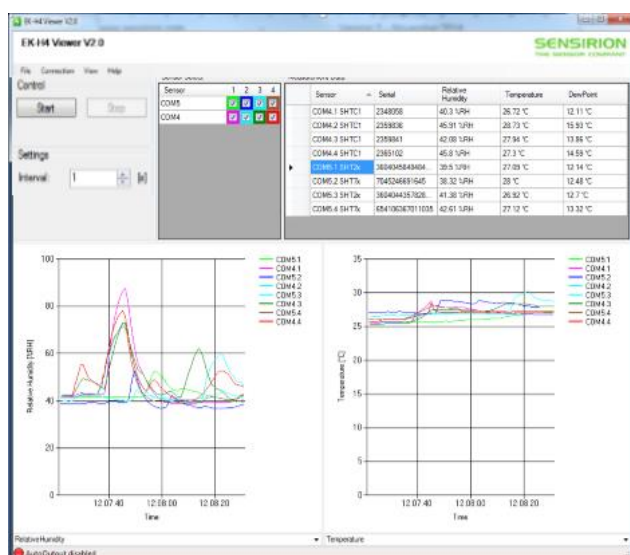

Figure 9 Software surface during measurement. Displayed values may be selected via menus at the bottom of the window.

4.6 Calculated Values

Relative humidity and temperature data are measured by the sensors. From this data **dew point** and **absolute humidity** values are derived.

4.7 Settings

In the settings section the measurement interval can be chosen. The default configuration is 1 second.

4.8 Data Logging and Data Export

The data displayed in the measurement plots is kept in memory. The measured values can be exported to a CSV file using the menu item *File/Log to file*. The measurement data can be cleared under the menu item *View/Clear Graph*.

4.9 Heater and Fast Conversion

Behind every sensor there are two tick boxes, one to activate the in-built heater and one to activate a fast conversion mode.

The **heater** can be used as a simple functional test. After switching on the heater, the temperature of the sensor should increase, while the humidity signal should drop. Please note that the heater power is different for every SHTxx sensor. Additionally, the temperature elevation that can be achieved through the in-built heater depends on the temperature itself (at higher ambient temperature a smaller temperature increase is achieved), the operating voltage (higher operating voltages lead to higher temperature increases) and on the thermal coupling of the sensor to the environment.

The **fast conversion** mode activates a different measurement command which has a higher noise level. For SHT1x, SHT7x and the SHT2x series a measurement with a lower resolution is started. While for the SHT3x series the repeatability is changed to the low repeatability mode. The default command (tick box not active) issues a measurement command with the smallest noise level (high resolution or high repeatability mode), except for the SHT1x/SHT7x series, where the low resolution mode is active per default.

4.10 Firmware Update

Starting from firmware version 2.4 (see section 3.2 on how to read out the firmware version) it is possible to update the firmware through the Viewer Software. If you have a EK-H4 box with version below 2.4 you can use the Viewer software Version 2, which is available from our webpage. It does support the functions (Heater, Fast Conversion and Firmware Update Function).

In Order to open the update window go to the Help Tab and click on "Update Firmware EK-H4 box".
To update the firmware perform the following steps:

1. Check the firmware version of the EK-H4 box
2. Download EK-H4 firmware (.hex file) from Sensirion's Webpage (sensirion.com/ek-h4) and store on the desktop
3. Power the EK-H4 with the external power supply
4. Disconnect the EK-H4 that you want to update (go to the connection tab and click on Disconnect, then choose the correct Com Port)
5. Open the Update window. Go to the Help Tab and click on "Update Firmware EK-H4 box".
6. Choose the correct com Port of the EK-H4 which connects to the EK-H4 that you want to update
7. Select the new EK-H4 firmware (.hex-File) with the „Browse" Button from the desktop
8. Press "Update"

Error handing: In the case that the EK-H4 was not disconnected prior to opening the update window an error message will be shown, when the com port is selected (step 6). If this happens close the Update window and perform step 4 or unplug the USB cable and plug it in again.

4.11 Firmware compatibility

- Firmware 2.4 and higher operates with Viewer 3.0
- Firmware 2.3 and lower can be operated with the Viewer V2

4.12 Sensor and EK-H4 Properties

Information about the sensors such as the serial number is shown behind each sensor in the Measurement Data Section.

4.13 License Information

The EK-H4 viewer software uses the NPlot charting library, to which the following license applies:

****
NPlot - A charting library for .NET
Copyright (C) 2003-2006 Matt Howlett and others.
All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.

2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

3. Neither the name of NPlot nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

Revision History

Date	Version	Page(s)	Changes
August 2009	1.0	1 – 7	Initial release
May 2010	1.1	2	Operating temperature ranges are defined – replacement for storage conditions
May 2015	2	all	Added SHT3x, Updated description to Viewer Software 3.0
June 2015	3	4	Updated .net framework instructions
July 2015	4	1,2	Combined EK-H4 and EK-H4 Flex
August 2016	5	1	Replaced SHTW1 on FPCB by SHTW2 on FPCB

SENSIRION
THE SENSOR COMPANY

Important Notices

Warning, Personal Injury

Do not use this product as safety or emergency stop devices or in any other application where failure of the product could result in personal injury. Do not use this product for applications other than its intended and authorized use. Before installing, handling, using or servicing this product, please consult the data sheet and application notes. Failure to comply with these instructions could result in death or serious injury.

If the Buyer shall purchase or use SENSIRION products for any unintended or unauthorized application, Buyer shall defend, indemnify and hold harmless SENSIRION and its officers, employees, subsidiaries, affiliates and distributors against all claims, costs, damages and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if SENSIRION shall be allegedly negligent with respect to the design or the manufacture of the product.

ESD Precautions

The inherent design of this component causes it to be sensitive to electrostatic discharge (ESD). To prevent ESD-induced damage and/or degradation, take customary and statutory ESD precautions when handling this product.
See application note "ESD, Latchup and EMC" for more information.

Warranty

SENSIRION warrants solely to the original purchaser of this product for a period of 12 months (one year) from the date of delivery that this product shall be of the quality, material and workmanship defined in SENSIRION's published specifications of the product. Within such period, if proven to be defective, SENSIRION shall repair and/or replace this product, in SENSIRION's discretion, free of charge to the Buyer, provided that:

- notice in writing describing the defects shall be given to SENSIRION within fourteen (14) days after their appearance;

- such defects shall be found, to SENSIRION's reasonable satisfaction, to have arisen from SENSIRION's faulty design, material, or workmanship;
- the defective product shall be returned to SENSIRION's factory at the Buyer's expense; and
- the warranty period for any repaired or replaced product shall be limited to the unexpired portion of the original period.

This warranty does not apply to any equipment which has not been installed and used within the specifications recommended by SENSIRION for the intended and proper use of the equipment. EXCEPT FOR THE WARRANTIES EXPRESSLY SET FORTH HEREIN, SENSIRION MAKES NO WARRANTIES, EITHER EXPRESS OR IMPLIED, WITH RESPECT TO THE PRODUCT. ANY AND ALL WARRANTIES, INCLUDING WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE EXPRESSLY EXCLUDED AND DECLINED.

SENSIRION is only liable for defects of this product arising under the conditions of operation provided for in the data sheet and proper use of the goods. SENSIRION explicitly disclaims all warranties, express or implied, for any period during which the goods are operated or stored not in accordance with the technical specifications.

SENSIRION does not assume any liability arising out of any application or use of any product or circuit and specifically disclaims any and all liability, including without limitation consequential or incidental damages. All operating parameters, including without limitation recommended parameters, must be validated for each customer's applications by customer's technical experts. Recommended parameters can and do vary in different applications.

SENSIRION reserves the right, without further notice, (i) to change the product specifications and/or the information in this document and (ii) to improve reliability, functions and design of this product.

Headquarters and Subsidiaries

SENSIRION AG
Laubisruetistr. 50
CH-8712 Staefa ZH
Switzerland

phone: +41 44 306 40 00
fax: +41 44 306 40 30
info@sensirion.com
www.sensirion.com

Sensirion Taiwan Co. Ltd.
phone: +41 44 306 40 00
info@sensirion.com

Sensirion Inc., USA
phone: +1 805 409 4900
info-us@sensirion.com
www.sensirion.com

Sensirion Japan Co. Ltd.
phone: +81 3 3444 4940
info-jp@sensirion.com
www.sensirion.co.jp

To find your local representative, please visit
www.sensirion.com/contact

Sensirion Korea Co. Ltd.
phone: +82 31 337 7700~3
info-kr@sensirion.com
www.sensirion.co.kr

Sensirion China Co. Ltd.
phone: +86 755 8252 1501
info-cn@sensirion.com
www.sensirion.com.cn