

# Sensistor ISH2000

## HYDROGEN LEAK DETECTOR



Publication: INFICON AB - nipa60e1-a (1202) - All information can be modified without prior notice

## Technical Reference Manual



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# Introduction

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Sensistor ISH2000 Technical Reference Manual

## Detailed content

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## A 100 Introduction to the Sensistor ISH2000 series

Sensistor ISH2000 can be purchased in one of three versions. A desktop model (Sensistor ISH2000), a battery operated model (Sensistor ISH2000C), and a panel mount model (Sensistor ISH2000P).

### Sensistor ISH2000



Figure A-1: Sensistor ISH2000

Sensistor ISH2000 is equipped with a number of powerful functions making it very easy to integrate in a semi or fully automatic test system. The functions range from output of all necessary status signals and printer/communication port to an advanced Active Probe Control system (APC). This makes the detector capable of controlling advanced sample collecting devices down to simple test fixtures.

### Sensistor ISH2000C



Figure A-2: Sensistor ISH2000C

The battery operated model, Sensistor ISH2000C, has all the Sensistor ISH2000 features apart from the APC system. This means that only passive probes (for example Hand Probe P50) can be used. The battery, a Li-ion battery at 14.8 V, can not support the current required to operate external probes. Sensistor ISH2000C will operate for 14 hours on a fully charged battery with screensaver and mute function. One hour charging will give about one hour of operating time.

### Sensistor ISH2000P



Figure A-3: Sensistor ISH2000P

The panel mount model, Sensistor ISH2000P, has identical features of the Sensistor ISH2000. The difference is that the Sensistor ISH2000 can be installed in

the operator's panel or any other flat surface. Also it operates on +24 VDC. Mounting brackets and a panel rubber seal are delivered with the detector.

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## A 300 Sensor Technologies working principle

### Sensor Technology

The Sensistor ISH2000 leak detector is using SENSISTOR sensor technology inside. SENSISTOR sensor technology uses an extremely sensitive hydrogen gas sensor based on a microelectronic field effect transistor (MOS-FET).

The gas sensitivity appears when hydrogen absorbs into the sensor through a metal alloy (metal hydride) layer.

Only hydrogen can diffuse into the metal and this makes the sensors practically insensitive to other substances that do not contain free hydrogen molecules.

The signals from the sensors are processed by a microprocessor which also controls the sensor temperature with high accuracy, and other sensor diagnostics in order to ensure perfect functionality. It also automatically compensates for background gas.

## A 400 Testing methods

### To Detect leaks

If all you wish to do is to detect the presence of a leak, that is, find out whether there is a leak or not, then use the Detection Mode (or use the detection bar in Combined Mode). The definition of Leak/No Leak will then simply be "A leak is a leak when it can be detected by the detector, set to a specific sensitivity".

To set up:

The operation in Detection Mode is not quantitative. The audio and visual signal will increase and decrease with the gas concentration. Therefore, there is no actual calibration to be done, but rather a setting of the sensitivity to a desired level.

A typical set-up procedure for Detection Mode is:

- Set up a reference leak which corresponds to the smallest leak you wish to detect.
- Put the probe close to the reference leak and note approximately what reaction you get (no reaction, small, medium, high, full scale) within the first few seconds.
- Set the sensitivity. This can be done permanently under the menu Detection Mode Settings or temporarily as a Direct Sensitivity Adjustment on the display (unless you have set this function to OFF under the Detection Mode Settings menu).

There is also an Auto ranging function which can be selected under the Detection Mode Settings menu.

**Note:** If the Detection Mode is used and the alarm function is required to be activated at a particular calibrated level, then the unit must be calibrated in accordance with the instructions, see "Calibrate the leak detector" on page 17.

The reason for this is that the alarm is based on the Analysis Mode when the Detection Mode is displayed.

### To Locate Leaks

**Note:** The Detection Mode (or use the detection bar in Combined Mode) is used to locate leaks. This mode is semi-quantitative, that is, it gives an audio and visual signal which increases as a leak is approached (a higher gas concentration) and decreases as you move the probe away from the leak. It does not display figures. In this mode of operation leaks can easily be detected using a sensitivity which can be preset.

Leaks can be located very accurately, even when there are other leaks nearby. If, for example, you are trying to locate a leak on a product and the product has a major leak, then you will get an audio signal as soon as the probe is placed close to the product.

When the probe is moved around and over the product, the signal will increase as the probe approaches the leak. If the signal goes out of scale, simply reduce the sensitivity setting to bring the signal within the scale. Working with the sensitivity setting this way you will be able to locate multiple leaks that are in close proximity to each other.

**Note:** Working inside a confined space such as, for example, a cabinet or a narrow passage on a combustion engine there is a risk that the background concentration accumulates to levels close to the upper detection limit of the detector. In such case it will not be possible to locate leaks as easily as in open spaces.



**Hint:** It is good practice to detect a leak, locate it, and immediately remove the probe to avoid saturation. The probe is not damaged by the exposure but it will recover more slowly. After excessive exposure it will be less sensitive for a short period of time.

## To Quantify Leaks

The Analysis Mode (or use the analysis figures in Combined Mode) is used for measuring the size of a leak (or the concentration of a gas sample). To be able to do this measurement and obtain correct values, the instrument must first be calibrated using the calibration function.

In the Analysis Mode the detector determines the gas concentration from the change, as the probe goes from being exposed to background to being exposed to a certain gas concentration. The detector does not continuously monitor the gas concentration but takes just one reading instead. Another suitable alternative name for this mode could be Sampling Mode. It is important to keep this in mind when using the detector in this mode.

In Analysis Mode the probe should be moved directly from a background situation to the test point. The size of the leak in PPM, or any other selected units, is shown on the display. The probe can and should be removed from the measuring point as the measured value steadies and remains on the display. The period during which the measured value is displayed can be adjusted in the Analysis Mode Settings menu.

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## A 401 About Hydrogen

When pure hydrogen gas is released in air its flammability range spans from 4% to 75% of hydrogen in air. Below 4% there is insufficient chemical energy available for a flame to occur. Above 75% hydrogen there is not enough oxygen left to support a flame. When, for example, a mixture of less than 5.5 % hydrogen in nitrogen mixes with air there is not sufficient energy to support a flame, irrespective of the ratio of air-to-gas. When a mixture of more than 5.5 % hydrogen in nitrogen is released into air there is a region of ratios of air-to-gas where the mixture is flammable. When, for example, a mixture of 10% hydrogen in nitrogen mixes with air there is still very little energy available. Only in exceptional circumstances can a flame be self-supporting. However, such mixtures cannot detonate.

Hydrogen can be stored and transported as either a gas a cryogenic liquid.

The tracer gas is standard welding gas of industry quality, easy to obtain at low cost. The generic name is Forming Gas.

## A 600 Options

Which options for which model?

	Sensistor ISH2000	Sensistor ISH2000 C	Sensistor ISH2000 P
Table model	•		
Portable model			•
Panel model		•	
Hand probe P50	•	•	
3 m C21 cable	•	•	
Power supply cable	•		
Battery recharger		•	
Carry case		•	
Probe control port	•		•

## A 700 Sensistor ISH2000 Components

### Sensistor ISH2000

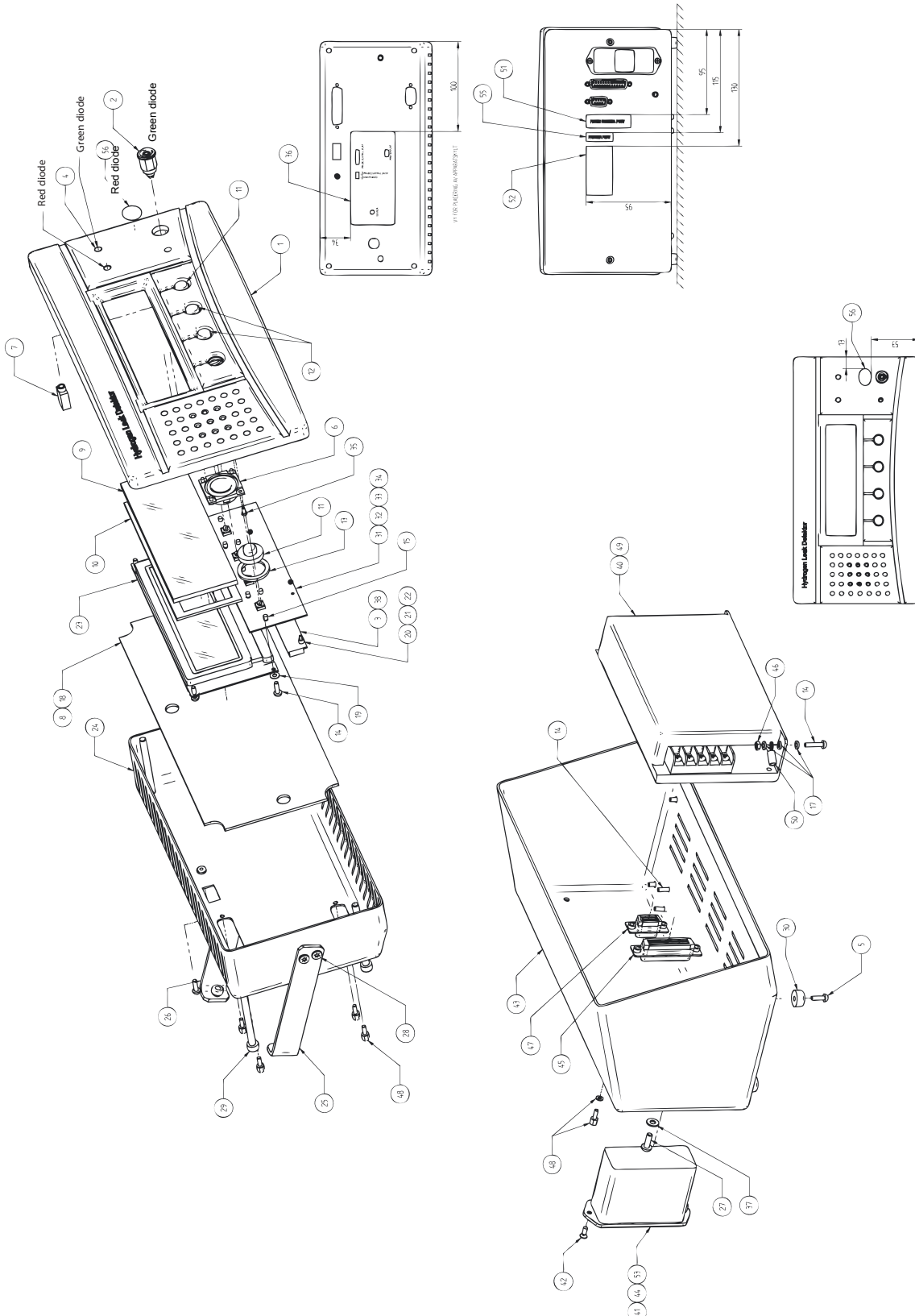


Figure A-4: Sensistor ISH2000 components

Sensistor ISH2000 components according to Figure A-4: on page 12.

Position	P/N	Position	P/N	Position	P/N
1	598-170	21	591-493	41	591-812
2	591-770	22	591-499	42	591-607
3	591-496	23	591-494	43	598-167
4	591-771	24	598-166	44	591-578
5	591-533	25	591-502	45	591-774
6	591-773	26	591-503	46	591-013
7	591-779	27	591-487	47	591-777
8	591-780	28	591-488	48	591-538
9	598-121	29	591-490	49	591-781
10	591-501	30	591-786	50	591-772
11	591-500	31	591-497	51	598-177
12	591-515	32	591-796	52	591-809
13	598-043	33	591-797	53	591-577
14	591-791	34	591-798	54	591-317
15	591-790	35	591-787	55	598-173
17	591-775	36	598-174	56	591-810
18	591-778	37	591-266	57	591-017
19	591-532	38	591-527	58	591-142
20	591-492	40	591-482		



Sensistor ISH2000C components according to Figure A-5: on page 14.

Position	P/N	Position	P/N	Position	P/N
1	598-170	19	591-532	36	598-174
2	591-770	20	591-492	37	591-266
3	591-498	21	591-493	38	591-527
4	591-771	22	591-499	39	598-178
5	591-533	23	591-494	40	591-782
6	591-773	24	598-166	41	591-328
7	591-779	25	591-502	42	591-452
8	591-780	26	591-503	43	591-806
9	598-121	27	591-298	44	591-327
10	591-501	28	591-488	45	598-172
11	591-500	29	591-490	46	591-538
12	591-515	30	591-786	48	591-785
13	598-043	31	591-497	49	591-807
14	591-791	32	591-796	50	598-173
15	591-790	33	591-797	51	591-777
17	591-775	34	591-798	52	591-810
18	591-778	35	591-787	53	591-810

## Sensistor ISH2000P

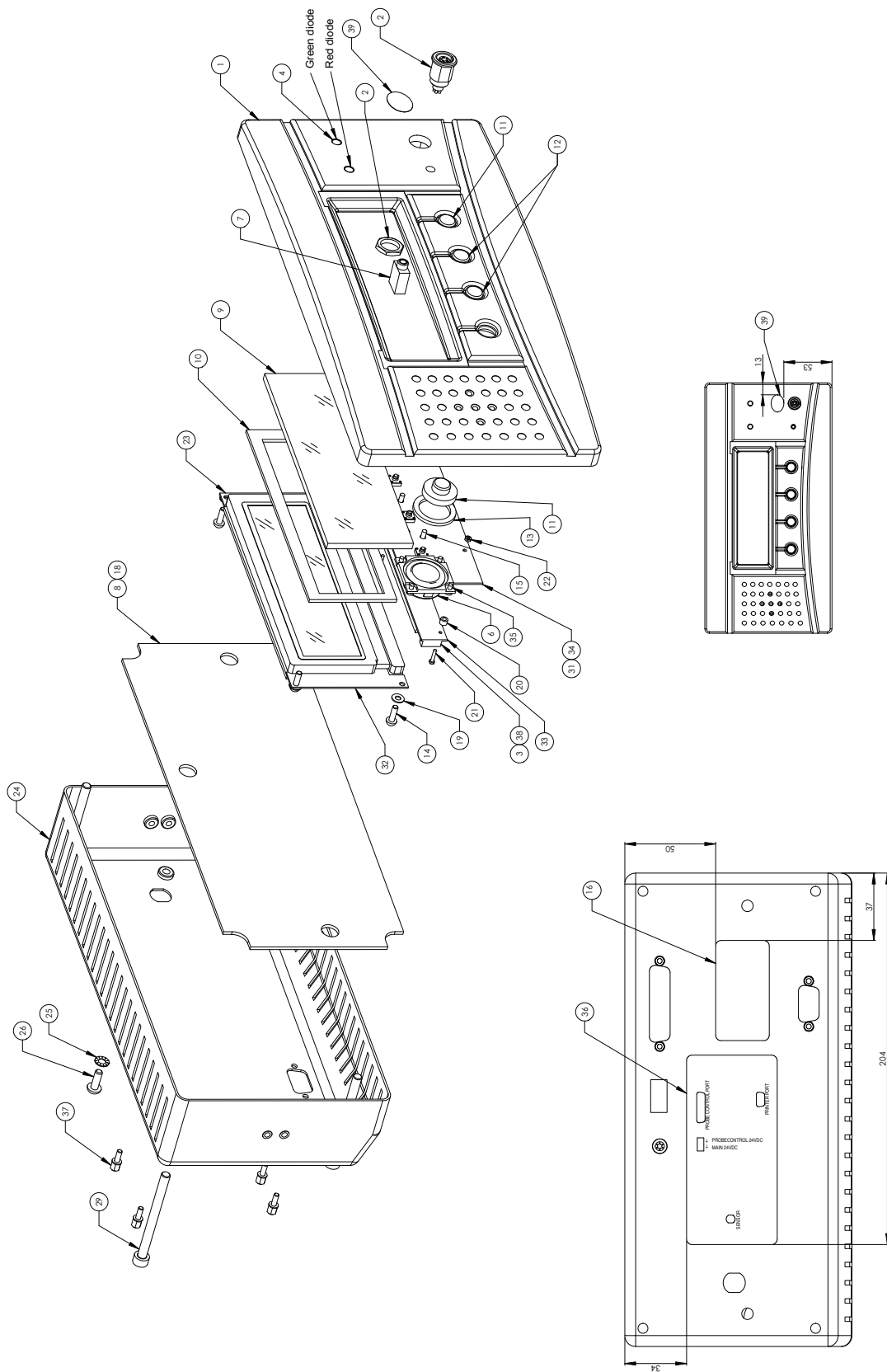


Figure A-6: Sensistor ISH2000P components



Sensistor ISH2000P components according to Figure A-6: on page 16.

Position	P/N	Position	P/N	Position	P/N
1	598-170	14	591-791	29	591-490.
2	591-770	15	591-790	31	591-497
3	591-498	16	591-808	32	591-796
4	591-771	18	591-778	33	591-797
6	591-773	19	591-532	34	591-798
7	591-779	20	591-492	35	591-787
8	591-780	21	591-493	36	598-174
9	598-121	22	591-499	37	591-538
10	591-501	23	591-494	38	591-527
11	591-500	24	598-166	39	591-810
12	591-515	25	591-776		
13	598-043	26	591-298		

## A 701 Spare parts and accessories

### AP29ECO Sampling Probe

For automatic leak testing of entire products or parts of products. Can also be used for testing permeability of materials.



<b>Part No:</b>	<b>590-035</b>
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### AP55 Sniffer Probe

For fast manual leak location in hard to-reach places. Active probe that sniffs the sample air past the hydrogen sensor in the probe tip.



<b>Part No:</b>	<b>590-550</b>
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### AP57 Counter Flow Probe

For leak detection in enclosed spaces or in environments with a high background level of tracer gas. An adjustable air flow from the probe tip provides a protective air curtain against tracer gas in the surroundings.



<b>Part No:</b>	<b>590-555</b>
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## P50 Hand Probes

Hand Probe P50 with rigid neck.



<b>Part No:</b>	<b>590-780</b>
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With a flexible neck. Facilitates leak detection in hard-to-reach places.



<b>Part No:</b>	<b>590-790</b>
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## H65 Insert Sensor

Replaces the standard hand probe in automated tests.



<b>Part No:</b>	<b>590-250</b>
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## Probe Tip Protection Cap and filter

For Hand Probes P50 and P50-FLEX.

<b>Part No:</b>	<b>591-273 (Probe Tip Protection Cap, set of 50)</b> <b>590-625 (Probe Tip Protection Cap, set of 500)</b> <b>591-234</b>
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## Combox

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Probe adapter for AP29ECO, H65, AP55 and AP57.



<b>Part No:</b>	<b>590-820</b>
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## C 21 Probe Cables

In various lengths for comfortable leak detection in every situation.



<b>Part No:</b>	<b>590-161 (3m)</b> <b>590-175 (6 m)</b> <b>590-165 (9 m)</b> <b>590-163 (4 m, spiral)</b> <b>590-164 (6 m, spiral)</b>
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## Reference Leaks

Large and small, with certificate, for calibration and function tests of the Sensistor ISH2000.



<b>Part No:</b>	<b>590-420</b>	<b>Type A</b>	<b><math>5 \times 10^{-2}</math> atm ml/s</b>
	<b>590-421</b>	<b>Type B</b>	<b><math>5 \times 10^{-3}</math> atm ml/s</b>
	<b>590-422</b>	<b>Type C</b>	<b><math>5 \times 10^{-4}</math> atm ml/s</b>
	<b>590-427</b>	<b>Type D</b>	<b>10 g/a R134a</b>
	<b>590-429</b>	<b>Type G</b>	<b>3 g/a R134a</b>

## Power cables

Power cables for Sensistor ISH2000

<b>Part No:</b>	<b>591-146 (Power cable eu)</b> <b>591-147 (Power cable uk)</b> <b>591-853 (Power cable us)</b>
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## Fuse

2 A slow for Sensistor ISH2000

<b>Part No:</b>	<b>591-578</b>
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## Carrying case

For Sensistor ISH2000C	
	
<b>Part No:</b>	<b>591-329</b>

## Battery charger

For Sensistor ISH2000C	
<b>Part No:</b>	<b>591-795</b>

## Hand Probe sensor

Sensor, for sensor replacement on P50 Hand Probe.	
	
<b>Part No:</b>	<b>590-292</b>

## Mounting kit

For Sensistor ISH2000P including Brackets and seals.	
<b>Part No:</b>	<b>590-810</b>

## Phoenix connector to Sensistor ISH2000P

For Sensistor ISH2000P, power connection.	
<b>Part No:</b>	<b>591-792</b>

## O-ring seal

For Sensistor ISH2000P.	
<b>Part No:</b>	<b>591-528</b>

## A 800 Sensistor ISH2000 - Technical specifications

### Power supply specifications

Power	Sensistor ISH2000	Sensistor ISH2000C	Sensistor ISH2000P
AC mains voltage	100-240 V 50/60Hz.		-
AC mains voltage to the charger		100-240 V50/60 Hz	-
AC mains current	Typically 1 A (2 A pulse at power on).		-
AC mains current to the charger		Typically 300 mA	-
Fuse	2 A slow/ 250 VAC.	-	-
Nominal battery voltage	-	16.1 VDC (nominal). The unit will shutdown at approx. 12VDC, and will be operational at approx. 14VDC	-
Operating time	-	8 h	-
Charging time	-	6.5 h	-
Power supply voltage	-	-	24 VDC
Power supply current	-	-	3 A max

### Input and output connections

Type	Sensistor ISH2000	Sensistor ISH2000C	Sensistor ISH2000P
<b>General</b>			
Power input connector	AC input connector, IES 320.	Charger input connector, 2.1 x 5.5 mm std. Positive centre.	4 pin Phoenix MC 1.5/5.81 Series Detachable screw terminal.
<b>Probe control port inputs</b>			
Minimum pulse length	40 ms	-	40 ms
Input impedance	50k ohm	-	50k ohm
Input maximum range	-34 to +38 VDC	-	-34 to +38 VDC
Input high	> 12.0 VDC	-	> 12.0 VDC
Input low	< 8.0 VDC	-	< 8.0 VDC
<b>Probe control port outputs</b>			
Output current	max 0.5 A/output, max 2.5 A total	-	max 0.5 A/output, max 2.5 A total
Inductive loads	External clamp diodes recommended	-	External clamp diodes recommended
Low stage voltage	Max 1.5 VDC	-	Max 1.5 VDC

Type	Sensistor ISH2000	Sensistor ISH2000C	Sensistor ISH2000P
Short circuit protection	Thermal and electronic	-	Thermal and electronic
Output high	22-24 VDC	-	> (Supply voltage – 2.5 VDC)
Output low	< 1.5 VDC	-	< 1.5 VDC

#### Serial communication port

Connector	9-pol D-sub male	9-pol D-sub male	9-pol D-sub male
Standard	RS232	RS232	RS232

#### Probe control/Status port

Connector	25-pin D-sub female	9-pin D-sub female	-
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## Miscellaneous specifications

Misc	Sensistor ISH2000	Sensistor ISH2000C	Sensistor ISH2000P
Protection (IEC529)	IP64 (front), IP32 (back)	IP63 (in carrying case)	IP64 (front), IP32 (back)
Net weight	3.9 kg (8.6 lb)	4.0 kg (8.8 lb) 4.9 kg (10.8) incl. case, probe and charger	1.8 kg (4.0 lb)
Overall dimensions	275 x 155 x 170 mm (11 x 6 x 7 inches)	275 x 190 x 170 mm (11 x 7 x 7 inches)	275 x 140 x 75 mm (11 x 6 x 3 inches)
Environment temperature	0-50°C	0-50°C	0-50°C
Environment humidity	10-90% RH	10-90% RH	10-90% RH

## Gas sensing specification (In Detection Mode)

Selected unit	Sensitivity
mbar/s air (using 5% H <sub>2</sub> /95% N <sub>2</sub> as Tracer Gas)	1 x 10 <sup>-7</sup> mbar/s
g/a R143a (using 5% H <sub>2</sub> /95% N <sub>2</sub> as Tracer Gas)	0.02 g/a



## Gas sensing specification (In Analysis Mode)

Selected unit	Sensitivity	Measurement range	Linearity	Repeatability
ppm (H <sub>2</sub> )	0.5 ppm	0.5 - 2000 ppm (0.2%)	Typ. ± 15% of reading (within 0.1 - 10 x calibration point in range 0.5 - 100 ppm)	Typ. ± (10% of reading + 0.3 ppm)
mbarl/s air (using 5% H <sub>2</sub> / 95% N <sub>2</sub> as Tracer Gas)	$5 \times 10^{-7}$ mbarl/s	$5 \times 10^{-7}$ - $4 \times 10^{-2}$ mbarl/s	Typ. ± 15% of reading (within 0.1 - 10 x calibration point in range $1 \times 10^{-5}$ - $2 \times$ $10^{-3}$ mbarl/s)	Typ. ± (10% of reading + $3 \times 10^{-7}$ mbarl/s)
g/a R143a (using 5% H <sub>2</sub> /95% N <sub>2</sub> as Tracer Gas)	0.2 g/a	0.2 - 8300 g/a	Typ. ± 15% of reading (within 0.1 - 10 x calibration point in range 0.2 - 420 g/a)	Typ. ± (10% of reading + 0.1 g/a)

## A 900 Dimensions

### Sensistor ISH2000

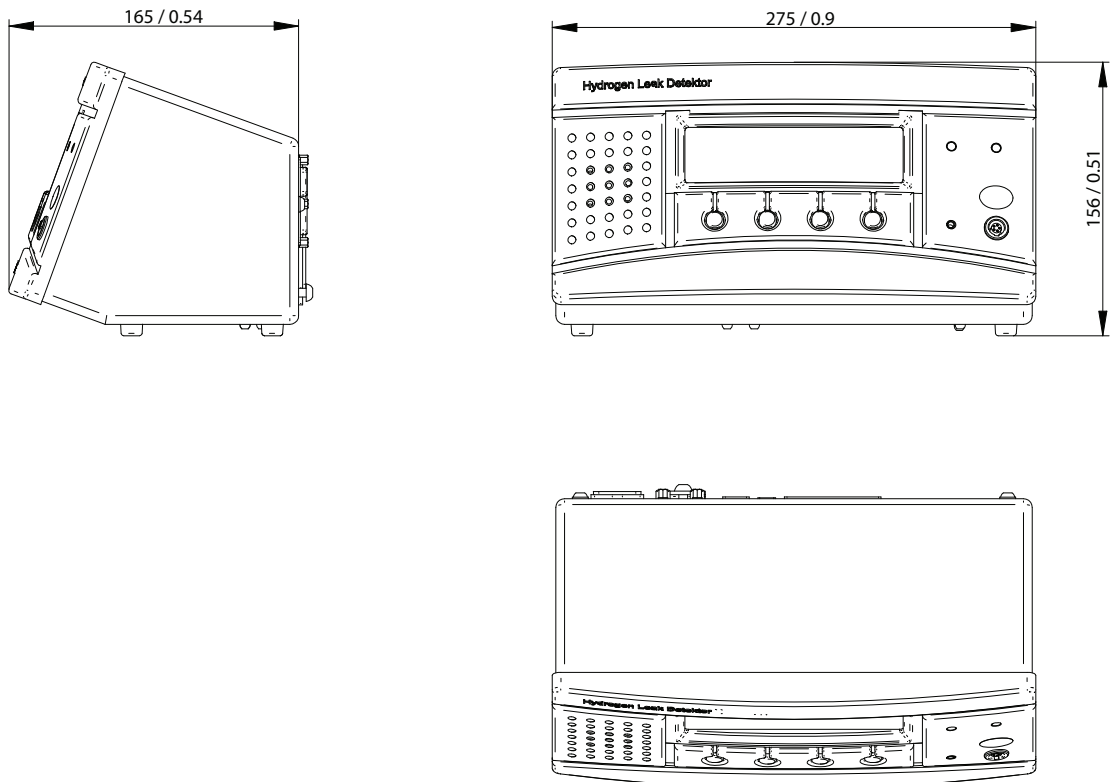


Figure A-7: Sensistor ISH2000 dimensions

## Sensistor ISH2000C

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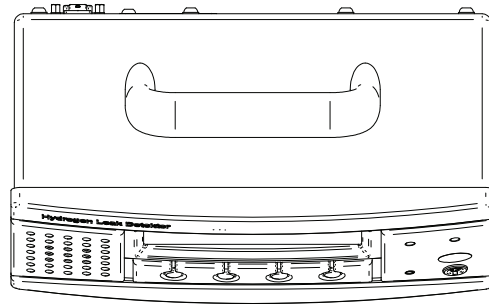
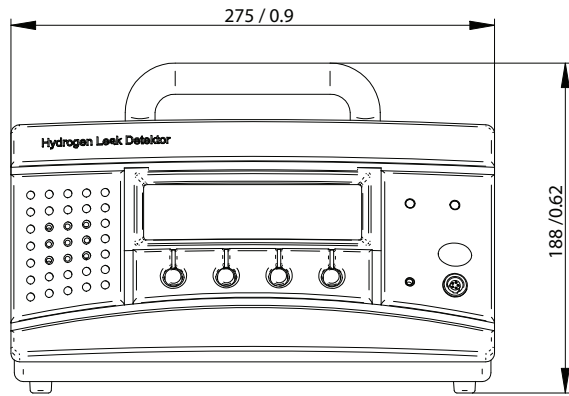
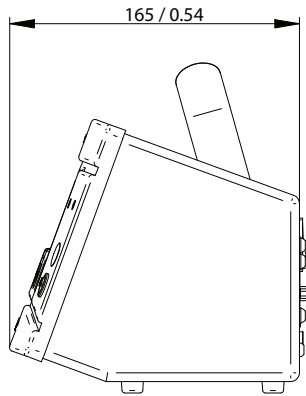


Figure A-8: Sensistor ISH2000C dimensions

## Sensistor ISH2000P

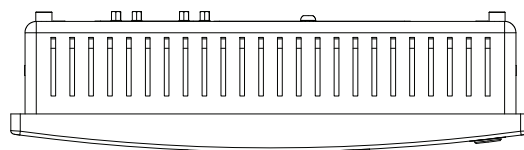
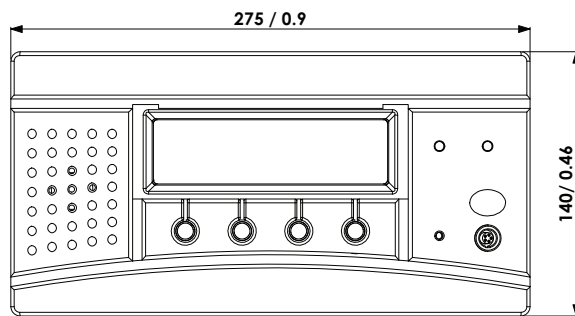
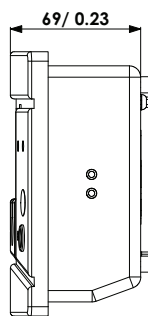


Figure A-9: Sensistor ISH2000P dimensions



# Installation

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Sensistor ISH2000 Technical Reference Manual

## Detailed content

B 100

***Safety***

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B 110

***Storage - transportation***

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B 210

***Connecting the detector to the installation***

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B 300

***Controlling the detector with the I/O interface***

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B 310

***Controlling the detector with a PC computer through RS 232***

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B 310


***Connecting the detector directly to a printer or another device***


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## B 100 Safety instructions

The normal risks associated with working with all compressed gases must be considered.


	Indicates a potentially hazardous situation which, if not avoided, could result in property damage.
	Indicates a potentially hazardous situation which, if not avoided, could result in moderate or minor injury. It may also be used to alert against unsafe practices.
	Indicates a potentially hazardous situation which, if not avoided, could result in death or severe injury.
	Indicates an imminently hazardous situation that, if not avoided, will result in death or severe injury (extreme situations).

 **WARNING!**  
Pure hydrogen is a flammable gas. Only use ready-made Hydrogen Tracer Gas of 5% Hydrogen in Nitrogen. This is a standard industrial gas mixture used in various industrial applications.  
**Note:** Whenever the word Hydrogen is used in this manual it implies that the hydrogen gas is safely mixed with Nitrogen in the proportions 5% H<sub>2</sub> - 95% N<sub>2</sub>.

 **WARNING!**  
Since the tracer gas mix contains no oxygen, releasing large amounts of gas in a confined space may lead to asphyxiation.

 **WARNING!**  
Compressed gases contain a great deal of stored energy. Always carefully secure gas bottles before connecting pressure regulator. Never transport gas bottle with the pressure regulator fitted.

Before connecting tracer gas: confirm that the connectors or test object is designed for working at the test pressure.

 **WARNING!**  
Pressurising objects at too high pressures can result in a burst object. This in turn can result in serious injury or even death.  
Never pressurise objects that have not previously been burst tested or otherwise approved for the chosen test pressure.

### Leak detector label

Located at the back of the Sensistor ISH2000, a label indicates the electrical specifications of the leak detector and its serial number.

## B 110 Supplies and storage

### Supplies

The following parts are supplied with your detector:

<b>Sensistor ISH2000</b>	<b>Sensistor ISH2000C</b>	<b>Sensistor ISH2000P</b>
Detector unit	Detector unit	Detector unit
Hand Probe P50. Optional P50-Flex	Hand Probe P50. Optional P50-Flex	Brackets
Probe cable C21	Probe cable C21	Screws
Power cable (the power cable is country specific and may differ)	Battery charger (the bat- tery charger are country specific and may differ).	O-rings seal
User manual	User manual	User manual
User manual CD	User manual CD	User manual CD
Product return form	Product return form	Product return form
Sample Kit Probe Tip Prot	Sample Kit Probe Tip Prot	Phoenix contact
	Case	

### Storage

For prolonged storage, factors such as temperature, humidity, saline atmosphere, etc. may damage the detector elements.

Please call your local representative for further information.

## B 210 Connecting the detector to the installation

### Ports and connections Sensistor ISH2000

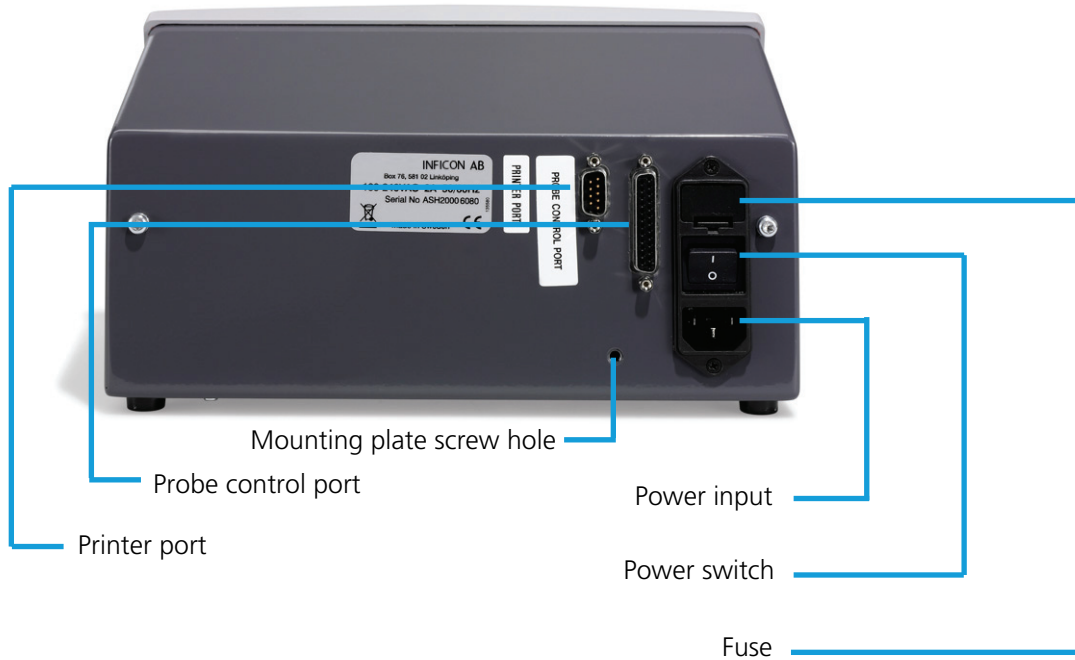


Figure B-1: Sensistor ISH2000 back panel

### Sensistor ISH2000 connections

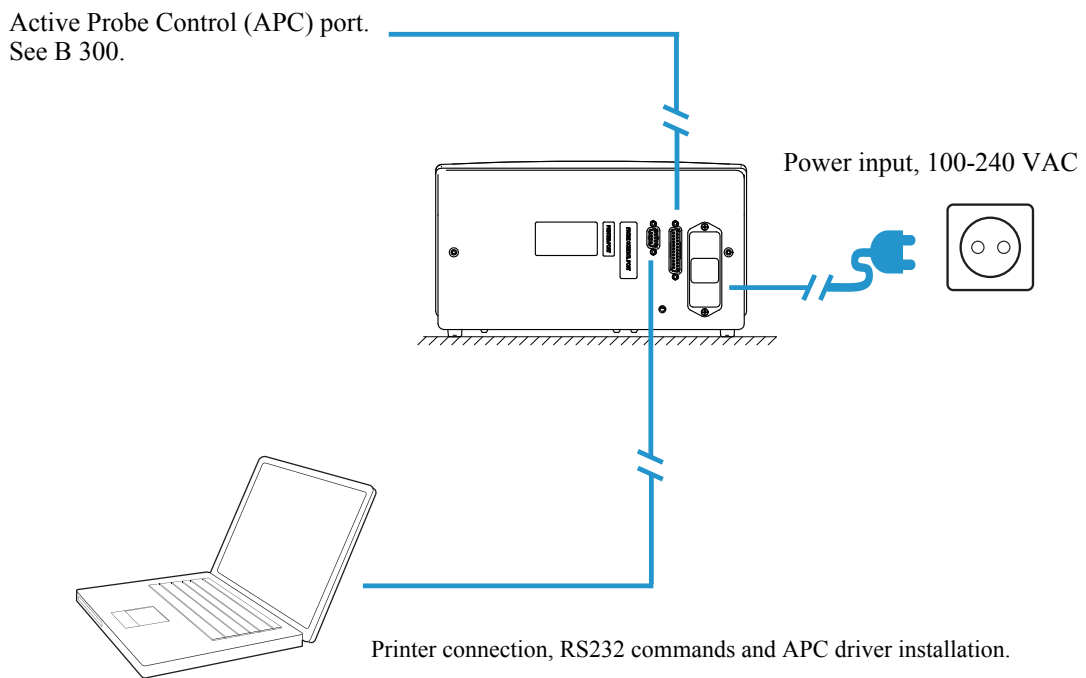


Figure B-2: Sensistor ISH2000 connections

## Sensistor ISH2000C connections

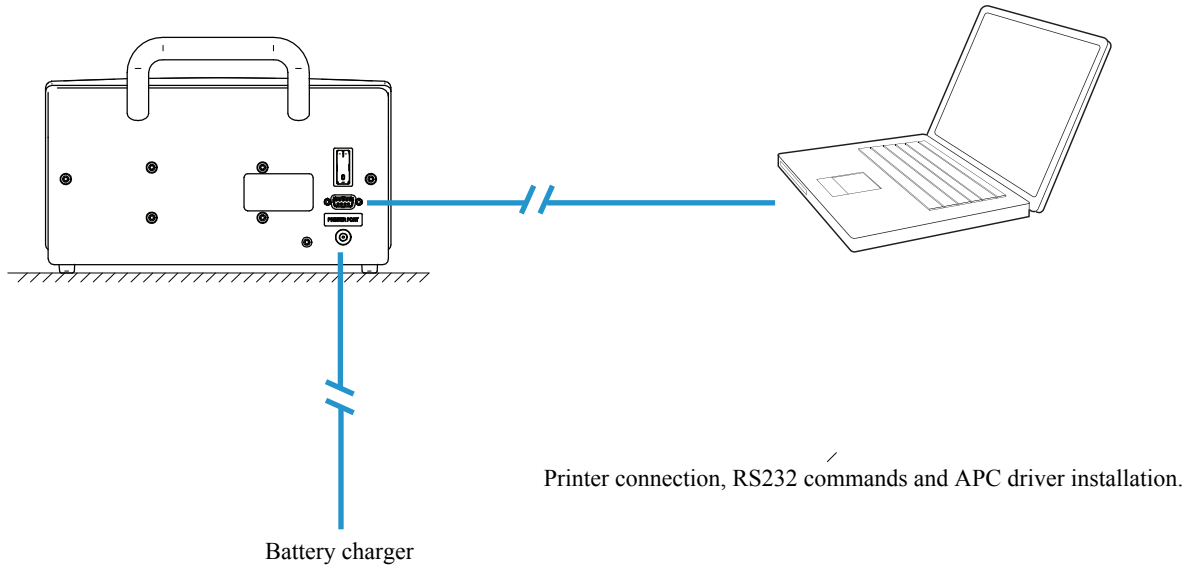


Figure B-3: Sensistor ISH200 C connections

## Sensistor ISH2000P connections

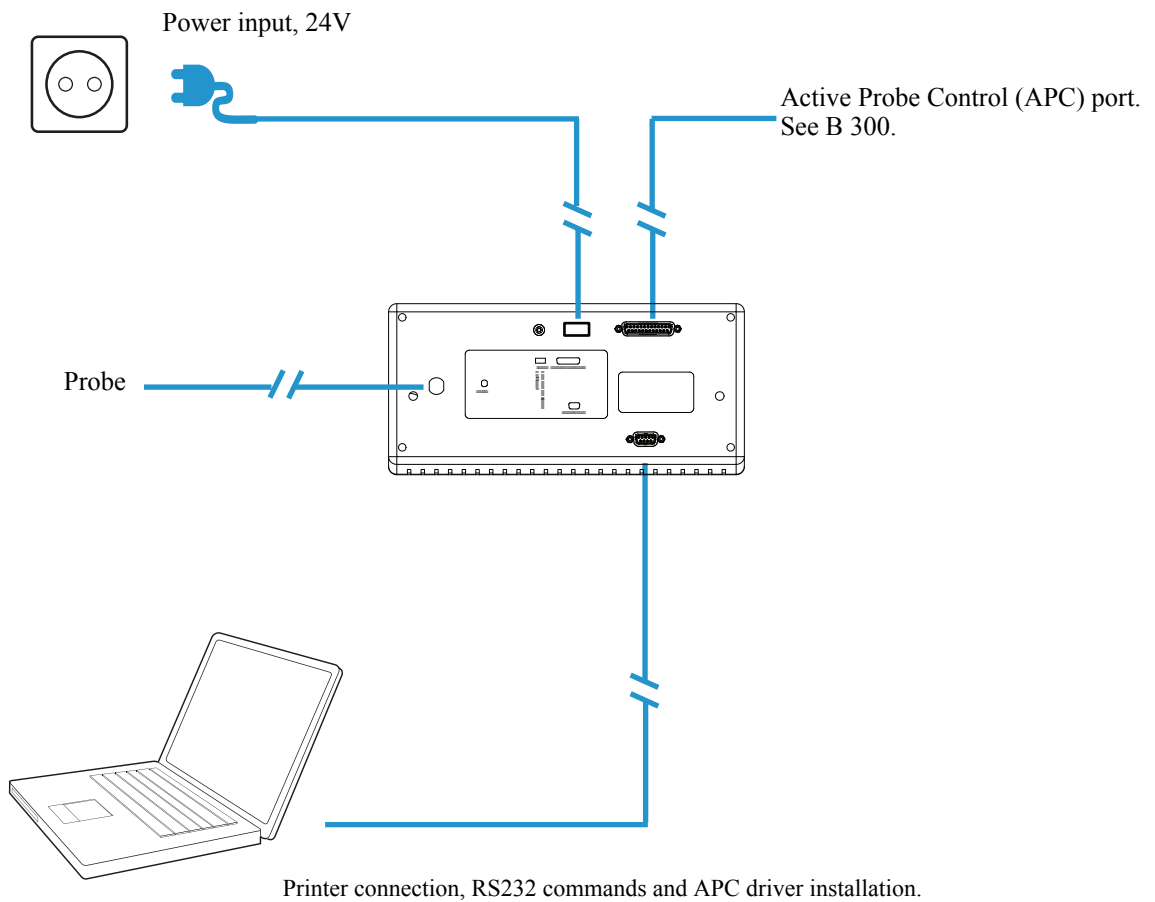


Figure B-4: Sensistor ISH2000P connections



## B 300 Controlling the detector with the I/O interface

### I/O Interface

The Sensistor ISH2000 is equipped with a parallel Probe Control port. This Probe control port can be used for controlling active probes, feeding status signals to a supervising computer system, and for simple test fixture control.

**Note:** Battery operated model Sensistor ISH2000C does not have a Probe Control Port.

Pin configuration for the different detector models is described under Model Specific Specifications below.

See "Sensistor ISH2000 Technical Specifications" on page page 23 for electrical specifications.

## Probe Control Port Connector

The control port connector is a 25-pin female D-sub.

Pin	Type	Signal name
1	-	GND
2	-	GND
3	-	GND
4	In	In_0
5	In	In_1
6	In	In_2
7	In	In_3
8	In	In_4
9	Out	CAL_CONF
10	Out	OUT_6
11	-	GND
12	-	GND
13	-	GND
14	OUT	DET_ERROR
15	OUT	LEAK_OUT
16	OUT	DET_ON
17	OUT	DET_SIGNAL
18	OUT	DET_WAIT
19	OUT	OUT_0
20	OUT	OUT_1
21	OUT	OUT_2
22	OUT	OUT_3
23	OUT	OUT_4
24	OUT	OUT_5
25	OUT	24 VDC OUT

## Status signal patterns

Status signals for pin 14 - 18.

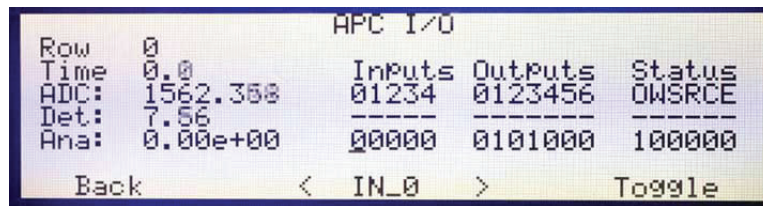


Figure B-5: Example screen

Where:

I/O name on the screen	Signal Name on the pins	Function
Inputs 0 to 4	In_0 to In_4	Input signal
Outputs 0 to 6	Out_0 to Out_6	Output signal
Status O	DET_ON	When detector is on
Status W	DET_WAIT	High during warm-up
Status S	DET_SIGNAL	Gas detected / Sensor not recovered
Status R	LEAK_ALARM	Leak above Reject Level detected
Status C	CAL_CONF	Calibration performed and ok
Status E	DET_ERROR	High if Probe, Sensor or Cable is broken

DET\_ERROR will go high for a short time (1-5 seconds) when the detector is switched on. It will go low when the sensor has been checked. In normal operation, DET\_ERROR = HIGH means that there is a problem with the sensor, probe, or cable.

DET\_WAIT is high when instrument is in warm-up mode after switching on power. Instrument will also go into warm-up if there is a temporary fault in the sensor or sensor connection.

The timing of the status signals in relation to different events is described by the following two examples:

- Example: Input signals issued to control the APC system should have a pulse length of at least 40 ms.
- Example: Output signals switch with a cycle time of 20 ms (0.02 s). This is the cycle time of the APC system.

**Note:** Not valid for battery operated version of Sensistor ISH2000.

## Status signal after power on

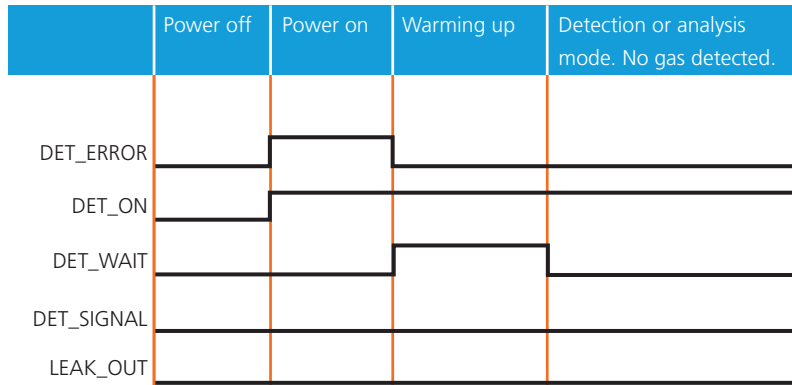


Figure B-6: Status signals after power on

## Status signal when detecting a gas signal

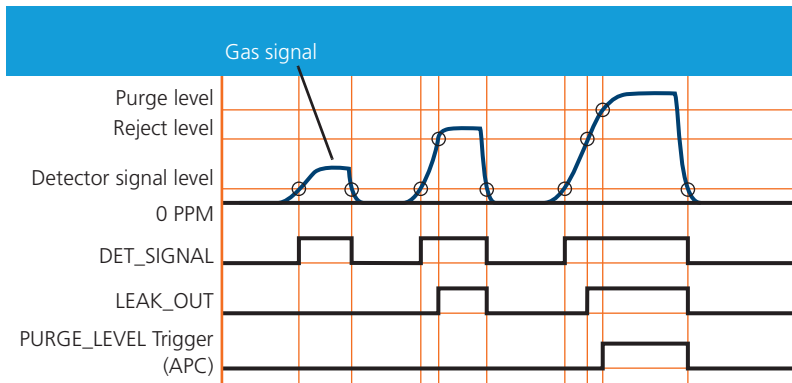


Figure B-7: Status signals when detecting a gas signal

## B 310 Controlling the detector with a PC computer through the RS 232 interface

### RS 232 interface

The RS 232 interface makes it possible to control the leak detector with a PC compatible computer: it is installed on all leak detectors.

### Commands available for your leak detector

#### RS232 interface commands

Setting	No printer	PC printer	Data output
Data rate	115200 baud	1200 baud	9600 baud
Data bits	8	8	8
Stop bits	1	1	1
Parity	None	None	None
Flow control	None	None	None

#### Common used functions

Command	Header
Calibrate	K
Measure	M
Print Request	N
Stop Measurement	Q
Hand Probe	R
Active Probe (Installed AP)	S
Analysis Mode	X
Detection Mode	Z
Combined Mode	Y

#### **K = Calibration request**

Starts calibration if the Sensistor ISH2000 has an active probe driver installed. Sensistor ISH2000 answers with a "K" if an active driver containing a calibration routine was found and "F" if the calibration APC sequence not found. Calibration doesn't start if Purge level is reached.

#### **M = Measure Request**

The active test cycle defined by the APC driver starts. "M" is returned if the selected driver supports active test. "F" (failed) is returned otherwise.

#### **N = Print Request**

Returns current analysis value.

**Q = Set APC in stand by, (stop a measurement)**

Returns a "Q".

**R = Activates probe 0 (built in P50 driver)**

Returns an "R".

**S = Activates probe 1 (Installed probe driver)**

Returns an "S".

**X = Shift State to "Analysis Mode"**

Returns nothing.

**Z = Shift State to "Detection Mode"**

Returns nothing.

**Y = Shift State to "Combined Mode"**

Return nothing.

**Supported parameters**

The following parameters can be downloaded to Sensistor ISH2000 in Analysis and Detection mode.

Where: "Header" + "?" returns the a value from the instrument. This value is presented as "A", "B" and so on.

Parameter	Header	Data
Reject Level	A	n.nnE+nn
Correlation Value	B	n.nnE+nn
Analysis Unit	C	Text string (max 12 characters)
Analysis Unit (Default list unit**)	CUx	x=1 to 10, 1=PPM, 2=CC/S up to 10
Timer A	D	nnn*
Timer B	E	nnn*
Timer C	F	nnn*
Timer D	G	nnn*
Purge Level	H	n.nnE+nn
Reference Value	I	n.nnE+nn
Reference Unit	J	Text string (max 12 characters)
Reference Unit (Program settings)	JUx	x=1 to 10, 1=PPM, 2=CC/S up to 10

\* entered as integer in 10's of seconds, 1= 0.1s, 100 = 10s, 60000= 6000s

**Default listed unit**

PPM, cc/s, cc/min, SCCM, g/a, oz/yr, mbarl/s, mm3/s, mm3/min, Pa m3/s

**Transfer of parameters**

Send parameters one by one; send the specific header and then send the data (for example "1.00E+01"). String must be ended with a carriage return character, chr13 (dec).

**Example:** "CPPM" or "C PPM", Carriage Return (chr 13). This sets Reject Level Rate Unit to "PPM".

Parameters can be sent in any order you like:

- If your data was received and correct, Sensistor ISH2000 immediately echoes (sends back) the data.
- If you send a non existing header you will not receive anything.
- If the data could not be converted in the Sensistor ISH2000 you will receive the string "CoEr", (Conversion Error).

**Note:** Remember to use capitals for the header.

## APC driver installation

APC drivers are installed in the detector from a PC. All active probes need a driver to be installed before they can be used.

**Note:** Battery operated model Sensistor ISH2000 does not incorporate the APC feature.

For driver installation you will need the following:

- APC Driver software. (Delivered with the probe.)
- File transfer cable. (Delivered with the probe.)
- PC computer with Windows XP with .NET Framework 2.0 or later.

Refer to chapter "F 800" on page 105.

## B 320 Connecting the detector directly to a printer or another device

For detailed information please refer to document RS 232 for leak detectors users manual.

### Printer port

The Sensistor ISH2000 is equipped with a serial printer port. This is the 9-pin D-type connector. It is used for printer connection, RS232 commands and APC driver installation.

**Note:** Always switch power off before disconnecting or connecting any cable.

### Preparing the RS 232 link cable

Use INFICON cable, P/N: 103616, or make your own by following the pin connections specified below:

Use a Sub D9 pin, female connector (7 and 8 connections are necessary only if RTS and CTS are used in an user software).

### Connector pin configuration

Pin	Signal	Comment
1		Not used
2	RX	Received data
3	TX	Transmitted data
4	(DTR)	Not used
5	SG	Signal ground
6	(DSR)	Not used
7	(RTS)	Not used
8	(CTS)	Not used
9	(RI)	Not used

Only pin 2 (Received data), pin 3 (Transmitted data) and pin 5 (Signal ground) are used.

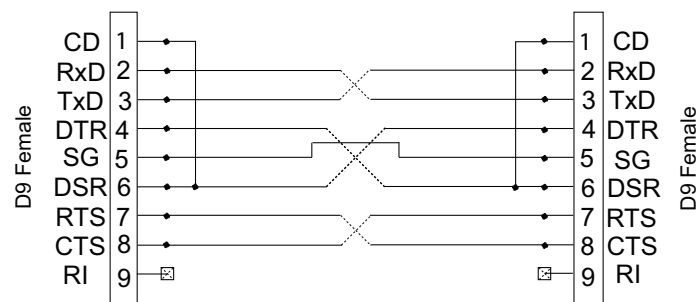


Figure B-8: D9 Null modem cable wiring diagram



## Connecting the detector to a computer

For example, the user can communicate easily with the detector using the Terminal or Hyper Terminal program in Windows®.

## Selectable printer types

Most PC-printers with serial interface can be connected to the 9-pin printer port. Parallel (Centronics) interface printer can be used if connected through a serial to parallel converter. The port can be set up for the following printer types: PC Printer and Data Dump.

### No printer

Printer output disabled. Incoming communication is enabled. Sensistor ISH2000 listens for incoming data but will not print/send test results.

### PC printer (with serial interface)

The PC Printer option can be used to print data on most standard PC printer with serial interface. Parallel interface printers can be used if connected through a serial to parallel converter.

**Note:** The output format has been chosen to be as simple as possible to ensure that most printers will accept it. Therefore, the printer output does not use any flow control. This means that some printers may delay printing until the input buffer is full or a pre-defined timeout has elapsed.

Figure B-9:

Setting	Value
Data rate	1200 baud
Data bits	8
Stop bits	1
Parity	None
Flow control	None

**Note:** Due to the large variety of printers available on the market, INFICON AB does not take responsibility for the operation of a particular type of printer.

### Printed data

The detector can print the following information:

- 1 Date and Time for Power on of detector.
- 2 Time of print.
- 3 Value of all gas signals above the Reject Level.
- 4 Test result: "Accept" or "Reject".
- 5 Value of signal obtained during active test.
- 6 Result of calibration: "OK" or "Calibration Not saved", Date and Time, Parameter settings.

Printing of the current value can also be requested by an RS232 command or ordered manually by pressing PRINT.

Probe type determines information printed.

Probe type	Data printed
Hand Probe P50	1, 2, 3, 4, 6
Counter Flow Hand Probe AP57	1, 2, 3, 4, 6
Sniffer Hand Probe AP55	1, 2, 4, 5, 6
Sampling Units AP29 and H28	1, 2, 4, 5, 6
APC driver with active test (using MEAS flag)	1, 2, 4, 5, 6
APC driver not using MEAS flag	1, 2, 3, 4, 6

### Analysis data output

The Analysis Data Output option is intended for transferring test results to a supervising computer system such as, for example, a PLC system. Communication specifications.

Setting	Value
Data rate	9600 baud
Data bits	8
Stop bits	1
Parity	None
Flow control	None

The data format for Analysis data output consists of nine ASCII characters. Seven characters show the value in engineering format one character shows the result of the test, and one character shows line feed (LF).

The character indicating the result of the test is one of the following.

Character	Result of the test
A	Accept. Previous test was below Reject Level alarm limit.
R	Reject. Previous test was above Reject Level alarm limit.
P	Rejected by Purging. Previous test was above purge limit (and Reject level limit).
C	Calibration approved. Previous cycle was calibration. Calibration was approved.
F	Calibration failed. Previous cycle was calibration.
E	Test interrupted by "Error" that occurred during cycle (probe or sensor error etc.).

**Example:** 2.5E-04R (LF)

This example is a line feed (LF), R means that the test was above the Reject Level alarm limit, and the value was 2.5E-04.

For passive probes (for example P50 and AP57\*) data is printed when a signal is detected above Reject Level or when the print button is pressed. Activate this under Measure Button menu.

For active probes (e.g AP29) data is printed at end of measurement sequence. Printing of the current value can also be requested by an RS232 command or ordered manually by pressing PRINT.

\* A custom APC program setting the MEAS flag prints as AP55/AP29 and an APC program not using MEAS flag prints as P50.

**Detection data output**

The Detection Data Output option is intended for automated scanning of weld seams etc.

**Note:** The Detection Data is expressed in arbitrary units. Detection Mode signal is not affected by calibration!

Communication specifications.

Setting	Value
Data rate	9600 baud
Data bits	8
Stop bits	1
Parity	None
Flow control	None

The data format for Detection data output contains of ten ASCII characters. Nine characters show the value in engineering format, and one character shows linefeed (LF).

The print time is 50Hz continuous streaming data.



# Operation

Sensistor ISH2000 Technical Reference Manual

## Detailed content

C 100	<b><i>Getting started with the leak detector</i></b>
C 110	<b><i>Operating principle of the control panel</i></b>
C 200	<b><i>Control panel</i></b>
C 201	<b><i>Menu system</i></b>
C 210	<b><i>Password</i></b>
C 211	<b><i>Operation of the leak detector</i></b>
C 300	<b><i>Calibration of the leak detector</i></b>
C 304	<b><i>Correlation Value</i></b>
C 305	<b><i>Calibrated leak values programming</i></b>
C 410	<b><i>Headphone and loudspeaker</i></b>
C 500	<b><i>Factory configuration of the leak detector parameters</i></b>
C 570	<b><i>Date - Time - Language - Unit</i></b>
C 580	<b><i>Service mode och debug mode</i></b>

## C 100 Getting started with the leak detector

### Starting up / switching off the leak detector

1. Connect power.
2. Connect the probe.
3. Start the unit and wait approximately 1 minute.
4. Select probe in the menu.

Refer to C 211 "C 211 Operation of the leak detector" on page 55.

### To familiarize oneself with the control panel

Refer to "C 200 Control panel" on page 46 for the control panel description.

## C 200 Control panel

### Description

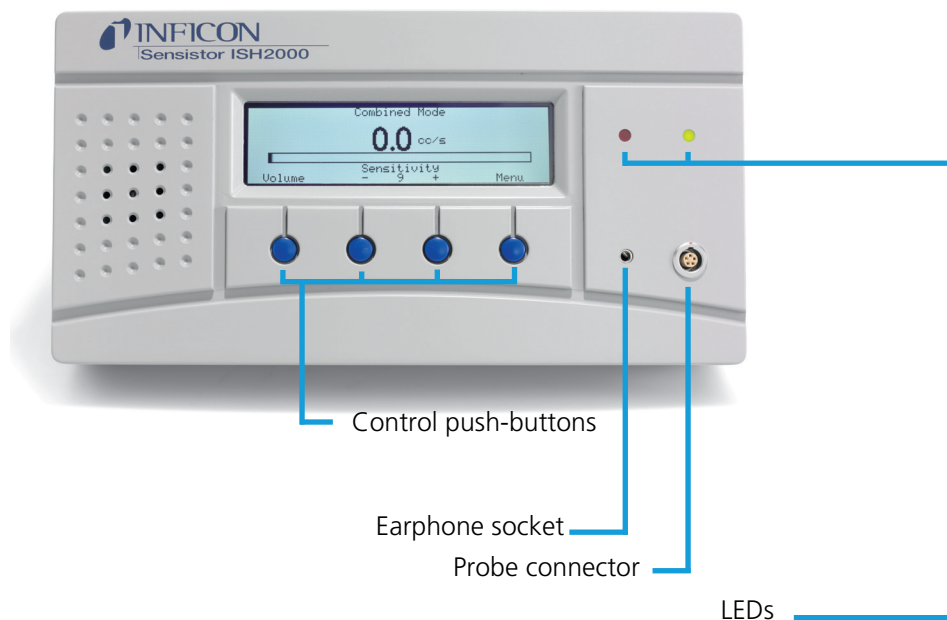


Figure C-1: Sensistor ISH2000 control panel

### Graphic interface

The display shows:

- indicator bar in **Detection Mode** and the figures in **Analysis Mode**.
- seven main menus. Their positions are indicated on a horizontal scale. Change from one menu to another using the < and > buttons.
- main menus have submenus, which are also indicated by horizontal scales and can be selected using the < and > buttons.
- scales for setting numeric values, languages, etc.
- messages.

Sensistor ISH2000C:

- A battery status indicator in the upper right corner, where 13.5 V indicates discharged state and 16.0 V indicates that the battery is fully charged.
- six main menus. Their positions are indicated on a horizontal scale. Change from one menu to another using the < and > buttons.

### LEDs

The two LEDs indicate the status of the instrument as follows:

- Green flashing slowly, during warming up phase.
- Green fixed light indicates that instrument is ready and hydrogen signal is below Reject Level limit.
- Red fixed light together with Reject on display means the instrument has detected a leak larger than the set alarm limit. Red flashing rapidly, check message on screen. (See "Trouble-shooting" on page 74.

## Push-buttons

The functions of the push-buttons are shown at the lower edge of the display. In this manual the buttons are numbered, from left to right, 1, 2, 3, and 4. The push-buttons are used to:

- Change from one menu item to another using the < and > buttons.
- Press Enter to move down to the nearest submenu.
- Press Save to save the set value.
- Press Undo to restore the previously set value.

Press Esc to move up to the nearest higher level(s).

## Demo Mode

Demo Mode is a demonstration mode, special designed for seller. All APC drivers for standard probes and filler will be selectable. The seller can easily swap between the different drivers and won't need to download them.

To set the Detector in **Demo Mode**:

- Select: Menu/General Settings/Change Password
- Enter "DEMO"
- Confirm New Password "DEMO"

Select driver under menu: APC Settings/Probe Type

The word "DEMO" will be shown at start up.

To turn Demo Mode off repeat the list above.

## C 201 Menu system

The menu system is designed as a tree structure similar to that used in mobile telephones. The display shows all the levels when browsing down through the menus so that you can always see exactly where you are.

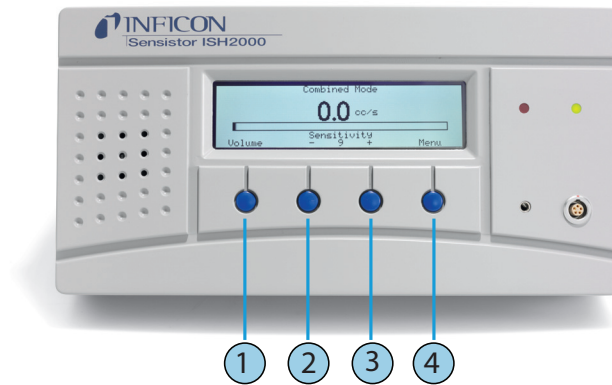


Figure C-2: Push-buttons

To enter the menus, press Menu (button 4). Press < and > (button 2 and button 3) to choose between main menus.

If no setting is made in a menu or its submenus within 60 seconds, the instrument will revert to the Detection Mode/Analysis Mode.

The buttons may change functions in different menus. Always read the text, just above the buttons in the display, for the button functions.

All changes in values are valid only when saved using the Save button (button 4).

Use the Undo button (button 1) to delete a change in value and revert to the previous setting.

Use the Esc button (button 1) to browse backwards through the menus to the start position Detection Mode/Analysis Mode/Combined Mode.

To change quickly from Detection Mode to Analysis Mode or vice versa, press button 3 three times in succession.



Sensistor ISH2000 v. 6.0 Menu System

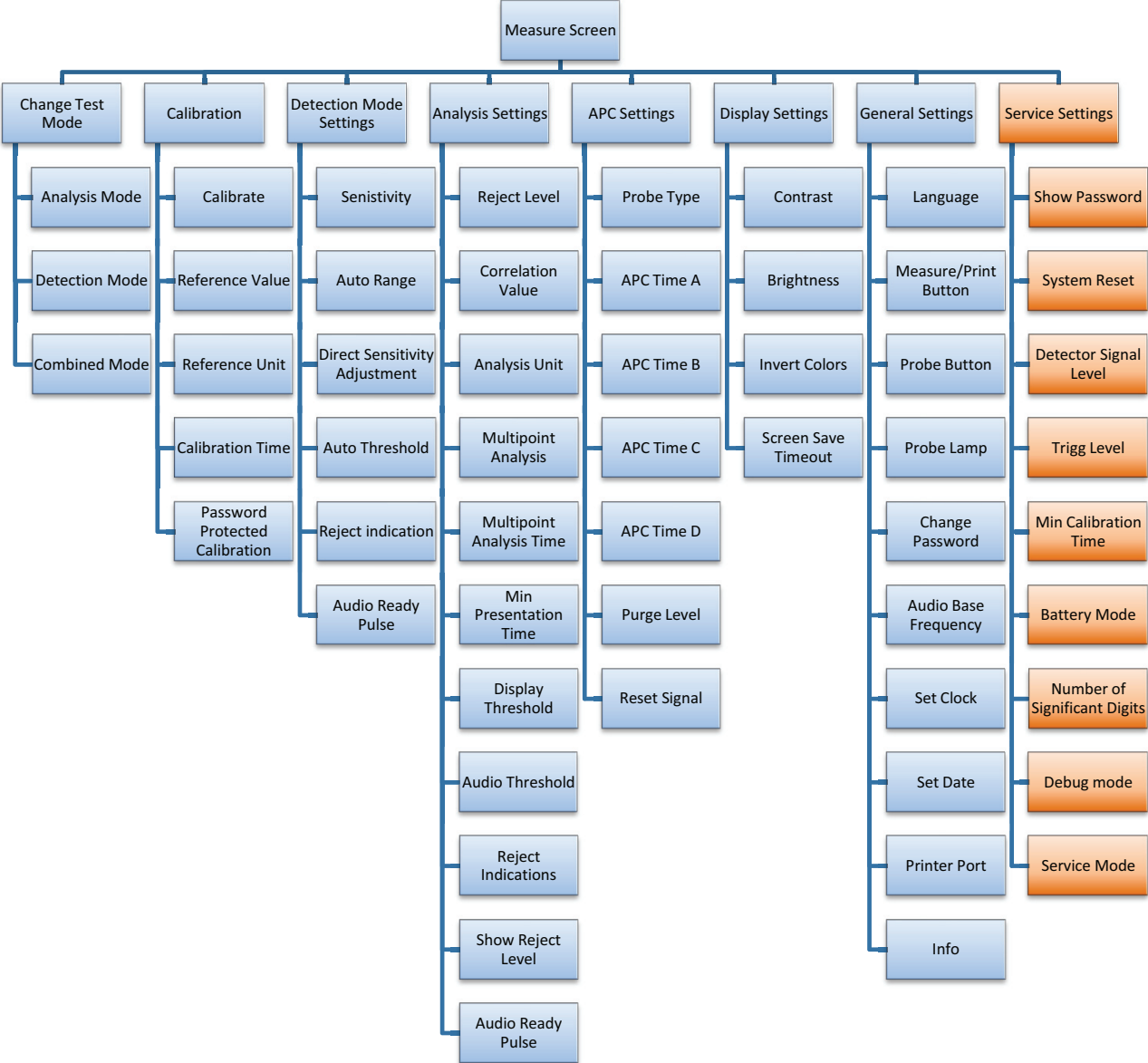


Figure C-3: Menu system

## Change test mode

Choose the measuring method you will use in the menu Change Test Mode. There are three different methods to choose:

- Analysis Mode
- Detection Mode
- Combined Mode

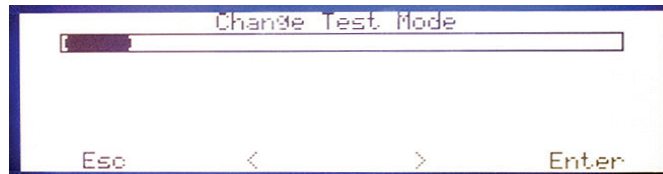


Figure C-4: Change test mode screen example

## Calibration

The instrument must be calibrated by using the integral calibration function to ensure it displays the correct values in Analysis Mode/Combined Mode. After calibration the instrument will show the correct measured values on the display. The calibration parameters will be stored into the probe.

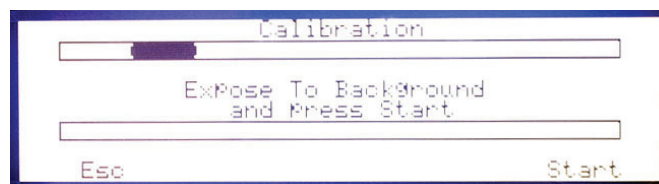


Figure C-5: Calibration screen example

## Detection mode settings

In Detection Mode, the signal is displayed in the form of a bar. The length of the bar varies with the gas concentration.

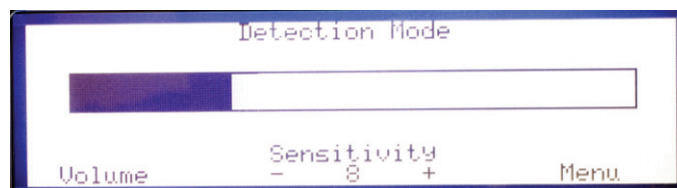


Figure C-6: Detection mode screen example

## Analysis mode settings

In Analysis Mode the measured value is displayed in figures. The default unit is in PPM but it is possible to choose other units, See "C 500 Factory configuration of the leak detector parameters" on page 65

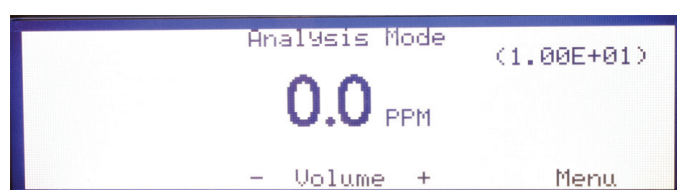


Figure C-7: Analysis mode screen example

## APC settings

APC is an abbreviation for Active Probe Control. The APC function is for the control of an active probe that has a built-in alarm, valves or pumps via Probe Control Port.

Different probes require controls therefore, it is possible to download different drive routines for the instrument from a PC.

There is a possibility to adapt how to measure by adjusting the timers and Purge Level.

### **Probe Type**

Select the connected probe. Choose between "Hand Probe" and another probe driver installed from the disc delivered with active probe (if ordered).

### **APC Time A-D**

Adjustable timer used by the APC system. Select a APC timer and press "Enter" to display specific use of this timer. APC timer can be used for general purposes in a custom APC program.

### **Purge Level**

Signal level controlling the Purge\_Level APC Triggers. Standard probes that support active sampling use the Purge Level for fast interruption of sampling that result in high gas signals.

Setting Purge Level equal to, or just above, Reject Level will give the fastest possible cycle times for those probes.

Quick purging also enhances signal repeatability.

Note: Purge level interrupts active sampling of APC probes. This means that higher signals will be underestimated as the sensor is purged before full signal has developed.

### **Reset Signal**

Reset the sensor level in Analysis mode and Detection mode.

## Display settings

This section describes the different display settings of the Sensistor ISH2000.

### Contrast

Contrast level of display. Higher value gives higher contrast. The contrast may need adjustment if ambient temperature changes.

### Brightness

Brightness of the display lamp. A lower brightness value saves energy and prolongs the lamp.

### Invert Colors

Change the black to white and white to black. Useful in a dark environment to keep a high readability.

### Screen Save Timeout

Display lamp will dim to half brightness if instrument is left idle for the number of minutes set by this parameter. The screen save timeout can be set between 1 and 60 minutes, the function is deactivated if set to OFF. The display lamp will return to the set brightness if any of the display buttons are pressed, if a gas signal is detected or an instrument error is detected.

## General settings

This part describes the general settings of the Sensistor ISH2000.

### Language

The Sensistor ISH2000 user interface contains the following languages:

- English
- French
- German
- Italian
- Spanish
- Swedish

### Measure/Print Button

Setting this parameter to ON displays Measure or Print above the button 1. Measure will be displayed for an APC-Probe or Print for a Hand Probe. Pressing Measure will initiate a sample cycle. Pressing Print will send the values from the hand probe measurement to the printer port.

### Probe Button

This is for setting the different functions with the probe button. These functions are as follows:

- Toggle Mode-makes it possible to switch between Analysis mode and Detection mode.
- Zero detection signal-in Analysis mode and Detection mode.
- Measure/Print-makes it possible to initiate sample cycles or send the values from the hand probe measurement to the printer port.
- Probe Lamp-makes it possible to turn on and off the Probe Lamp.

### Probe Lamp

Makes it possible to have the Probe Lamp on even if the other Probe Button function is chosen.

### Change Password

The user password is a text string (max 12 alphanumeric characters) used to lock critical parameters. Setting password to an empty string (no characters)

means that no password is needed to modify the critical parameters. The default is no password ("").

Contact INFICON AB if you have lost your user password. If the Password Protected Calibration parameter is set to ON you will be prompted for a password when starting a calibration.

Note: Setting Password Protected Calibration to ON has no effect if no password is set.

Note: APC controlled calibration can be started from the bus in both cases.

### **Audio Base Frequency**

This sets the lowest audio base frequency tone in Search and Detection Mode.

### **Set Clock**

Real time set as hh:mm:ss. Hours and minutes can be adjusted. Seconds will automatically be set to 00 when hours and minutes have been set. Clock runs even when detector is disconnected from the power supply.

### **Set Date**

Real Time Clock date set as YY-MM-DD. Clock runs even when detector is disconnected from the power supply.

### **Printer Port**

The Sensistor ISH2000 is equipped with a serial (RS232) printer port. See "Printer port" on page 35.

### **Info**

Contains information about software versions, Serial number, and Internet contact information.

## **Service settings**

The Service Mode is reached by starting the instrument and at the same time hold the right button down on the panel. After start a new main menu called Service Settings will appear.

See "E 140 Service menu" on page 84

## C 210 Password

### Change Password

The user password is a text string (max 12 alphanumeric characters) used to lock critical parameters. Setting password to an empty string (no characters) means that no password is needed to modify the critical parameters. The default is no password ("").

Contact INFICON AB if you have lost your user password. If the Password Protected Calibration parameter is set to ON you will be prompted for a password when starting a calibration.

**Note:** Setting Password Protected Calibration to ON has no effect if no password is set.

**Note:** APC controlled calibration can be started from the bus in both cases.

## C 211 Operation of the leak detector

### To detect leaks

#### CAUTION

*Do not expose the probe to a hydrogen concentration higher than 0.1 % when the instrument is not put into operation, this might damage or destroy the probe sensor.*

*When the instrument is put into operation the sensor withstands temporary exposure to hydrogen concentration up to 100%. Avoid long exposures to high concentrations.*

If all you wish to do is to detect the presence of a leak, that is, find out whether there is a leak or not, then use the Detection Mode (or use the detection bar in Combined Mode).

The definition of Leak/No Leak will then simply be "A leak is a leak when it can be detected by the detector, set to a specific sensitivity".

To set up:

The operation in **Detection Mode** is not quantitative. The audio and visual signal will increase and decrease with the gas concentration. Therefore, there is no actual calibration to be done, but rather a setting of the sensitivity to a desired level.

A typical set-up procedure for Detection Mode is:

- Set up a reference leak which corresponds to the smallest leak you wish to detect.
- Put the probe close to the reference leak and note approximately what reaction you get (no reaction, small, medium, high, full scale) within the first few seconds.
- Set the sensitivity. This can be done permanently under the menu Detection Mode Settings or temporarily as a Direct Sensitivity Adjustment on the display (unless you have set this function to OFF under the Detection Mode Settings menu).

There is also an Auto ranging function which can be selected under the **Detection Mode** Settings menu.

**Note:** If the Detection Mode is used and the alarm function is required to be activated at a particular calibrated level, then the unit must be calibrated in accordance with the instructions. The reason for this is that the alarm is based on the Analysis Mode when the **Detection Mode** is displayed.

### To locate leaks

**Note:** The **Detection Mode** (or use the detection bar in **Combined Mode**) is used to locate leaks. This mode is semi-quantitative, that is, it gives an audio and visual signal which increases as a leak is approached (a higher gas concentration) and decreases as you move the probe away from the leak. It does not display figures. In this mode of operation leaks can easily be detected using a sensitivity which can be preset.

Leaks can be located very accurately, even when there are other leaks nearby. If, for example, you are trying to locate a leak on a product and the product has a major leak, then you will get an audio signal as soon as the probe is placed close to the product.

When the probe is moved around and over the product, the signal will increase as the probe approaches the leak. If the signal goes out of scale, simply reduce the sensitivity setting to bring the signal within the scale. Working with the sensitivity setting this way you will be able to locate multiple leaks that are in close proximity to each other.

**Note:** Working inside a confined space such as, for example, a cabinet or a narrow passage on a combustion engine there is a risk that the background concentration accumulates to levels close to the upper detection limit of the detector. In such case it will not be possible to locate leaks as easily as in open spaces.

**Hint:** Do not expose the probe to more gas than is necessary, because it will slowly saturate with time. It is good practice to detect a leak, locate it, and immediately remove the probe to avoid saturation. The probe is not damaged by the exposure but it will recover more slowly. After excessive exposure it will be less sensitive for a short period of time.

## To quantify leaks

The **Analysis Mode** (or use the analysis figures in **Combined Mode**) is used for measuring the size of a leak (or the concentration of a gas sample). To be able to do this measurement and obtain correct values, the instrument must first be calibrated using the calibration function.

In the **Analysis Mode** the detector determines the gas concentration from the change, as the probe goes from being exposed to background to being exposed to a certain gas concentration. The detector does not continuously monitor the gas concentration but takes just one reading instead. Another suitable alternative name for this mode could be Sampling Mode. It is important to keep this in mind when using the detector in this mode.

In **Analysis Mode** the probe should be moved directly from a background situation to the test point. The size of the leak in PPM, or any other selected units, is shown on the display. The probe can and should be removed from the measuring point as the measured value steadies and remains on the display. The period during which the measured value is displayed can be adjusted in the Analysis Mode Settings menu.

The leak detector operates in the range 0.5 - 2000 ppm H<sub>2</sub> giving linearity between 0.5 and 500 ppm. To obtain greatest accuracy over this range, follow the calibration recommendation. See "Calibration of the leak detector" on page page 57.



## C 300 Calibration of the leak detector

### Introduction

The leak detector is the instrument and the probe together. This section consists of step by step examples about how to calibrate the detector in the most common cases.

The instrument must be calibrated by using the integrated calibration function to make sure it displays the correct values in **Analysis Mode**. After calibration the instrument will show the correct measured values on the display in **Analysis Mode** and **Combined Mode**. The calibration parameters will be stored into the probe.

### Calibration reference

There is a possibility to calibrate the detector by Reference Gas or Reference Leak.

A Reference Gas contains a well-defined concentration of Hydrogen gas in ppm mixed by air or some inert gas. A Certificate will normally follow the gas bottles. Reference Gas can be ordered from local gas suppliers.

A Reference Leak is a well-defined gas leak, and should be fed by same gas as used in the detection test and with a gas pressure that is defined in the Reference Leak certificate. Reference Leak can be ordered from the detector provider.

Choose a calibration reference size, as follows recommendations:

- Same or higher than the Reject Level (but maximum 10 times higher)
- In one of the following ranges:
  - 5 to 1000 ppm H<sub>2</sub>
  - $1 \times 10^{-5}$  to  $1 \times 10^{-2}$  cc/s (mbarl/s) defined for air
  - 3 to 300 g/a defined for R134a

Please contact the provider of the detector for help to select optimal calibration reference for your application.

## Calibration procedure

Before calibration, the **Reference Value** in the **Calibration Menu** must be set. See "With reference gas" and "With reference leak" below.

When calibrating, expose the probe to the background air then do the following steps:

1. First Menu then Calibration/Calibrate/Enter.
2. Push the Start button or push the probe button.
3. Expose the probe for the reference gas/leak

The probe does not have to be exposed to the calibration gas during the whole **Calibration Time** (the time set in the **Calibration Menu** while the bar is moving). The instrument only measures the change as the probe goes from the background air to calibration gas.

While the calibration time bar is moving, the probe should be exposed to the calibration gas or reference leak. Then the display shows **Detecting Gas** and gives sound signals. Save or repeat the calibration routine until you can save the calibration. If the calibration is not saved, the instrument will revert to the previous value after one minute.

**Note:** You will need to repeat the calibration 2-3 times to get Calibration OK after changing setup or probe.

- Allow at least 30 seconds between each calibration for best accuracy!
- If the message "No Gas or Unstable Signal" is displayed repeatedly - go back to Detection Mode and check functionality.
- If Repeat Calibration is displayed then this means that the measured value deviated more than 10% from the previous calibration. Repeat the calibration procedure.

Also set the Analysis Unit to the same as the Reference Value. If you want to use another unit you have to put a recalculation number into Correlation Value which describes the relationship between the different units.

## Calibration intervals

Calibration is a natural part of leak measurement and an important factor in quality assurance. It is impossible to specify an exact requirement for the interval between the calibrations because the applications for which the instrument is used can vary considerably.

There will be some oxidation of the probe sensor, which reduces the sensitivity, if the probe sensor:

- is not subjected to gas for a lengthy period or
- is exposed to a very small gas concentration (less than 10 PPM) with long intervals between exposure.

If the instrument is subjected to a very large gas concentration over a long period, a certain amount of insensitivity can occur directly afterwards. This saturation can make it difficult to detect very small leaks. Therefore, make it a habit of removing the probe from the measuring point as soon as the measured value is displayed. This gives the detector an opportunity to recover.

## Low sensitivity warning

The Detector will warn if sensitivity of sensor is too low to safely detect a leak equal to the set Reject Level limit. The warning can be ignored and calibration updated but the CAL\_CONF output will not be set.

## Irregular reference warning

The Detector will warn if the calibration signal is unreasonably high. This can occur, for example, if 5% tracer gas mix has been used instead of proper reference gas or if the reference leak has an extra non-intentional leak. The warning can be ignored and the calibration updated but the CAL\_CONF output will not be set.

## Sensor condition indicator

The indicator bar extends in length when the sensor is detecting reference gas. This indicator can be used for an early warning as to when a sensor replacement will be needed.

The length of the bar shows the condition of the sensor. The bar will become shorter if the sensor has lost some in sensitivity. The scaling of the indicator is not precise enough to say at exactly what length the sensor must be replaced. You will learn when this happens for your particular application. The instrument will also tell you in clear text when sensitivity is too low.

## Calibration messages

Message	Explanation	Remedy
Expose to background...	Prepare the probe for calibration by holding it in hydrogen free background.	-
Detecting gas	Gas signal is detected.	Normal operation, gas exposure can be interrupted.
Repeat calibration	Calibration was not within 20% of last.	Wait 30 s and calibrate again.
Calibration OK	Calibration was within acceptable limit.	Press Save (button 4) to store calibration in memory.
No gas or unstable signal.	No gas signal or no stable signal detected during calibration.	Check reference. Gas valve may be shut. Check that probe tip is not clogged.
	Signal when reference gas is shut off. Happens for reference gas only.	Background is higher than reference gas concentration. Improve ventilation.
Sensitivity too low for Reject level	Sensitivity of sensor is too low to guarantee correct response to a gas flow or concentration equal to the Reject level. The most likely reason is that sensor is too old.	Check reference. Gas valve may be shut. Check that probe tip is not clogged. Check setting of Reject Level. Replace sensor if problem remains.

Message	Explanation	Remedy
High signal! Check reference!	Reference signal is abnormally high.	Check that reference gas mix is not replaced with tracer gas mix. Check condition of reference. Check that reference leak connections has no leaks.

**Note:** If calibration fails you can still use the instrument. Last valid calibration parameters will be used. You should, however, check that the instrument reacts to the reference.

## Reference Value

Your reference should have a concentration or flow equal to or slightly above what you want to measure. See the examples below for specific recommendations.

Example for reference gas:

- Reject Level is set at 8 PPM
- For good accuracy, use a reference gas between 8-80 ppm hydrogen.
- 8 PPM hydrogen in synthetic air will give best results.

Example for reference leak

- Reject Level level is set at 2.0E-4 atm. cc/s
- For best accuracy reference leak within 2.0E-4 - 2.0E-3 atm cc/s.
- A reference leak calibrated to 2.0E-4 atm. cc/s will give best accuracy.

## Reference Unit

The Reference Unit is set in the Calibration menu. Select PPM, cc/s, cc/min, SCCM, g/a, oz/yr, mbarl/s, mm<sup>3</sup>/min, Pa m<sup>3</sup>/s or Custom. When you select Custom you can enter any unit as long as it contains a maximum of 12 characters.

Calibration can be performed with:

- a known hydrogen concentration
- a known flow leak

The following characters can be used: Upper and lower case Roman letters, the numbers ü, Å, Ä, Ö, å, ä, ö, %, /, (, ), and - (dash).

**Note:** The space (" ") is not supported. The leak rate unit string will be cut short at the first space found.

## Calibration Time

The calibration time decides how long time the detector looks for a reference signal before giving up. If the calibration is set to, for example, 6 seconds the detector will record the maximum signal during 6 seconds after that the operator (or external hardware) orders a calibration.

It is very important that all delays in gas exposure as well as reaction time of sensor are taken into consideration when setting the calibration time. Calibration will not be correct if the maximum signal comes after that the calibration time has terminated.

## Minimum calibration time

This parameter sets the lowest possible Calibration Time that can be set under the Calibration menu. Default is 5 seconds.

Minimum calibration time should be set to safeguard so that the following two requirements are fulfilled:

- 1 The hydrogen from the reference leak or gas line must reach the sensor before end of calibration time.
- 2 The sensor must have time to reach its maximum signal before end of calibration time.

Setting Min Calibration Time too low will have the following effects:

- Calibration will fail if calibration time is set too low.
- Calibration might pass but be incorrect.

Setting a high Min Calibration Time will have the following effects:

- Calibration takes longer time than necessary.
- Calibration gas consumption is higher than necessary.

**Note:** Correct calibration is an essential parameter in quality testing. We, therefore, recommend that careful consideration is paid to setting an appropriate Min Calibration Time. This will inhibit personnel, lacking detailed knowledge about calibration, from jeopardising quality by setting a too short Calibration Time.

## Password protected calibration

If desired, the calibration can be set under the general password to prevent the operator from calibrating by mistake. In this case you will have to enter the password to start the calibration routine. Setting password protection on calibration is done in the General Settings menu. Note that you must also set a password. The instrument is delivered with no password set.

## C 304 Correlation value

If you want to use another unit you have to put a recalculation number into **Correlation Value** which describes the relationship between the different units.

This might be necessary when you want to display Reject Level unit other than the reference leak rate unit.

Useful also for correct the value when volume and time affect the measure value result in accumulation test.

Example:

To use mbar/s as an calibrate reference unit and mm<sup>3</sup>/s as a analysis Unit you have to set a Correlation Valus to 1.00E-03.

---

## C 305 Reference values settings

### Reference value with reference leak

When measuring leak flow you will, in normal cases, calibrate the detector with a reference leak.

Set the **Reference Value** equal to the calibrated flow of your reference leak. This value can be found on the calibration certificate issued for the leak. Also set the **Reference Unit** to the same unit as that used to express the leak rate of the reference leak.

Example: Reference leak rate is 4.2E-5 mbarl/s.

1- Set Reference Value = 4.2E-05.

2- Set Reference Unit = "mbarl/s"

### Reference value with reference gas

When measuring hydrogen concentration (instead of leak flow) in most cases you will calibrate the detector to a reference gas with a known concentration.

Set the **Reference Value** equal to the Hydrogen concentration in your reference gas. This can be found on the certificate of analysis issued for the gas. Also set the **Reference Unit** to the same unit as that used to express the leak rate of the reference leak.

Example: Reference gas contains 10 PPM Hydrogen in synthetic air.

1- Set the Reference Value = 10

2- Set the Reference Unit = "PPM"

## C 410 Headphones

The operator can connect a headphone to the detector.

### Accessories

#### Headphone

INFICON does not sell headphones. The specifications are: Jack plug mono 3.5 mm.



## C 500 Factory configuration of the leak detector parameters

### Default parameters

Range and default settings of all Sensistor ISH2000 parameters.

Parameter	Range	Configuration	
		Factory default	Customer modification
Analysis Unit	Several Choices	PPM	
APC Time A	0.0 - 6000.0 s	10.0	
APC Time B	0.0 - 6000.0 s	0	
APC Time C	0.0 - 6000.0 s	0	
APC Time D	0.0 - 6000.0 s	0	
Audio Base Frequency	Several Choices	400 Hz	
Auto Range	ON/OFF	ON	
Audio Ready Pulse	ON/OFF	ON	
Audio Threshold (Detection)	0 - 100 %	0 %	
Audio Threshold (Analysis)	0 - 100 %	4 %	
Brightness	0 - 21	21	
Calibration Time	Min Calibra. Time-30 s	10 s	
Clock	hh:mm:ss	-	
Contrast	0-20	10	
Correlation Values	1.00E-37 - 1.00E+37	1.00E+00 = 1	
Date	YY-MM-DD	-	
Debug Mode	ON/OFF	OFF	
Detector Signal Level	0-100 %	20 %	
Direct sensitivity adjustment	ON/OFF	ON	
Display Threshold	0-100 %	4 %	
Invert Colors	ON/OFF	OFF	
Language	Several choices	English	
Measure/Print Button	ON/OFF	OFF	
Min Calibration Time	0 - 30 s	5 s	
Min Presentation Time	120 s	1 s	
Multipoint Analysis	Several Choices	OFF	
Multipoint Analysis Time	0.0 - 30.0 s	5.0 s	

Parameter	Range	Configuration	
		Factory default	Customer modification
Number of significant Digits	2/3	2	
Password	Max 12 characters	"" = No password	
Password protected calibration	ON/OFF	OFF	
Printer Port	Several choices	No printer	
Probe Button	Several choices	No Function	
Probe Lamp	ON/OFF	OFF	
Probe Type	Several choices	No probe	
Reject Indicator	ON/OFF	ON	
Purge Level	1.00E37 - 1.00E+37	1.00E+02 = 100	
Reference Unit	Several choices	PPM	
Reference Value	1.00E- 37 - 1.00E+37	10	
Reject Indication	ON/OFF	OFF OFF	
Reject Level	1.00E-37 - 1.00E37	1.00E+01 = 10	
Screen Save Timeout	1 - 60 min	20 min	
Sensitivity	1 - 15	8	
Show Reject Level	ON/OFF	ON	
Trigg Level		42	
Menu Mode	Several choices	Combined Mode	

## C 570 Date - Time - Language - Unit

### Set Date

Real Time Clock date set as YY-MM-DD. Clock runs even when detector is disconnected from the power supply.

### Set Clock

Real time set as hh:mm:ss. Hours and minutes can be adjusted. Seconds will automatically be set to 00 when hours and minutes have been set. Clock runs even when detector is disconnected from the power supply.

### Set Language

The Sensistor ISH2000 user interface contains the following languages:

- English
- French
- German
- Italian
- Spanish
- Swedish

## C 580 Service mode och debug mode

### Service settings

The detector is equipped with a service setting to help in trouble shooting and diagnostics.

**IMPORTANT!** The normal operator should not enter this mode.

The service mode menu option is therefore normally not shown in the menu system and most of the functions in the service mode are protected by a special password.

**IMPORTANT!** We strongly recommend that the service mode log in procedure is kept secret from all personnel not fully trained in the details of all functions of the detector.

### Logging in to Service settings

#### Service Mode Log In Procedure

1. Switch power OFF.
2. Press and hold the right display button.
3. Switch power ON.
4. Release right button when text appears. During warm up the display will show software revision numbers and date and time of the real time clock.

### Service mode

When in service mode the display will show a service info screen as shown below.

To get to Service Mode: Choose Menu / Service Settings / Service Mode

The Service Menu has two screens. Toggle between them by using APC and Back.

- First screen (Service Mode) show electrical parameters and sensor signals.

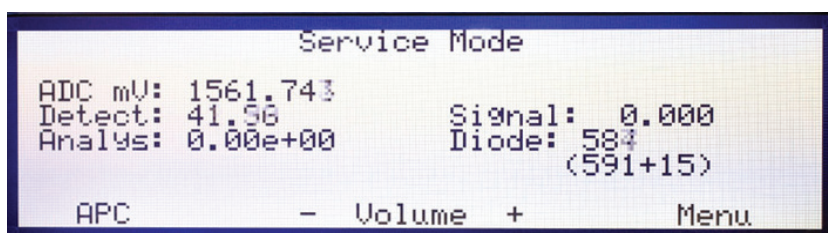


Figure C-8: Service mode screen example

- Second screen (APC I/O) show APC program status, APC I/O:s input, outputs and some internal flags.

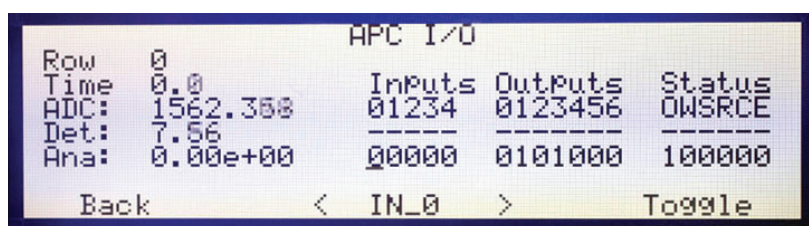


Figure C-9: APC I/O screen example

In Service Mode, the following information accessible:

ADC	Raw Sensor Signal (mV)
Detect	Numeric value of the Detection Mode signal
Analys	Analysis Value
Battery	Battery voltage if portable model, (V)
Signal	Sensor signal when the probe expose
Diode	Temperature voltage from probe (mV)

In APC I/O, the following information accessible:

Row	Executing APC program row
Time	Executing time for the row
ADC mV	Raw Sensor Signal (mV)
Det	Numeric value of the Detection Mode signal
Ana	Analysis Value

Inputs	
0	Status of external input 0 (IN_0)
1	Status of external input 1 (IN_1)
2	Status of external input 2 (IN_2)
3	Status of external input 3 (IN_3)
4	Status of external input 4 (IN_4)

Outputs	
0	Status of external output 0 (OUT_0)
1	Status of external output 1 (OUT_1)
2	Status of external output 2 (OUT_2)
3	Status of external output 3 (OUT_3)

<b>Outputs</b>	
4	Status of external output 4 (OUT_4)
5	Status of external output 5 (OUT_5)
6	Status of external output 6 (OUT_6)

<b>Status (also output)</b>	
O	Detector on (ON)
W	Wait during the detector starts up period (WAIT)
S	Sensor signal detected (SIGNAL)
R	Reject (REJECT)
C	Calibration confirmed (CAL_CONF)
E	Error (ERROR)

## Debug Mode

Do not enter this mode. Debug mode is for the manufacturer's use only. Entering debug mode will set the detector to continuously dump debugging data on the printer port.

**IMPORTANT! Setting the detector in debug mode will inhibit normal use of the printer port.**

If you have accidentally entered the debug mode, you can exit by choosing the "Debug Mode" menu option again.

Debug Mode get to Debug Mode: Choose Menu / Service Settings / Debug Mode/Enter the code: SEN

Print Port output:

- Time (ms) counted from power up
- Raw Sensor Signal (mV)
- Numeric value of the Detection Mode signal
- Analysis Value

All values are presented with three digits and tabs between. Printer rate: 50 Hz (20 ms).



# Maintenance - troubleshooting

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Sensistor ISH2000 Technical Reference Manual

## Detailed content

D 100

*Preventive maintenance*

---

D 200

*General troubleshooting guide*

---

D 300

*Reference Leak Trouble Guide*

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## D 100 Preventive maintenance

As the Sensistor ISH2000 does not contain any mechanical parts there is no need for preventive maintenance. However it is recommended to keep some spare parts ready.

Item	Part number
Hand Probe sensor	590-292
O-ring seal	591-528
Fuse	591-578
C21 cable (3m)	590-161
Power cable (EU)	591-146
Power cable (UK)	591-147
Power cable (US)	591-853
Probe Tip Protection Cap	See "Which options for which model?" on page 11.
Probe Tip Filter	See "Which options for which model?" on page 11.
Battery (clock battery)	591-780

## D 200 General troubleshooting guide

### Symptoms description

Fault symptoms	Fault	Measures
Error messages: " <b>Check Probe and Cable</b> ". Red LED flashes quickly.	Broken connection between probe and instrument	Check that the probe cable is properly connected to the probe and the instrument. If the fault persists, replace the probe/cable.
	Software problems	Install the software
	Broken Main PCB	Replace Main PCB
	Broken Probe PCB	Replace Probe PCB
Error messages: " <b>Error</b> "	Error in Active Probe	See Probe Manual.
Error messages: " <b>Check Sensor, Voltage Error</b> "	Sensor voltage from the gas sensor out of the range 300 - 3500 mV	Check that the sensor is properly connected to the probe. If the fault persists, replace the sensor.
Error messages: " <b>Check Sensor, Temp.</b> "	Diode voltage from the gas sensor out of the range 544 - 612 mV	Check that the sensor is properly connected to the probe. If the fault persists, replace the sensor.
No sound in Detection Mode and Analysis Mode.	Sound set low	Press the + button repeatedly.
	Broken speaker	Replace the speaker
No picture on display, no sound	Fuse broken	Check the fuse.
	Broken Main Cable	Replace the Main Cable
	Discharged battery	
	Broken Main PCB	Replace the Main PCB
No picture but only sound when exposed to gas.	Display setting may be wrong	Watch the display from the side at a low angle and aim a lamp at the screen. Try to see the text so that you can enter the Display Settings menu and adjust contrast and brightness.
	Display or Inverter Cable loose	Reconnect loose wiring
	Display Lamp broken	Replace the display
Loss of spots or black lines on screen	Internal contact to LCD broken	Replace the display
Bad sound out of the speaker	Broken speaker	Replace the speaker

<b>Fault symptoms</b>	<b>Fault</b>	<b>Measures</b>
Short operating time on battery model	Old or broken battery	Replace the battery
The time and dates resets at restart	The clock battery is empty	Replace the clock battery on the Main PCB
Settings lost on restart	The main PCB Memories broken (Flash Memories)	Replace the Main PCB
Low or no gas sensitivity	Old or broken gas sensor	Replace the gas sensor
	Probe PCB broken	Replace Probe PCB

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## **D 300 Reference leak trouble guide**

It is very important that we advise the end user to carefully study the manuals for how to take best care and handle the reference leaks.

Here are a couple of mistakes a user can make:

1 The small leaks with a gas container (E, F and G) are delivered at atmospheric pressure due to transportation limitations. This means that the end user has to start by filling the gas container to the indicated pressure. This filling **MUST** be conducted according to the included instructions to ensure you get as close as possible to a 5%H<sub>2</sub>/95%N<sub>2</sub> gas mix inside the container. Otherwise you risk having an undefined gas mix in the container, and what is on the certificate is in that case no longer valid.

2 The smaller leaks that have a gas container are sometimes emptied by the new user, simply because he sees the fill valve and "have to try what it is for". This way you empty the container quite effectively. After this you need to refill the container. See above in point 1 for possible problems.

3 When users connect leak A, B, C to the gas line they sometimes forget that the hose from the bottle may be full of air to start with. If they do this the leak will appear to be very difficult or impossible to pick up by the detector simply because there is mainly air passing through the leak to start with. What they should do is purge the hose from air before attaching it to the leak. Also remember to use the purge valve on the leak itself to release any air trapped inside the leak housing, and replace it with tracer gas.

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# Maintenance sheets

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Sensistor ISH2000 Technical Reference Manual

## Detailed content

E 100

*Maintenance operations introduction*

---

E 120

*Sending the leak detection for reparation to a service center*

---

E 130

*Functional verification*

---

E 140

*Service Menu*

---

E 160

*Software and documentation evolution*

---

E 230

*Sensistor ISH2000 Main board*

---

F 240

*Sensistor ISH2000 Wiring diagram*

---

E 410

*Instrument maintenance*

---

E 411

*Probe maintenance*

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## E 100 Maintenance operations introduction

### Electrostatic discharge (ESD) protected equipment

To a greater or lesser extent all contact between objects, separation of one item from another, or sliding of one thing on another, causes a disturbance of electrical charge. When charge disturbances take place faster than charge redistribution, static charge accumulates.

Amongst the greatest generators of static electricity are people. It can be readily shown how in ordinary ambient conditions a person's electrical charge, measured in Volt, is constantly changing. It can move up or down at every step, as they sit or rise, when they touch things, or as another person passes nearby. Consequently if people handle electrostatic discharge sensitive devices (ESD) without appropriate precautions, there is a real risk they will unwittingly damage them.

Electrostatic discharge (ESD) has been recognized as a potential hazard for semi-conductors and integrated circuits.

To protect devices from the unwanted effects of ESD, two key measures must be taken and applied at all times:

1. devices must be handled exclusively in an ESD Protected Area (EPA). In essence, an EPA is a defined space within which all surfaces, objects, people and devices are kept at the same potential.
2. devices must be transported from one EPA to another only in ESD shielding packages.

The issue is to save defects on customer sites for the integrated electronic boards in leak detector, drytels, controllers and accessories.

The ESD reduce the useful life of the electronic boards. There is no immediate consequences during the assembly of the electronic devices but there is a premature aging of components.

All the Service Centers must be equipped to protect the INFICON products against the ESD during repair process.

On Customers site, during exchange or maintenance of electronic card, the engineer must wear the ESD coat and use disposable wristband.

To achieve this goal, we invite you to order the "ESD KIT" and install it in your Service Center as soon as possible.

### Safety instructions

See B 100 "B 100 Safety instructions" on page 29

### Icons used

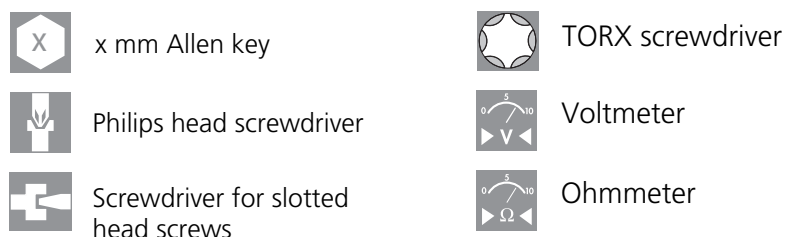


Figure E-1: Icons used

## E 120 Sending the leak detection for repair to a service center

### Product return form

See "How To Contact INFICON" on page 103.

### WEEE standard + RoHS

#### WEEE directive:

INFICON products like portable helium leak detectors, gauges or vacuum measurement devices fall within the scope of the WEEE directive.

INFICON AB provides a collection and recycling service for used electrical and electronic products.

Any obligation of the manufacturer to take back such equipment shall apply only to complete not amended or modified equipment, using Alcatel Vacuum Technology original spare parts, delivered by Alcatel Vacuum Technology, containing i.e. all its components and sub-assemblies. This obligation will not cover the shipping cost to an INFICON AB take back facility.

#### RoHS directive:

The RoHS directive aims to limit the use of certain substances (lead, mercury, cadmium, hexavalent chromium, PBDE and PBE), commonly used in designing electrical and electronic equipment.

INFICON products do not fall within the scope of the RoHS directive, but as we wish to protect the environment, many actions have already been launched:

- Inventory of all items which include these substances
- Action to eliminate these substances
- Qualification of new materials, new parts, etc.

All INFICON products are RoHS compliant since December 2007.



## E 130 Functional verification

### Sensitivity Test

Sensitivity Test has been designed to help to double-check Hand Probe sensors and H65 sensors for Sensistor ISH2000 before delivery to end customers. Every sensor has been tested thoroughly before delivery from the factory. It happens, however, that sensors lose sensitivity while kept in stock.

By following these instructions the user will get the information you need to accept or reject a new sensor before delivery. The test is done using a reference gas containing 10 ppm H<sub>2</sub> in synthetic air.

You need the following equipment:

- Leak Detector (Sensistor ISH2000) with probe cable and hand probe.
- Reference gas 10 ppm H<sub>2</sub> in synthetic air.

#### **IMPORTANT:**

A sensor can be calibrated using reference gas or a reference leak. There are some fundamental differences between these two methods:

- When using a reference leak you add Hydrogen to the background.
- When exposing the sensor to reference gas you replace the background (ambient) with the reference gas.

It is important, in both cases, to calibrate in a non-polluted background (i.e. typically 0.5 ppm Hydrogen).

When using a reference gas this is essential. If the background is close to the concentration in the reference gas you will get no signal. If the background concentration is higher than the reference you will even get a negative signal (i.e. signal appears when reference gas is removed).

When using a reference leak the problem is less pronounced as the leak adds gas to the background. The calibration will however be significantly affected if background is higher than the resulting concentration added by the leak.

Calibrating in a high background will, however, always result in making the detector more sensitive. This means quality is not affected. Some "good" products may be rejected but no bad products will be passed.

On the following page are detailed instructions for testing the sensor with 10 ppm Reference Gas.

#### **Using Reference Gas**

##### 1. Preparing the Reference Gas

- a. Check the reference gas type ( must be 10 ppm Hydrogen in synthetic air)
- b. Connect pressure regulator to the gas bottle. **IMPORTANT!** Never use a regulator that has previously been used for the 5% tracer gas. This may contaminate the reference gas bottle and alter the concentration!
- c. Connect a hose to the gas regulator complete with mouthpiece or a piece of 11-15 mm inner diameter hose to slide over probe tip.

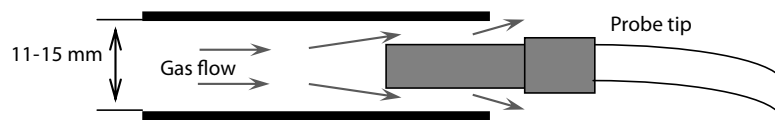


Figure E-2: Connect a hose to the gas regulator

d. Purge the hose with low flow of reference gas (1-5 cc/s). If you put the hose in a glass of water it should NOT "boil" the water but only release a gentle stream of bubbles.

## 2. Preparing the Hydrogen Sensor

a. Switch power OFF on Sensistor ISH2000

b. Connect the probe and probe cable according to Manual

c. Start Sensistor ISH2000 in service mode by doing the following:

i. Press and hold the right button while switching power ON.

ii. Release button when text screen appears. (If logo appears you released the button too late - try again)

iii. Go to service mode display after warm up period.

d. Remove probe tip protection cap!

e. Wait minimum 10 minutes more to stabilize sensor.

## 3. Sensitivity Test with Reference Gas 10 ppm

a. Make absolutely sure there is no abnormal increase of Hydrogen in the background ( i.e. avoid: smoking in the room, releasing tracer gas in big clouds, flatulence etc). Make sure you have as normal background of H<sub>2</sub> as possible (0.5 ppm).

b. Check that the Signal is 0.00E+00 (see See Figure E-3: "Service mode screen")

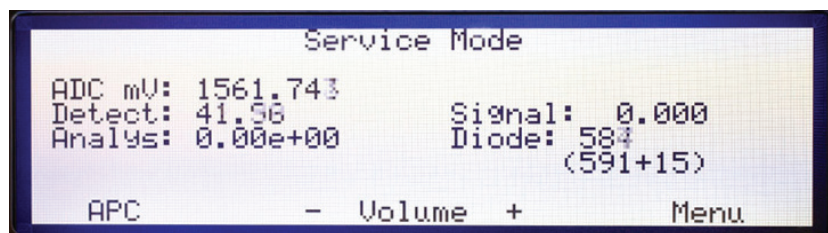


Figure E-3: Service mode screen

c. Open a gas flow of about 1-5 cc/s.

d. Wait until you are sure there is only the 10 ppm gas in the hose.

e. Insert the probe tip (without protection cap) minimum 1 cm into the open end of the hose. See See Figure E-2: "Connect a hose to the gas regulator". There must be no pressure on the sensor.

f. Wait until the signal has stabilized (takes a few seconds).

g. Read the Signal and then remove the probe. Close gas flow. The Signal is given in scientific (engineering) format.

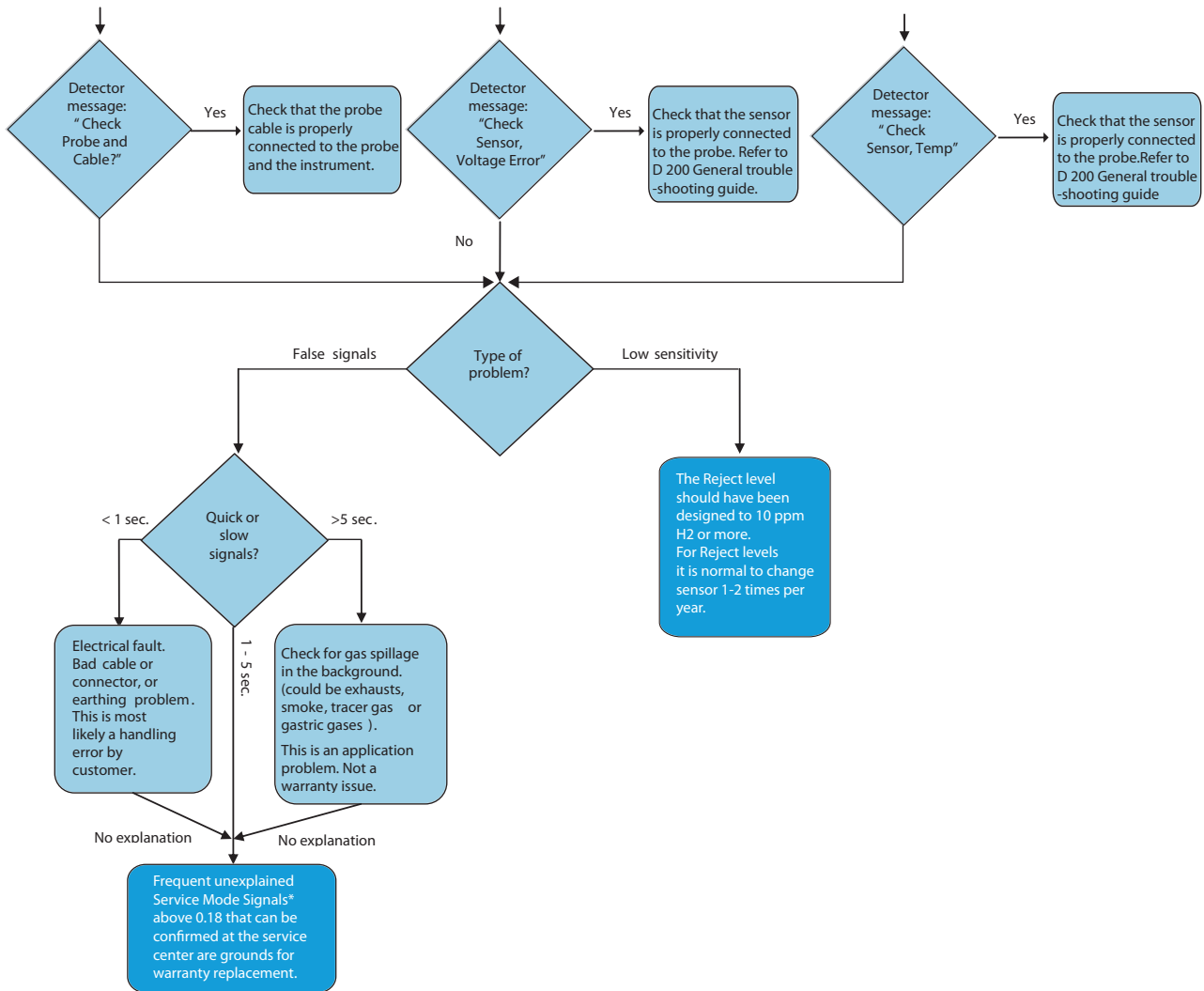
### Examples:

- $7.50E-01 = 7.5 \times 10^{-1} = 0.75$
- $1.40E+0.0 = 1.4 \times 10^0 = 1.4$

- h. Acceptance level for new sensor is minimum 1.2 = 1.20E+00.
- i. If the Signal is below 1.2: Wait at least 10 minutes (leave instrument on) and then repeat the test. If the Signal (after a repeated test) is still below 1.2 the sensor is to be considered no good for delivery.

## Sensitivity fault analysis

The following questions below are useful to detect a problem.



\* Service Mode Signal is read in Service Mode. See instructions for Sensitivity Test

Figure E-4: Sensitivity fault analysis

## E 140 Service menu

The Service Mode is reached by starting the instrument and at the same time hold the right button down on the panel. After start a new main menu called Service Settings will appear.

### Show Password

Shows the chosen password in case the customer has forgotten the password. Contact INFICON AB to have the code sent to you.

### System Reset

Resets all parameters to default settings, stored in the detector and the prob if it is connected. Contact INFICON AB to have the code sent to you.

### Detector Signal Level

The Detector Signal Level is the level below which the sensor is considered to have recovered from the last gas signal. It decides when the DET\_SIGNAL output will come on. This signal can be used to block the start of a calibration or new test cycle in semi and fully automatic testers.

If DET\_SIGNAL is high then this means that the sensor has detected hydrogen and has not yet recovered.

Detector Signal Level can be adjusted in the Service Settings menu. You can increase Detector Signal Level if you have many small disturbing signals. A high setting of Detector Signal Level gives better tolerance to "noise" gas signals at the expense of accuracy. A low setting gives best accuracy but lower tolerance for "noise" gas signals. The Detector Signal Level is set as 1 to 100% of the Reject Level. Default is 20%.

**NOTICE! Increasing the Detector Signal Level may give poorer accuracy.**

### Trigg Level

Upper Limit setting for Peak hold in analysis mode.

### Minimum Calibration Time

Lower limit setting for the timer which is used during calibration. Contact INFICON AB to have the code sent to you.

### Battery Mode

Selection of battery power. Only used to adapt software for the battery model.

### Number of Significant Digits

Choice of a number of significant numbers in Analysis and Combined Mode. It is used when a more exact measurement is needed. A good control of the environment and calibration is required to be useful. Contact INFICON AB to have the code sent to you.

### Debug Mode

This mode is used during service and software development. Service Mode This mode contains useful information to analyse the gas sensor behavior. If the instrument starts in the Service Mode then it is possible to reach APC Service Mode. Under APC Service Mode is useful information to check timers, I/O on the Probe Control Port, and other.

## E 160 Software and documentation evolution

Instrument software Version	Probe Software Version	Date	Notes	Info/changes
6.01	1.01	2010-09-30	First release.	-
6.02	1.02	2010-10-28		<p>At probe upgrade, errors appeared because of use of too short variable type at timeout control. Result print format using "Analysis Data Output" corrected. (Log-a-Leak works now). "n.nnE+ee".</p> <p>Probe connection and reconnection, approved user interface (quicker response at disconnect and connect of probe).</p> <p>RS232 command "C?" and "J?" works now.</p>
6.02	1.03	2011-01-14	Temp error limits adjusted.	

# E 230 Sensistor ISH2000 Main board

## Component locations on board

Cable connections to MAIN PCB rev 02 (Production files 02B)  
 INFICON AB 2010-09-10 /DJ

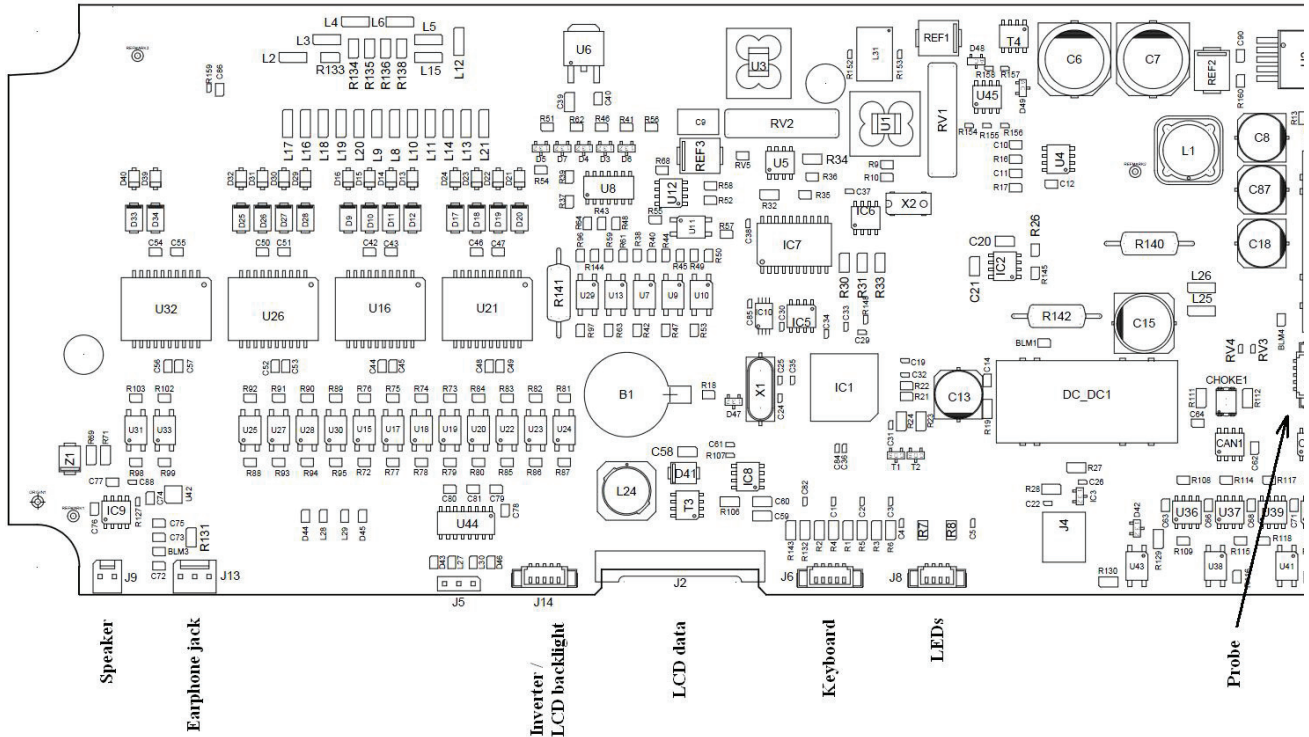
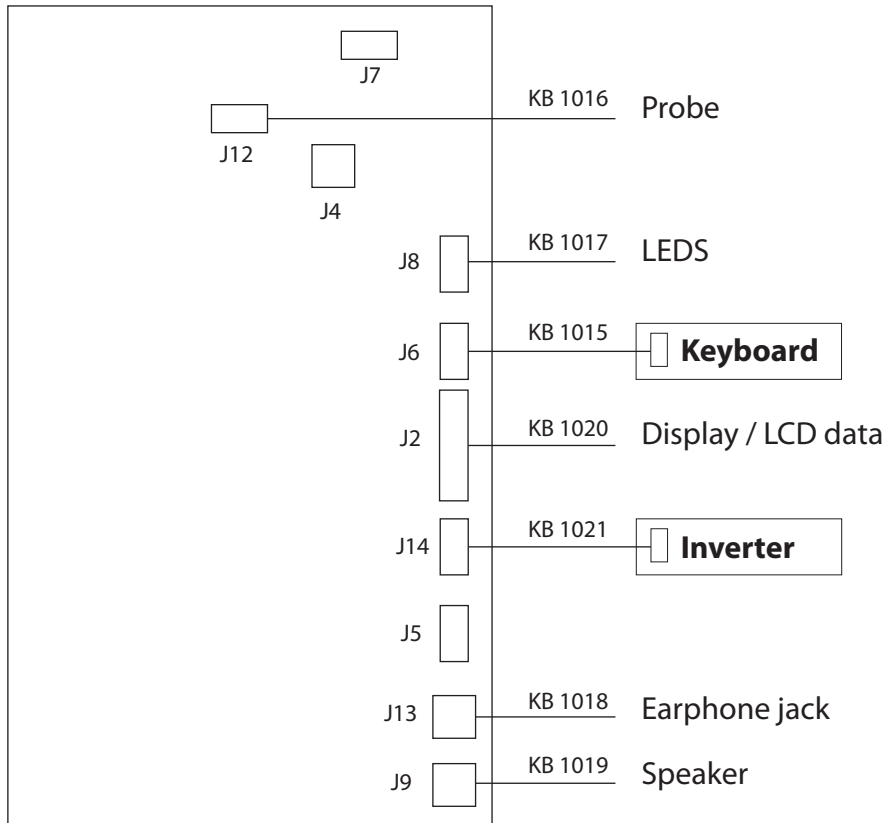


Figure E-5: Main board

## E 240 Wiring diagram Sensistor ISH2000

### Main PCB



E-6: Main PCB

## E 410 Instrument maintenance

### Tools needed

P/N	Sensistor ISH2000	Tools	Supplier
591-533	Torx screw MRT M3x10	Torx TX10	
591-791	Torx screw MRT M3x12	Torx TX10	
591-790	Philips head screw MFX-Z 3x6	Philips head screw-driver PH1	
591-493	Slotted head screw MCS M1.6x8	Screw driver for slotted head screw	
591-499	Hexagonal nuts M6M M1.6	6 mm spanner	
591-487	Torx screw MRT4x20	Torx TX20	
591-488	Torx screw MFT M4x8	Torx TX20	
591-490	Allen Key Screw MC6S M5x55	4 mm Allen key	
591-787	Philips head screw RXK-Z ST2,2x4,5	Philips head screw-driver PH1	
591-607	Philips head screw M3x8 svartkrom	Philips head screw-driver PH1	
591-013	Nut M6M M3 A2	6 mm spanner	
591-538	Screw Lock UNC G 5 mm + S 3mm	4,5 mm spanner	
591-452	Allen Key Screw K6SF M8x10 10.	5 mm Allen key	
Purchase from the supplier	Spanner for noched nuts phoenix prob	DCH.91.161.PA	LEMO



## Dismantling Sensistor ISH2000

1. Turn off the instrument and remove power supply.
2. Unscrew the two torx screws (T20) on the back side of the unit.



Figure E-7: Unscrew the two torx screws

3. Open the instrument by pulling out the front as shown in the picture to the right.



Figure E-8: Pull out the front

4. Unscrew the four torx screws and remove the power supply.



Figure E-9: Remove power supply

## Dismantling Sensistor ISH2000C

1. Unscrew the two torx screws on the back side of the unit.



Figure E-10: Turn off the instrument and start dismantling

2. Open the instrument by pulling out the front as shown in the picture to the right.



3. Pull out the front enough to loosen the three connectors.

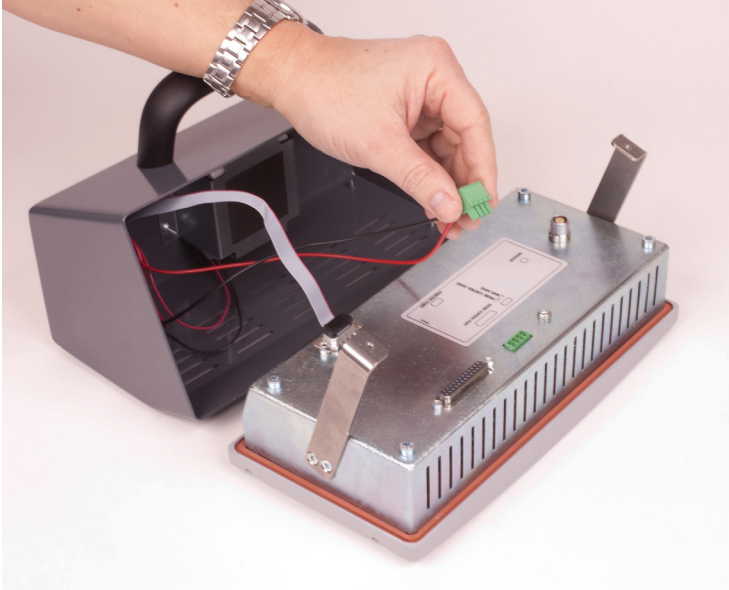


Figure E-11: Pull out the front

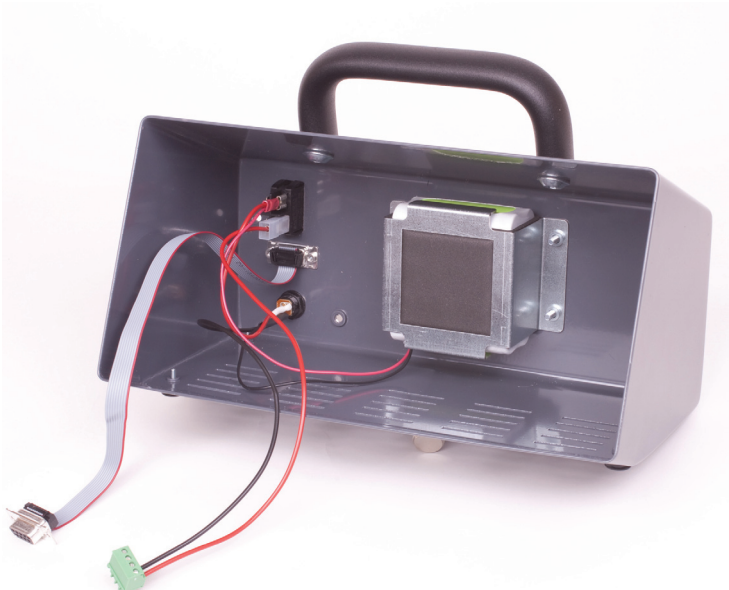


Figure E-12: Connectors

4. Remove the battery as shown in the figures to the right.



Figure E-13: Remove screws

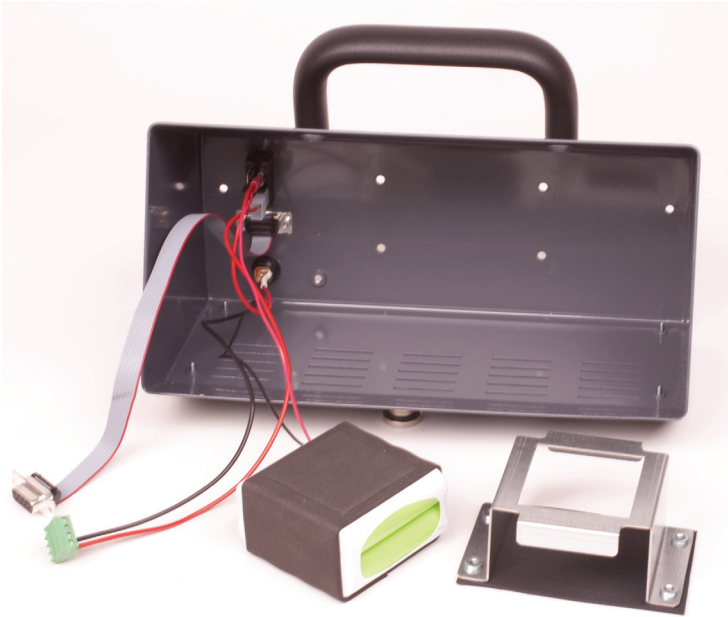


Figure E-14: Battery

## Dismantling Sensistor ISH2000P

1. Turn off the instrument and remove power supply.
2. Unscrew the two Allen Key Screw M6 on the back side of the unit.



Figure E-15: Unscrew the two Allen Key Screws

3. Open the instrument by lifting the inner housing

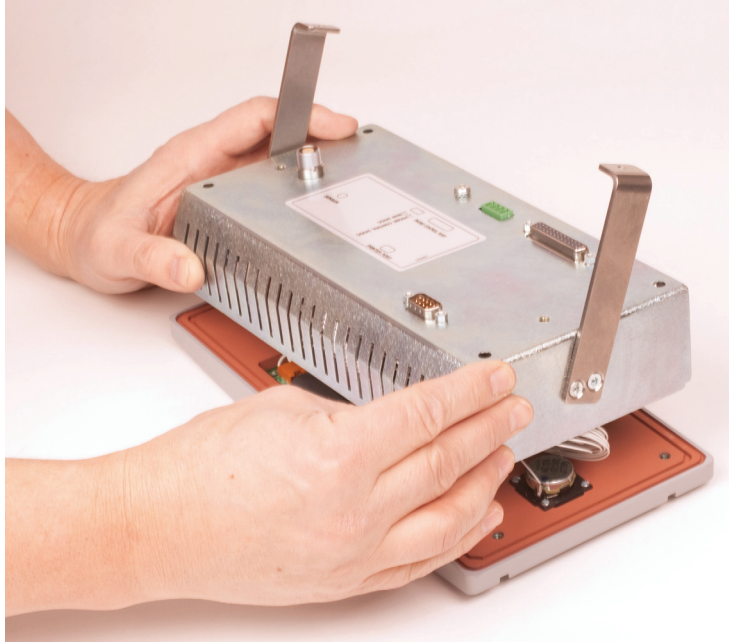


Figure E-16: Open instrument

## Replacement of main PCB

1. Separate the cables as shown in the picture to the right.



Figure E-17: Separate cables

2. Release the PCB by losing the locknuts on the D-Sub connectors and the LEMO connector.



Figure E-18: D-Sub

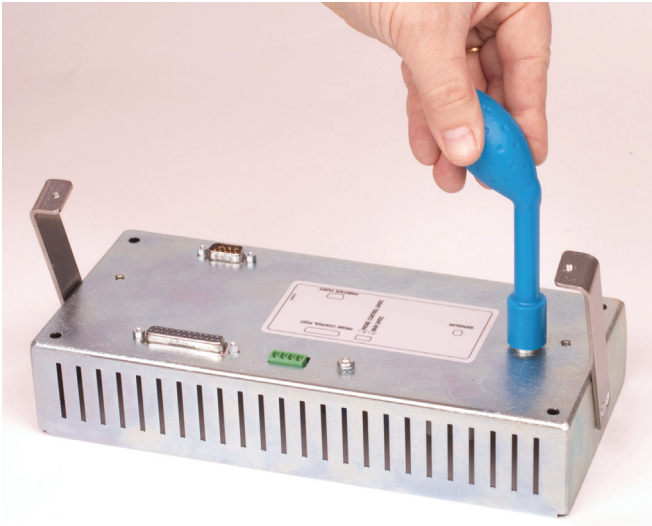


Figure E-19: LEMO connector

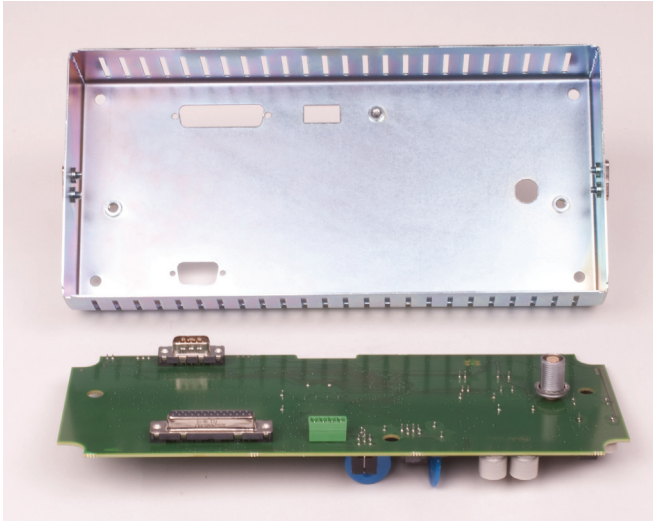


Figure E-20: PCB



## Removal of speaker

Unscrew the speaker Philip Head Screws as shown in the picture to the right.

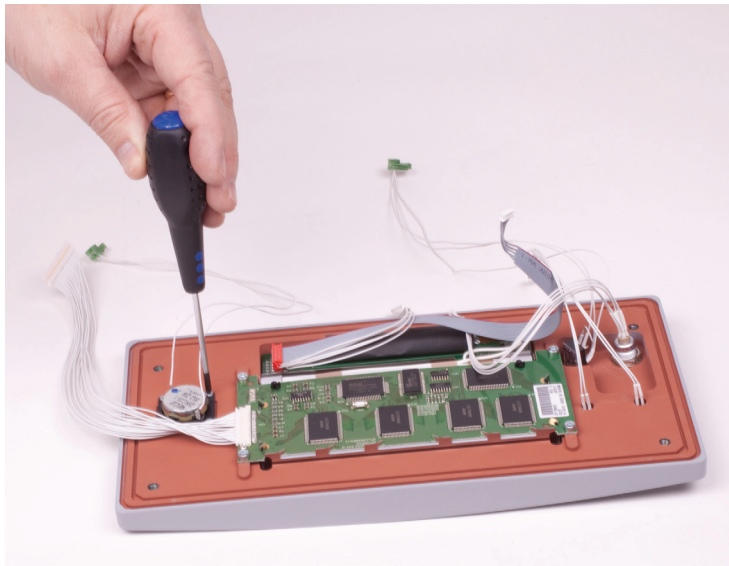


Figure E-21: Removal of speaker

## Removal of display

Remove the display by unscrewing the 4 Torx screws as shown in the figure to the right.

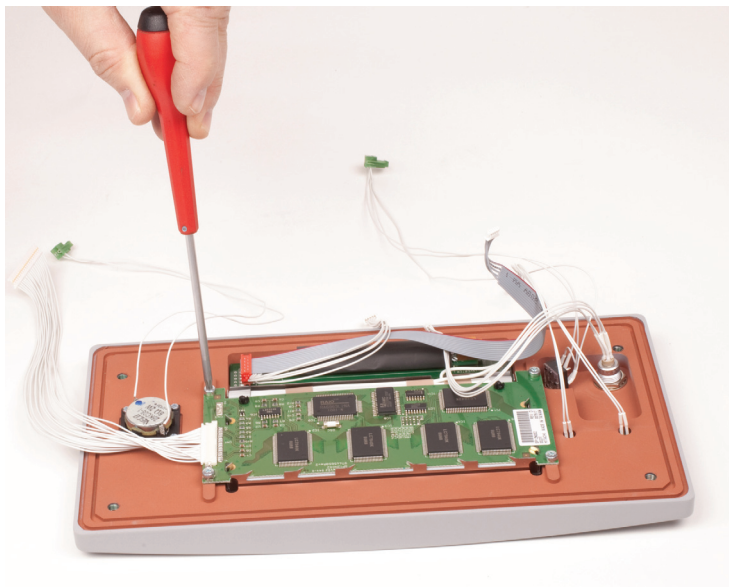


Figure E-22: Removal of display

## Removal of panel buttons

Unscrew the panel button card Philip Head Screws as shown in the pictures to the right.

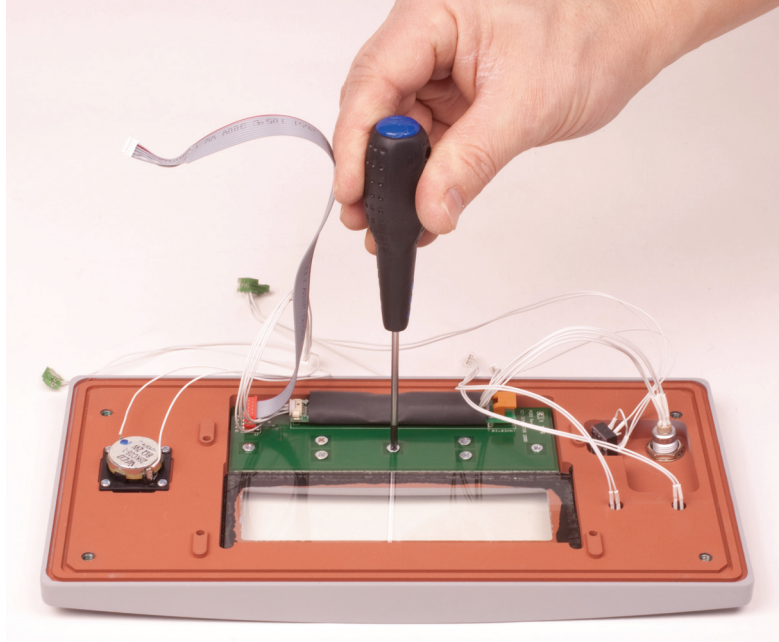


Figure E-23: Unscrew the panel button card Philip Head Screws

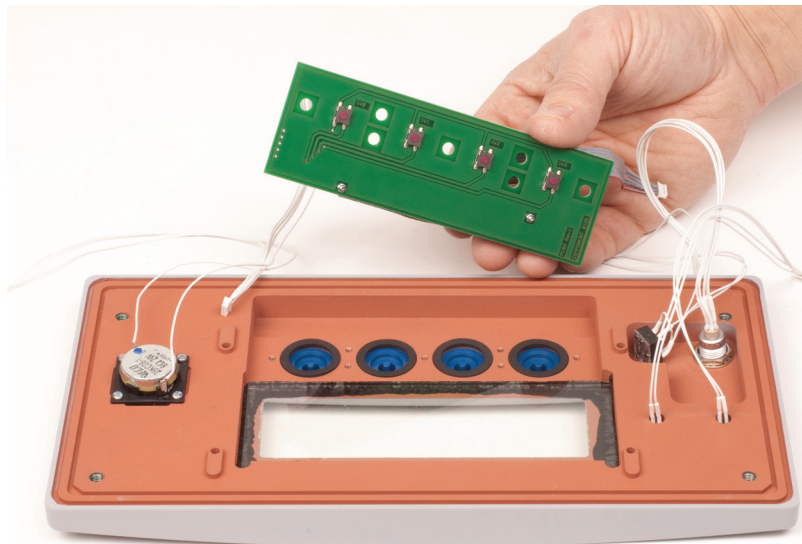


Figure E-24: Panel button card

**Note:** When mounted, the high buttons shall be mounted in the two middle holes!

When mounting the Main PCB the lower nut on LEMO connector with washer must be located 6 mm above the PCB surface.

## E 411 Probe maintenance

### Tools needed

P/N	P50/P50 Flex	Tools	Supplier
598-160	Nut probe tip	10 mm spanner	
591-802	Allen key S6SS M4x6 steel	2 mm Allen key	
591-803	Allen key screw MC6S M3x20 fz	2,5 mm Allen key	
T.B.A.	Spanner for noched probe nuts	DCH.91.161.PA	LEMO

### Changing the Probe Tip

1. Turn off the instrument.
2. Loosen the safety nut with the appropriate tool from INFI-CON AB or with a 10 mm wrench.



Figure E-25: Loosen the safety nut

3. Remove the tip by hand. The o-ring creates some friction.
4. Remove the sensor by drawing it straight out.
5. Mount a new sensor. Make sure it turns in the correct direction.
6. Observe the contact area between the probe pipe and the sensor. They should contact each other.
7. Mount the union nut.
8. Tighten with a suitable tool.



Figure E-26:

## Dismantling probe

1. Loosen the LEMO contact nut using a spanner for noched probe nuts.



Figure E-27: LEMO connector

2. Unscrew the 2 screws at the bottom as shown in the picture to the right.



Figure E-28: 2 screws

3. Gently separate the 2 parts.



Figure E-29: Separated pars

4. When changing the PCB the cables must be removed by soldering.

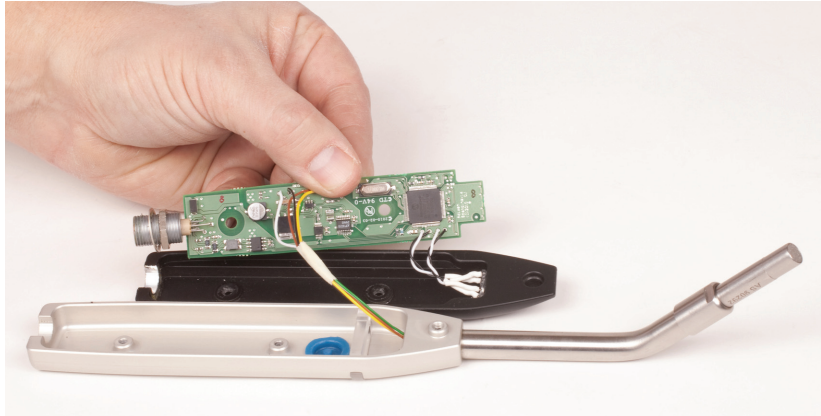


Figure E-30:

5. To replace the probe tube release the safety screw by using an Allen key. Heat the probe connection with a warm gun lift and loosen the probe tube. At assembly the probe tube must be bonded with Loctite.



Figure E-31:

**Note:** When mounting, ensure that the nut on the Lemo connector on the the PCB is properly adjusted (distance shall be 9 mm from LEMO's edge to the nut).



# Appendix

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Sensistor ISH2000 Technical Reference Manual

## Detailed content

F 100

*Service*

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F 800

*Tools*

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## **F 100 Support by INFICON**

### **How To Contact INFICON**

For Sales and Customer Service contact nearest INFICON Service Center. The address is found on the website: [www.inficon.com](http://www.inficon.com)

If you are experiencing a problem with your instrument, please have the following information readily available:

- The serial number and firmware version for your instrument,
- A description of your problem,
- An explanation of any corrective action that you may have already attempted, and the exact wording of any error messages that you may have received.

### **Returning you instrument to INFICON**

Please use the Product Return Form which was included with the product at delivery.

Do not return any component of your instrument to INFICON without first speaking with a Customer Support Representative. You must obtain a Return Material Authorization (RMA) number from the Customer Support Representative.

If you deliver a package to INFICON without an RMA number, your package will be held and you will be contacted. This will result in delays in servicing your instrument.

Prior to being given an RMA number, you may be required to complete a Declaration Of Contamination (DOC) form if your instrument has been exposed to process materials. DOC forms must be approved by INFICON before an RMA number is issued. INFICON may require that the instrument be sent to a designated decontamination facility, not to the factory.

## F 110 Disposal of product when taken out of service



According to EU legislation, this product must be recovered for separation of materials and may not be disposed of as unsorted municipal waste.

If you wish you can return this INFICON AB product to the manufacturer for recovery.

The manufacturer has the right to refuse taking back products that are inadequately packaged and thereby presents safety and/or health risks to the staff.

The manufacturer will not reimburse you for the shipping cost.

Shipping address:

INFICON AB

Westmansgatan 49

582 16 LINKÖPING'

SWEDEN

### RoHS and WEEE

For information regarding RoHS and WEEE directives, please contact INFICON AB



## F 800 Tools

### Sensistor ISH2000 software

#### Sensistor ISH2000 Installer

“Sensistor ISH2000 Installer” file contains the software for instrument and probe, as well as several service functions.

Installation instructions

1. Turn off the Sensistor ISH2000
2. Connect a a standard RS232 Null Modem cable between the computer and the instrument.



Figure F-1: PC and instrument

3. Double click the “Sensistor ISH2000 Installer” file



Figure F-2: Sensistor ISH2000 software installer

4. Choose program and com port
5. Press download

6. Turn on the instrument
7. Wait for download
8. The following windows on next page appears when the installation is complete.
9. Repeat for downloading probe software

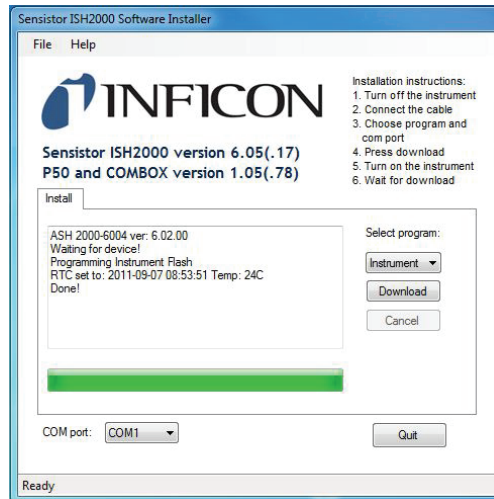


Figure F-3: Sensistor ISH2000 installer after installation of the instrument software

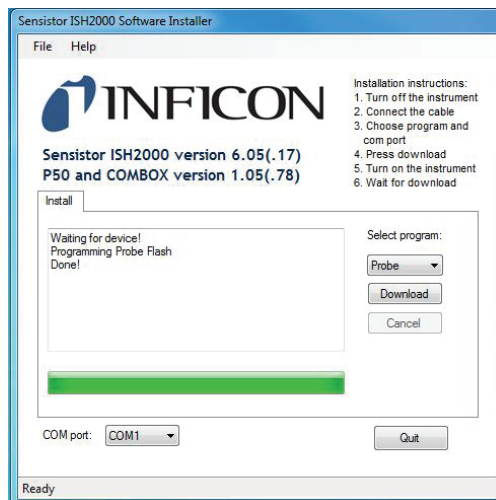


Figure F-4: Sensistor ISH2000 installer after installation of the probe software

## APC Installer

Installation instructions:

1. Turn off the instrument
2. Connect a a standard RS232 null modem cable between the computer and the instrument.
3. Double click the "APC Installer" file
4. Choose probe, language and com port
5. Press download
6. Turn on the instrument
7. Wait for download
8. The following window on next page appears when the installation is complete.



Figure F-5: APC Install after installation of software



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