SF6 LeakCheck P1 XTL

Instrument Quick Start Guide V14



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Register your instrument online for an extended warranty.

Thank you for purchasing your ION Science® instrument.

The standard warranty for your SF6 LeakCheck P1 XTL is 1 year.

To receive your extended warranty, you must register your instrument online within one month of purchase (terms and conditions apply).

Click here to extend your instrument warranty or scan the QR code below.

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Safety Information

Before using the measuring system, read and observe the following information:

Retain the documentation safely.

Only instructed and authorised staff may open the equipment or its parts.

Within the equipment, some components may require maintenance.

Symbols

This manual uses the following symbols to stress specific text passages:

Symbol	Meaning
	**Danger** – Failure to observe this note may cause incorrect measurements, material damage and risk of injury.
	**Note** – Please pay special attention to this paragraph.
	**Environmental** – Information relevant regarding the environmentally compatible operation and disposal of the product.
	**Recycling** Recycle all packaging.
	**WEEE Regulations** Ensure that waste electrical equipment is disposed of correctly.

Precautions

Use the instrument ONLY on voltage-free and grounded equipment. Failure to observe this rule may cause fatal injury and/or material damage.

The surface you are going to check for leaks must be free of all liquids, such as oil or water, and coarse dirt. If necessary, wipe it with a cloth before approaching it with the sensor tip. Liquid ingress will immediately destroy the SmartSensor, while grease and similar substances, even in small quantities, will obstruct the sample inlet.

Setup Options

This document is restricted to very few options that may be significant to the operator.

Measuring principle

An advanced high-voltage ionisation detector (NIC©- Negative Ion Capture) is used, which has been optimised in consideration of the following:

- Sensitivity
- Precision
- Service life
- Reliability

Through miniaturisation, it has been possible to integrate the sensor directly into the measurement tip, thereby achieving excellent response and recovery times.

Usage in practice

Owing to the practice-oriented design of the instruments, work with these is simple and reliable when observing the following:

For leak detection

Switch the instrument to **Search Mode**.

Guide the sniffer probe as closely as possible to the suspected leaking locations. Establishing material contact with the sniffer probe will be helpful.

The velocity at which the sniffer probe is advanced should be about 20 mm/s.

Please do not push the sniffer probe over the test specimen; instead, pull it gently to help prevent grease and dirt from entering the probe.

For leak measurements

Switch the instrument to **Measurement Mode**.

Make sure it is set to the desired units of measurement (cc/s or g/a).

Guide the sniffer probe as closely as possible to the suspected leaking locations. Establishing material contact with the sniffer probe will be helpful.

The magnitude of the leak is considered correctly acquired when the measured value remains constant for 2 seconds.

For concentration rise measurements (integral atm.)

In the setup, select the unit of measurement ‘ppm’.

Place the test specimen in the SF6-free chamber and close the chamber.

Zero the leak detector in clean ambient air by operating the ‘Zero’ button.

For the initial measurement with the P1 XTL leak detector, insert the sniffer probe into the corresponding connection in the chamber for approximately 10 to 20 seconds.

Check the measurement value V1. Remove the sniffer probe from the chamber.

After the customer-defined measurement time has elapsed, zero the leak detector in clean air by operating the ‘Zero’ button, then introduce the sniffer probe into the chamber again and perform the final measurement for approximately 10 to 20 seconds.

Check the measurement value V2. Remove the sniffer probe from the chamber.

The difference between the two measured values (V2-V1) gives the rise in concentration within the measurement time specified by the customer.

P1 XT menu system

On the main screen shown during measurement, the menu system is invoked by tapping the symbol in the upper-right corner. This will bring up the menu selection screen.

Available options are:

1. MEASUREMENT

This is where all settings related to actual measurement are located. From here, the following menu items are available (greyed out options are turned off and reserved for future use):

1.1 Display Units

By clicking on ‘cc/s’, ‘ppm’, or ‘gm/yr’, the corresponding units are selected for measurement. Please note that the concentration measurement (ppm) is calibrated independently, while the leak rate modes (cc/s, gm/yr) share a standard calibration.

To exit, use ‘BACK’ to continue with the menu system, or ‘ESC’ to return to measurement.

1.2 Set Alarm Value

Define your maximum allowable leak rate or concentration here. All alarm outputs (light signals, vibration alarm, audible alarm) are referenced to this value. The 0 to 100% scale on the available measurement screens is adjusted such that 100% equals the selected alarm value.

To exit, use ‘BACK’ to continue with the menu system, or ‘ESC’ to return to measurement.

1.3 Gas

Select the gas which is used in your components.

- SF6
- C4-FN (Pay-Option)

C4-FN allows you to select the desired concentration. The displayed value is adjusted for concentrations lower than 100% to provide a direct readout of the calculated leak rate.

1.4 User Adjustable Zero Tracking

The measurement of electron-capturing substances is based on a tiny current flowing through ionised air. When a substance such as SF6 is present, the current decreases slightly, and the reduction is used to determine its quantity.

The current flowing in the absence of such substances is considered a virtual zero line for measurement purposes. Since it is subject to slow fluctuations in the SmartSensor and to changes induced by ambient air, it is necessary to maintain and update this virtual zero continuously.

For leak detection in sniffing mode, which is often used in environments that may be contaminated with SF6, the medium setting ‘NORM’ is generally recommended. Try ‘HIGH’ if you experience frequent false alarms when changing background levels of detectable gas.

In laboratory environments, the ‘LOW’ setting is suitable and recommended for most concentration measurements, unless you need to detect very low concentrations (< 2 ppm).

In the latter case, or when you experience strange behaviour like a slowly rising readout after a measurement, switch to ‘OFF’. This freezes the Zero Tracking entirely. In this setting, it is mandatory to manually zero the instrument immediately before taking a measurement.

A minus sign at the start of the readout indicates that manual zeroing is required when it is displayed permanently. When it does not show up or flashes, this indicates that the virtual zero is right on the spot.

To set up the Zero Tracking mode, pull up the menu system, then select ‘Measurement’ / ‘Zero Tracking’, and use the arrow keys to set the desired modes (OFF/LOW/NORM/HIGH) for leak rate and concentration measurement, respectively.

To exit, use ‘BACK’ to continue with the menu system, or ‘ESC’ to return to measurement.

1.5 Calibration

This will calibrate the instrument for the currently selected units of measurement. Please observe that the concentration (ppm) and leak rate (cc/s, gm/yr) modes are calibrated separately. This is because, unlike concentrations, leak rate measurements must account for the instrument's sample intake flow, which may differ slightly between instruments.

The first step is to enter the value of the calibration source you intend to use, i.e., either the leak rate as specified on the calibration leak or the calibration gas concentration when running in ppm mode. Please note that calibration gases mixed with compounds other than air, particularly nitrogen as the neutral compound, are not suitable for use with this instrument.

Important note: The device must undergo a warm-up phase of at least 5 minutes before calibration. If necessary, increase the standby time to prevent the device from switching to standby mode. After the warm-up phase and before calibration, please press the zero point button.

Press ‘Modify’ if the value on display needs to be changed.

The next step is triggered by pressing ‘Confirm’. You will then be prompted to approach the calibration source. Calibration completes automatically when the instrument detects enough gas.

To exit, use ‘BACK’ to continue with the menu system, or ‘ESC’ to return to measurement.

Note: Calibration gases mixed with compounds other than air, especially nitrogen, are not suitable for use with this device. Premixed calibration gases for ppm-mode calibration, e.g., 10 ppm SF6 in synthetic air, have a relative humidity of 0% RH and therefore deviate significantly from the ambient air, leading to considerable interference during the calibration of the P1 XTL.

1.6 Cal. Factors

The instrument provides for separate calibration factors for the basic operating modes ‘Leak rate’ [cc/s, gm/yr] and ‘Concentration’ [ppm]. Typically, the final calibration for both operating modes is performed independently.

By optionally coupling the calibration factors (Tick the box), it is possible to calibrate the leak detector with a single final calibration in one operating mode and simultaneously in the other. This is particularly useful when no suitable calibration source for the desired operating mode is available.

Calibration for the presently active mode is performed as usual, while the calibration factor for the other mode is derived by internal calculation. However, this is subject to a significant error margin due to some tolerance in the sample intake flow rate. Therefore, cross-mode calibration is recommended only as a workaround when a suitable calibration source is unavailable for the desired mode.

To exit, use ‘BACK’ to continue with the menu system, or ‘ESC’ to return to measurement.

2. APPEARANCE

Here you can configure the device's ALARM reporting behaviour:

- Click ‘Volume’ and adjust the slider to the desired volume level.
- Click ‘Lights’ to confirm a selection: <NORM> flashing alarm notifications, <NOFLASH> non-flashing alarm notifications, or <OFF> alarm projector off.
- Click on ‘Vibration’ to confirm a selection: <NORM> 5 s vibration on alarm, <SHORT> 1 s vibration on alarm, or <OFF> vibration off.

To exit, use ‘BACK’ if you wish to continue with the menu system, or ‘ESC’ to return to measurement..

3. TECHNICAL

This menu comprises the following options:

3.1 Radio

Each P1 XT instrument comes with a USB Radio Stick uniquely dedicated to it. It will not connect to a different Radio Stick.

This option is used only when you need to connect the instrument to a different USB Radio Stick by entering the Radio Stick's MAC address. To change it, clear the entire entry field and enter the MAC address of the new USB Radio Stick as per separate instructions. When done, turn the instrument off and back on to transfer the new address to its permanent memory, and from now on, connect to the latest USB Radio Stick.

3.2 Serial Number

Displays the instrument's serial number.

3.3 Standby

This sets up the desired idle time before the instrument enters standby. This saves battery power and SmartSensor lifetime. The recommended time is 5 minutes; adjust the slider to the desired time (settings below 5 minutes are not possible). Setting it to the leftmost position will deactivate the standby option entirely. When the instrument is in Standby mode, the Alarm Projector's LEDs flash slowly in blue. This is meant to distinguish the Standby state from the Off state.

The instrument will wake up from standby when it is being moved.

To exit, use ‘BACK’ to continue with the menu system, or ‘ESC’ to return to measurement.

3.4 Technical Data

Here you can read out the SmartSensors and the instruments' hours of operation.

Please note that, for reliable operation, SmartSensors are considered unusable if their runtime exceeds 300 hours. When this limit is reached, the instrument will no longer work with this SmartSensor.

To exit, use ‘BACK’ to continue with the menu system, or ‘ESC’ to return to measurement.

Operating the SF6 LeakCheck P1 XTL instrument

Open the case.



Press firmly on the top of the P1 XT Handgun to release the docking station to the working position.



The instrument will slide out into the working position.



Wait for any action until the working position is reached.
Remove one P1 SmartSensor from the storage bay.



Attach the **P1 SmartSensor** to the plug on the handgun before you switch the instrument on.



To switch the instrument **ON**, briefly press the left button on the Handgun.



The P1 XT will start in **'SEARCH MODE'** or **'MEASUREMENT MODE',** whichever was used before.



To change from **'SEARCH MODE'** to **'MEASUREMENT MODE'** and back again, swipe your finger over the display from left to right.



To set the measured value to **Zero,** press the right button briefly.




Setup Button
Touch Screen
Hotkey Left
Hotkey Right
0
E-8 cc/s
OFF/STBY
ZERO
P1 XT

P1 XT Handgun Park Position
Push down to lock the docking station and secure the instrument by closing the lid

P1 SmartSensor
Storage Area

USB
No data, charge only for mobile devices

Mains Power
100 …240 V 50/60 Hz



Storage Shelf
For accessories e.g. power cable, user manual

Service life of the P1 SmartSensor

The expected service life of the SmartSensor is approximately 200 to 300 hours of continuous (!) operation under average room air conditions. Based on an active measurement time of approximately 2 hours per workday, this gives a utilisation duration of approximately 6 months.

In the case of a discontinuous measurement operation, the utilisation duration may be optimised by using the standby option. By using standby modes, the SmartSensor is shut down during breaks and thus not subjected to wear.

The service life of the SmartSensor is mainly limited by contamination. This occurs in two ways:

1. Small particles in the sample air can pass through the front filter (Part No. P1:P-100-0024) and enter the ionisation chamber.
2. Larger particles can block the filter element, reducing its filtering capacity.
   The service life, therefore, strongly depends on ambient conditions.

Any contamination in the ionisation chamber results in a noisier output signal from the SmartSensor, which manifests as fluctuations and sudden changes of the zero line. The SmartSensor must be considered worn out when these fluctuations relative to the setup limit become excessive. However, measurement sensitivity is maintained at a consistent level over the entire service life. In the case of severe contamination, the SmartSensor may fail to initialise when the system starts.

The decaying air permeability of the filter element is compensated for by increasing the operating vacuum within a wide range. However, in the case of severe contamination, the vacuum increases to the point where the discharge within the SmartSensor becomes unstable or is extinguished for no apparent reason. The filter element must be considered worn out when this occurs frequently.

From the 300th operating hour onwards, the operator is reminded upon starting the system that the SmartSensor must be replaced. The SmartSensor can still be operated for up to 320 hours after the reminder is confirmed. Thereafter, it must be replaced.

Exchanging the P1 SmartSensor

Before replacing the SmartSensor, the instrument must always be switched off first.

To remove the SmartSensor, hold it by the chequered section of the plug's movable section and pull it straight out of the socket.

When inserting the new SmartSensor, make sure the marks on the plug and socket line up, and that the movable section of the plug is in the locking position, resting flush against the outer collar of the socket.

Instrument Firmware Log

Instrument Firmware	Amendment	Manual Version	PC Software
1.0.08	Launch Version – P1 XTL First Edition	V1	N/A
1.0.11	Display Units ppm and g/year added Technical Data Screen added	V2	N/A
1.0.12	Battery drain Issue improved Calibration stabilisation time improved Passed calibration screen message improved SmartSensor lifetime message The firmware update process via the radio has been stabilised	V3	N/A
1.0.13	Option C4-FN added Reworked parameters for HV generation Reworked Zero Tracking Reworked filter for sensor noise Reworked signal cleardown Streaming selectable parameters added	V4	**1.0.01**
1.0.14.1	Zero Tracking added Standby Time below 5 min blocked	V5	**1.0.03**
1.0.14.2	Improved calibration routine ppm Zero Tracking optimised	V5	**1.0.03**
1.0.15	Disc pump flow technology design improved Battery management adjusted Standby flashing LED added @ Alarm Projector	V6	**1.0.04**
1.0.16	Regulation of measuring current improved Regulation of vacuum level improved for more precision; re-regulation after power-up less frequent Duration of forced Zero Tracking after manual zero prolonged to 4 seconds Watchdog added Couple Calibration Factors added	V7	**1.0.05**
1.0.16.1	Verification of plausible calibration values added	V7	**1.0.05**
1.0.16.2	Watchdog bug fix	V8	**1.0.06**
1.0.17.0	Remote control interface for 'PPM Calibrator' added ppm measurement optimised	V9	**1.0.07**
1.0.18.1	P1 SmartSensor Service tool for certified Service Centres added Optimised Disc Pump Software	V10	**1.0.09**
1.0.18.2	Bug fix flow measurement	V11	**1.0.09**
1.0.19	Improved Auto Zero after Startup Startup Message changed to 'P1 XTL' Improved P1 SmartSensor current control Minor Bugfixes	V12	**1.0.09**
1.0.19.1	Minor Bugfixes Incremental update prepared - future updates will be accelerated	V12	**1.0.09**
1.0.19.2	Accelerated upload process Improved calibration for ppm measurement Minor Bugfixes	V13	**1.0.11**
1.0.19.3	Setting Appearance filled with 'Lights' and 'Vibration' C4FN calibration bug fix	V14	**1.0.11**

Technical Data

Specification	Detail
Detector principle	NIC (Negative Ion Capture)
Detects	SF6 and gas mixtures with C4-FN (option)
SF6 sensitivity	Standard 1.0E-7 cc/s – 1.0 ppm – 0.01 g/a HIGHsens 1.0E-8 cc/s – 0.1 ppm – 0.001 g/a
Response time t90	approx. 0.5 s
Response time t10	approx. 0.5 s
Alarm	Selectable Handset Vibration Audio LED-Projection
Audio	Frequency/repeat rate coupled to leak rate condition signals.
Display	2.8’ Touch Display on handset
Self-diagnostics	Sample flow, sensor condition, battery condition, hardware fault
Battery	Handset Li-ion, inductive charge at docking station, shelf life 12 months if fully charged
Storage conditions	-10 °C to + 60 °C
Operating temperature	0 °C to 50 °C
Power supply	100 to 240 V 50/60 Hz
Dimension	Handset 300 x 105 x 80 mm (H x D x W) Console 420x240x470 mm (H x D x W)
Weight	Handset 0.750 kg Console 9.8 kg

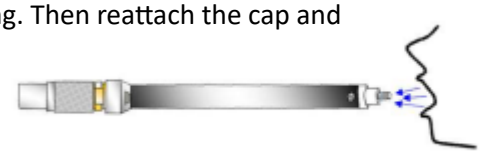
Error Codes

Error Code	Description
01	The SmartSensor could not be started.
02	Could not establish rated measuring current.
03	Insufficient Sample Flow.
04	Excess Sample Flow.
05	Signal from SmartSensor lost.
06	No SmartSensor found.

Description:

Error 01 - The P1 SmartSensor could not be started.

Remedy: The P1 SmartSensor is not generating ionisation. It is usually worn out or dirty. If the P1 SmartSensor is still in good condition, it often helps to switch off the device, remove the cap and the front filter, and gently breathe into the intake opening. Then reattach the cap and the front filter and switch the device back on.



Error 02 - Could not establish rated measuring current. The measuring current could not be regulated, e.g., because the discharge repeatedly cuts out. This sometimes occurs with advanced sensor wear.

Remedy: Use a new P1 SmartSensor and send the defective one to the service partner for refurbishment.

Error 03 - Sample flow rate too low. The sample flow is insufficient. The error condition occurs when the pump ramps up to maximum power without sufficient flow being detected.

Remedy: Check the red cap for blockages caused by dirt or grease. It can potentially be cleaned using isopropanol and/or compressed air. Allow to dry thoroughly before reuse. Replace the front filter regularly (once a week).

Remove oil, grease, condensation, etc., from the test sample before measurement.

Error 04 - Sample flow rate too high.

Defined but not used. There is no known way to reach this state.

Error 05 - Signal from the P1 SmartSensor lost. The measurement current dropped to zero during operation. This occurs if the sensor is unplugged while the device is running or if the discharge is extinguished due to excessively high gas concentration.

Remedy: Move the device away from the high-gas concentration area and restart it. Check that the SmartSensor is securely seated. Do not unplug it during operation. If the error persists, the P1 SmartSensor is worn out or heavily soiled and must be replaced.

Error 06 - No P1 SmartSensor found. This is reported if the device is switched on without the sensor.

Remedy: Insert the P1 SmartSensor before use.

EU DECLARATION OF CONFORMITY

According to Decision No. 90/2016 Sb. of the European Parliament and of the Council

SF6 LEAKCHECK P1 XTL

The manufacturer stated below declares that the characteristics of the product meet the required technical standards, directives and specification and that it conforms to the respective European Union harmonisation standards. Furthermore, the manufacturer declares the product to be safe whilst adhering to the conditions for its correct installation, maintenance and use. This declaration of conformity is issued under the sole responsibility of the manufacturer.

Manufacturer:
ISM Deutschland GmbH, Laubach 30, 40822 Mettmann, Germany - www.ism-d.de

Notification of quality assurance:
DIN EN ISO 9001:2015 Certificate No.: DE011836-1

Product description:
An SF6 Leak detector is a sensitive instrument for detecting SF6 or gas mixtures containing C4-FN leaks.

Conformity assessment procedure:
The product's conformity was assessed with respect to the following requirements:
– EMC Directive 2014/30/EU, LVD Directive 2014/35/EU.
– it was compared with the submitted documentation
– issued on fundamentals of declaration of conformity of the producer– it was tested according to standards

List of standards:

EN 55011 ed. 4:2017 + A1:2017 +A11:2020 +A2:2021	EN 61000-3-3 ed. 3:2014 + A1:2019 +A2:2022	EN 61000-4-2 ed. 2:2009
EN 61000-4-4 ed. 3:2013	EN 61000-4-6 ed. 4:2014	EN IEC 61000-3-2 ed. 5:2019 +A1:2021
EN IEC 61000-4-11 ed. 3:2020	EN IEC 61000-4-3 ed. 4:2021	EN IEC 62368-1 ed. 2+ A11:2021

Date and Place of Issue:
Mettmann 12.04.2024

Authorised
Representative:
Clemens A. VERLEY

CE

Disposal



Please contact **ISM** for return or proper disposal of equipment.

Environmental Notice



Dispose of all equipment and its components and any used batteries in accordance with all local and national safety and environmental requirements. This includes the European WEEE (Waste Electrical and Electronic Equipment) directive. **ISM** Deutschland GmbH offers a take-back service. Please get in touch with ISM for more information.

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