

Report No. S 498 2016 T1

Type test acc.

EN 50104:2010, EN 45544-1:2015,

EN 45544-2:2015 and

EN 60079-29-1:2007 / Annex A

incl. draft version 2016

IRwin SX...

INFICON AB

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Publication of page 2 is permitted.**

The test results presented in this report refer solely to the test object stated as described on page 2. The report does not represent a general statement about the serial production of the test object and gives not an authorization for use of a TÜV Rheinland test- / certification mark.

**Type test of
electrical apparatus for the detection and measurement of
oxygen, toxic and combustible gases acc. EN 50104,
EN 45544-1, EN 45544-2 and EN 60079-29-1 / Annex A**

Manufacturer / Contractor:	INFICON AB Box 76 58102 Linköping Sweden
Product:	Electrical apparatus for the detection and measurement of oxygen, toxic and combustible gases.
Type designation:	IRwin SX, IRwin SXT, IRwin SXG, IRwin SXGT
Test subject:	Portable gas detector for oxygen, toxic and combustible gases
Technical data:	Technical details see on clause 2.1
Max. working temperature :	-20 °C to +50 °C
Power:	12 V DC Battery
IP Protection :	IP 54
Sensors:	CH4-, C2H6-, C3H8-, C4H10-, H2S-, CO-, CO2-gas detector and Oxygen detector
Measurement range:	0-500 ppm CO, 0-5 vol.% CO2, 0 – 400 ppm H2S, 0-100 %LFL CH4, 0-25 vol.% O2
Test requirements:	EN 50104:2010, EN 45544-1:2015, EN 45544-2:2015 and EN 60079-29-1:2007 / Annex A incl. draft version 2016.
Test cause:	Type test for approval.
Test result:	The specimen complies with the requirements of the above mentioned guidelines / standards. The demands on the operational behavior according to Annex A of DIN EN 60079-29-1, extent these apply, are fulfilled. Restrictions see remark.
Remark:	Deviating from the device specification, the working temperature range was tested from -15 °C to +40 °C. The CO2 sensor does not meet the requirements cl. 5.4.3.1 of EN 45544-1, but the requirement of cl. 5.4.3.2 is met. EMC was proved separately with report REC-E704557 by DELTA Development Technology AB. The standard EN 50270 is not within the scope of the laboratory accreditation, but all EMC basic standards to which the standard refers, are within the scope of the accreditation.

Dated in Cologne, 05.12.2016
968/wi

Test Centre for Energy Appliances

Inspector

Report released after review

1. Task, Cause of Test

The requested type test shall prove the accordance of the portable methane leak detector and gas sensor unit Irwin, with the requirements of the standards.

Therefore the control was subjected to a test procedure according to the requirements of the standards EN 50104:2010, EN 45544-1:2015, EN 45544-2:2015 and EN 60079-29-1:2007 / Annex A incl. draft version 2016.

2. Description of the test subject

The IRwin is a battery operated, portable / handheld, aspirated system with integral sensor for gas detection. The device is used for professional use in residential and business areas. Use requires the necessary knowledge of gas pipeline network inspection. The 5 device versions, out of 4 certified (SX...), are suitable for the measurement of different gases, as well as for use in the applications listed in the following:

- IRwin S - Above ground verification, Bar Hole
- IRwin SX - Above ground verification, Bar Hole, Confined Space, House, Gas purity, Warning Ex
- IRwin SXG - Above ground verification, Bar Hole, Confined Space, House, Gas purity, Warning Ex, Ethane analysis
- IRwin SXT - Above ground verification, Bar Hole, Confined Space, House, Gas purity, Warning Ex, Warning ExTox
- IRwin SXGT - Above ground verification, Bar Hole, Confined Space, House, Gas purity, Warning Ex, Ethane analysis, Warning ExTox

The device is a portable methane leak detector for gas pipeline network inspection.

Depending on the device version it measures following gases:

Methane, Carbon dioxide, Ethane, Propane, Butane, Oxygen, Hydrogen sulfide, Carbon monoxide.

There are three probes available for the device:

- For searching for gas on fixed surfaces, use the carpet probe. Pull or push the carpet probe over the floor.
- For searching for gas at particular points, use the bell probe.
- The hand probe is used for searching textures on the house for gas, such as windows or external pipes. Use the hand probe as such, or combine with the probe rod and the carpet probe or the bell probe.



1	Display	4	Gas outlet
2	Reference intake	5	Multi function connector
3	gas inlet		

2.1 Technical data

Mechanical data

	IRwin S	IRwin SX	IRwin SXG	IRwin SXT	IRwin SXGT
Weight	1.4 kg	1.5 kg	1.5 kg	1.5 kg	1.5 kg
Dimensions (lxwxh)	167 mm x 247 mm x 59 mm	167 mm x 247 mm x 59 mm	167 mm x 247 mm x 59 mm	167 mm x 247 mm x 59 mm	167 mm x 247 mm x 59 mm

Electrical data

	IRwin S	IRwin SX	IRwin SXG	IRwin SXT	IRwin SXGT
Battery	Lithium-Ion battery	Lithium-Ion battery	Lithium-Ion battery	Lithium-Ion battery	Lithium-Ion battery
Protection class	IP54	IP54	IP54	IP54	IP54
Electronic interfaces	Bluetooth	Bluetooth	Bluetooth	Bluetooth	Bluetooth
Memory capacity for measured data	64 MB	64 MB	64 MB	64 MB	64 MB
Power input	4A	4A	4A	4A	4A
Operational voltage	12VDC +/- 5%	12VDC +/- 5%	12VDC +/- 5%	12VDC +/- 5%	12VDC +/- 5%
Battery operating time	> 8 h.	> 8 h.	> 8 h.	> 8 h.	> 8 h.

Physical data

	IRwin S	IRwin SX	IRwin SXG	IRwin SXT	IRwin SXGT
Noise level	< 70 dB (A)	< 70 dB (A)	< 70 dB (A)	< 70 dB (A)	< 70 dB (A)
Detectable gases	Methane, carbon dioxide	Methane, carbon dioxide	Methane, carbon dioxide, ethane, propane, butane	Methane, carbon dioxide, ethane, propane, butane, oxygen, hydrogen sulfide, carbon monoxide	Methane, carbon dioxide, ethane, propane, butane, oxygen, hydrogen sulfide, carbon monoxide
Gas flow through sniffer line	Flow 50l/h +/- 20l/h (typical)	Flow 50l/h +/- 20l/h (typical)	Flow 50l/h +/- 20l/h (typical)	Flow 50l/h +/- 20l/h (typical)	Flow 50l/h +/- 20l/h (typical)

Ambient conditions

	IRwin S	IRwin SX	IRwin SXG	IRwin SXT	IRwin SXGT
Max. altitude above sea level	2000 m	2000 m	2000 m	2000 m	2000 m

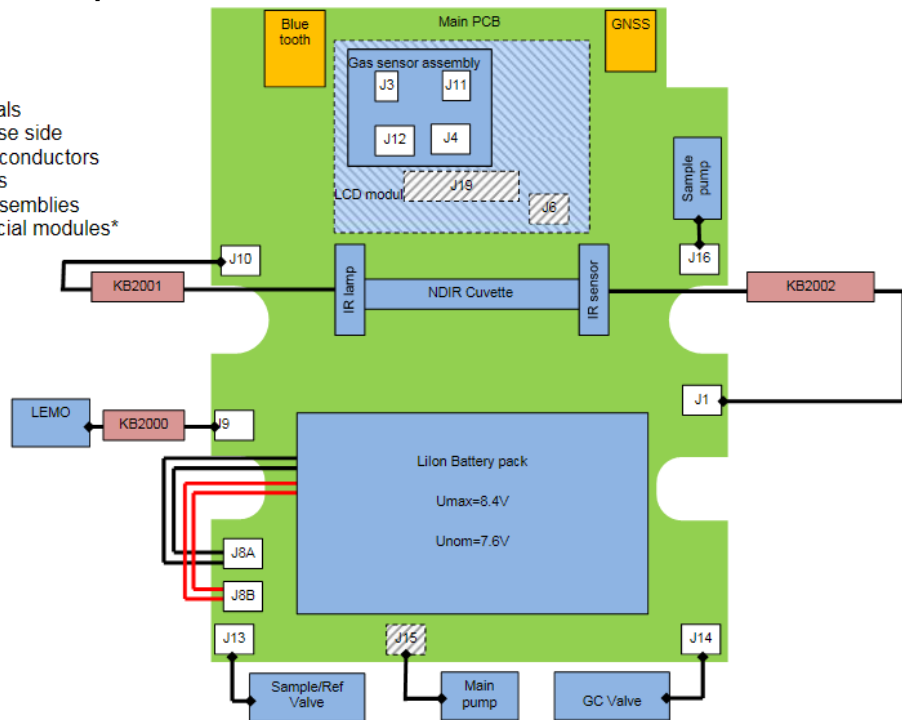
Sensor

Basic sensor data	Gas (measurement range)	Sensor	Warmup time
	CH4, C3H8, C4H10 (< 50ppm)	Infrared (IR) with semiconductor noise suppression	< 30 s
	CH4, C3H8, C4H10 (>50ppm)	Infrared (IR)	< 30 s
	CO2	Infrared (IR)	< 30 s
	O2, CO, H2S	Electrochemical	< 120 s O2 sensor: > 1 hour if stored unpowered longer than 1 month.

2.2 System overview example



- Light blue boxes: Peripherals
- Hashed devices: On reverse side
- Thick lines: Cables / conductors
- White boxes: Terminals
- Purple boxes: Cable assemblies
- Orange boxes: Commercial modules*

*Design not fully known.







2.3 Draft Labelling and marking:


SENSOR LABEL IRwin SX

IRwin SX
INFICON AB, P.O. Box 76
581 02 Linköping, Sweden
Ex ia IIC T3, Ga 
Ta = -20 to +50C
Daseefa16ATEX0034X 
Special conditions for safe use apply. See manual

EN 60079-29-1

 
Li-ion

Warning! Charge batteries in safe area only 

SENSOR LABEL IRwin SXT

IRwin SXT
INFICON AB, P.O. Box 76
581 02 Linköping, Sweden
Ex ia IIC T3, Ga 
Ta = -20 to +50C
Daseefa16ATEX0034X 
Special conditions for safe use apply. See manual



EN 50104, EN 45544, EN 60079-29-1




 
Li-ion



Warning! Charge batteries in safe area only 


SENSOR LABEL IRwin SXG

IRwin SXG
INFICON AB, P.O. Box 76
581 02 Linköping, Sweden
Ex ia IIC T3, Ga 
Ta = -20 to +50C
Daseefa16ATEX0034X 
Special conditions for safe use apply. See manual

EN 60079-29-1

 
Li-ion

Warning! Charge batteries in safe area only 

SENSOR LABEL IRwin SXGT

IRwin SXGT
INFICON AB, P.O. Box 76
581 02 Linköping, Sweden
Ex ia IIC T3, Ga 
Ta = -20 to +50C
Daseefa16ATEX0034X 
Special conditions for safe use apply. See manual

EN 50104, EN 45544, EN 60079-29-1

 
Li-ion

Warning! Charge batteries in safe area only 

3. Approval / Test

(The examination was conducted in the laboratory of TÜV Rheinland from 29.04.2016 to 15.07.2016).

3.1 Test procedure, test of requirements

EN 60079-29-1:2007 (incl. draft version 2016) Annex A

For the practical test, 10 samples type IRwin SXT were provided by the manufacturer. Detailed descriptions are described under cl. 2.

These tests were carried out based on EN 60079-29-1 Annex A. This standard is only applicable for flammable gases like CH4.

The results are listed in the following table of requirements with reference to the relevant standard sections.

The demands on the operational behavior according to Annex A of DIN EN 60079-29-1, extent these apply, are fulfilled.

Unless otherwise specified, the test results are related to all types of devices.

Test Requirements / Results	
Standard	EN 60079-29-1:2007 Annex A (incl. draft vers. 2016)
Results given with: P – Pass N – Not applicable F – Fail	

Requirement	Remark	Result
5.4 Test methods		
5.4.1 General		
The following tests shall be performed in accordance with 5.3, unless otherwise stated. All tests shall be performed. At the end of each test, indications shall be taken in both clean air and the standard test gas, unless otherwise stated. The values of the indications used for verification of compliance with the performance requirements of Annex A shall be the final indications (see 3.6.2) of both the clean air and standard test gas readings, unless otherwise stated.		P
5.4.2 Unpowered storage		
All parts of the equipment shall be exposed sequentially to the following conditions in clean air only:		P
a) a temperature of (-25 ± 3) °C for at least 24 h;		P
b) ambient temperature for at least 24 h;		P

Requirement	Remark	Result
c) a temperature of (60 ± 2) °C for at least 24 h;		P
d) ambient temperature for at least 24 h.		P
At each temperature, the humidity of the clean air shall be so that condensation does not occur.		P
5.4.3 Calibration and adjustment		
5.4.3.1 Initial preparation of the equipment		P
The equipment shall be calibrated and adjustments shall be carried out, to obtain correct indications in accordance with the manufacturer's instruction manual.		P
5.4.3.2 Calibration curve		P
The equipment shall be exposed to the gas selected in accordance with 5.3.2, at 10 % of the measuring range and four other volume fractions evenly distributed over the measuring range, starting with the lowest and finishing with the highest of the selected volume fractions. This operation shall be carried out three times consecutively.	Testgas CH4 9,1% LFL 22,7% LFL 50% LFL 68,2% LFL 80,2% LFL	P
5.4.3.3 Response to different gases		P
For group II equipment, the accuracies of the response curves or correction charts provided in the manufacturer's manual shall be checked by measuring the response for the representative gases according to 5.3.2, at a minimum of three different volume fractions spread evenly over the measuring range to verify response characteristics.	Representative testgas C3H8 23,8% LFL 47,6% LFL 58,1% LFL	P
The ratio between the indication of the equipment (before correction using the manufacturer's response curve or correction charts) and the gas volume fraction obtained for each of the three gas volume fractions of each gas tested shall not be less than 0,4 and shall not exceed 2,0.	1,13-1,17	P
5.4.4 Stability (continuous duty equipment only)		N
5.4.4.1 Short-term stability		N
The equipment shall be exposed to six applications of the standard test gas for 3 min followed by exposure to clean air for a period of 7 min. Indications shall be taken at the end of each exposure to air and the standard test gas.		N
5.4.4.2 Long-term stability (fixed and transportable equipment – Group I only)		N

Requirement	Remark	Result
<p>The equipment shall be operated in clean air continuously for a period of four weeks and shall be exposed to the standard test gas for an 8 h period at weekly intervals over the four-week period. Indications shall be taken prior to the application of, after stabilization and prior to removal of the standard test gas.</p>		N
<p>Following this period, the following test shall be performed.</p> <p>The equipment shall be exposed to a methane-air mixture with a volume fraction of 1,0 % (v/v) +/- 0,05 % (v/v) for 5 days, indications being taken daily in clean air and the standard test gas.</p>		N
5.4.4.3 Long-term stability (portable equipment – Group I only)		N
<p>The equipment shall be operated in clean air continuously for a period of 8 h per working day over a total of 20 working days. The equipment shall be exposed to the standard test gas for 1 h during each operating period. Indications shall be taken prior to the application of, after stabilization, and prior to removal of the standard test gas.</p>		N
<p>Following this period, the following test shall be performed.</p> <p>The equipment shall be operated in a methane-air mixture with a volume fraction of 1,0 % (v/v) +/- 0,05 % (v/v) for 8 h, taking indications in clean air and the standard test gas at the end of this period. The equipment shall then be switched off and exposed to clean air for 16 h. This cycle shall be repeated a further 4 times.</p>		N
5.4.4.4 Long-term stability (fixed and transportable equipment – Group II only)		N

Requirement	Remark	Result
At the beginning and at the end of this test, perform test 5.4.3.2.		N
The equipment shall be continuously subjected to the following sets of conditions for the periods stated:		N
a) Apply clean air and standard test gas and take the indications when the readings have stabilized;		N
b) operate the equipment in ambient air for a period of 168 hours \pm 4 hours;		N
c) expose the equipment to clean air and take the indication when the reading has stabilized;		N
d) expose the equipment to the standard test gas for a period of 8 hours - 0/+10 minutes. Indications shall be taken after stabilization of the reading and prior to the removal of test gas;		N
e) repeat (b) and (c);		N
f) expose the equipment to the standard test gas until the reading has stabilized. Indications shall be taken after stabilization of the reading and prior to the removal of test gas;		N
g) repeat for a total of 7 consecutive cycles;		N
5.4.4.5 Long-term stability (portable equipment – Group II only)		P
The equipment shall be operated in clean air continuously for a period of at least 8 h per working day over a total of at least 20 working days. The equipment shall be exposed to the standard test gas until stabilized, once during each operating period. Indications shall be taken prior to the application of, after stabilization and prior to removal of the standard test gas.		P
5.4.5 Stability (spot-reading equipment only)		N
The equipment shall be exposed to clean air for 1 minute -0/+5 seconds followed by the standard test gas for 1 minute -0/+5 seconds. The operation shall be repeated 200 times. The final indication will be taken in clean air and the standard test gas, after stabilization at the end of the test.	This device will not use for spot reading.	N
5.4.6 Alarm set point(s)		
5.4.6.1 General		
When the equipment is provided with either: Type a) externally adjustable means of setting either one or more alarm set points, or Type b) fixed pre-set alarm point(s) The activation of such alarms by gas at the appropriate	Performed for type a	P

Requirement	Remark	Result
set point values shall be verified by using test gases as described in 5.4.6.2 and 5.4.6.3. In all cases, the test gas shall be applied until either activation of the alarm(s) or twice the respective t(90), whichever is less.		
For equipment with several alarm set points, these tests shall be carried out for each alarm set point.		P
5.4.6.2 Increasing concentration		P
For equipment of type a) set the alarm set point at 10 % relative below the concentration of the standard test gas. If the alarm set point cannot be set at this concentration, the alarm shall be set as near as possible to that concentration. In this case and for equipment of type b), the test gas shall have a volume fraction of 10 % relative above the concentration of the alarm set point. Expose the equipment to clean air and then to the standard test gas or the specified test gas.	Performed for type a	P
5.4.6.3 Decreasing concentration		N
For equipment of type a) set the alarm set point at 5 % of the measuring range. If the alarm set point cannot be set at this concentration the alarm shall be set as near as possible to that concentration. In this case and for equipment of type b), the test gas shall have a volume fraction of the alarm set point minus 5 % of the measuring range. Expose the equipment to standard test gas and then to clean air or the specified test gas.	System is used only to measure increasing concentrations.	N
5.4.7 Temperature		
This test shall be performed in a temperature chamber having the capability of holding the sensor or equipment at the specified temperature within ± 2 °C. When the equipment (or the portion under test) has reached the temperature specified in Annex A, as appropriate, the sensor shall be exposed sequentially to air and the standard test gas, which shall be at the same temperature as the atmosphere in the test chamber. The dew point of the air or standard test gas shall be below the lowest temperature of the test chamber.		P
5.4.8 Pressure		
The effects of pressure variation shall be observed by placing the sensor or equipment (including the aspirator for aspirated equipment) in a test chamber that permits the pressure of clean air and of the standard test gas to be varied over the range specified in Annex A.		P
The pressure shall be maintained at the specified levels for 5 min, before a reading is accepted or a test is made. Readings shall be taken with clean air and standard test		P

Requirement	Remark	Result
gas.		
5.4.9 Humidity		
<p>The test shall be conducted at 40 °C. After a stabilization time of at least 2 hours at 40 ± 1°C, the equipment shall be calibrated and adjusted according to the instructions of the manufacturer. These instructions include the humidity of the test gases and the application times. The sensor shall be exposed for at least 1h -0/+5 min to clean air having 20±5 % RH.</p> <p>The sensor shall then be exposed to the standard test gas until stabilized at the 20±5 % RH. The procedure shall be repeated at 50±5 % RH, then at 90±5 % RH.</p> <p>The concentration of the test gas shall be held constant, or due allowance of changes in its concentration by dilution in water shall be made. The concentration of the test gas shall be held constant, or due allowance of changes in its concentration by dilution in water shall be made.</p>		P
5.4.10 Air velocity		
5.4.10.1 General		
The effects of air speed over a range of 0 m/s to 6 m/s on equipment with sensors that operate by diffusion shall be determined using the test conditions given in 5.4.10.2.	Not applicable because the system is a pump generated system. See flow rate.	N
5.4.10.2 Test conditions		
The separate sensors of equipment with remote sensors and, when practicable, the entire equipment if the sensors are integral shall be tested in a flow chamber in both clean air and standard test gas.		N
For equipment having integral sensors, which are too large to be tested in a flow chamber, other flow equipment for carrying out the test shall be permitted.		N
Irrespective of whether a flow chamber or other flow equipment is used, orient the sensor in relation to the direction of the air flow as follows: 1) sensor oriented directly towards direction of flow, 2) sensor oriented away from the direction of flow, 3) sensor oriented at right angles to the direction of flow. Measurements shall be made under static conditions, at 3 m/s and at 6 m/s.		N
5.4.11 Flow rate for aspirated equipment		P
The equipment shall be tested by varying the flow rate in	Max flow around 110%	P

Requirement	Remark	Result
both clean air and standard test gas 1) from 130 % of the nominal flow rate or, if this is not possible, from the nominal flow rate, 2) to the flow rate at which the failure alarm is set, or to 50 % of the nominal flow rate if no failure alarm is provided.	and lowest around 75%. Normal flow rate around 20 l/h	
5.4.12 Orientation		
5.4.12.1 Portable equipment		P
During tests with clean air and standard test gas, rotate the sensor, or the whole equipment if relevant, through 360° in steps of 90° around each of its three mutually perpendicular axes (one axis at a time). Record the indication in each position.		P
5.4.12.2 Fixed and transportable equipment		N
Test the sensor, or the equipment having an integral sensor, with clean air and standard test gas within the orientation limits stated in the manufacturer's instructions, but in no case less than a deviation of ±15° from the nominal orientation.		N
5.4.13 Vibration		
5.4.13.1 Test equipment		
The vibration test machine shall consist of a vibrating table capable of producing a vibration of variable frequency and variable constant displacement (peak-to-peak), with the test equipment mounted in place, as required by the following test procedures.		P
5.4.13.2 Procedures		
The equipment shall be energized and mounted on the vibration test machine and vibrated successively in each of three planes respectively parallel to each of the three major axes of the equipment.		P
An adjustable alarm set point shall be set to 20 % of measuring range.		P
Before, and at the conclusion of the test, the equipment shall be exposed to clean air followed by the standard test gas.		P
The equipment shall be mounted on the vibration table in the same manner as intended for use including any resilient mounts, carrier or holding devices that are provided as standard parts of the equipment.		P
The equipment shall be vibrated over the frequency range specified at the excursion or constant acceleration peak specified, for a period of 1 h in each of the three		P

Requirement	Remark	Result
mutually perpendicular planes. The rate of change of frequency shall not exceed 10 Hz/min.		
5.4.13.2.1 Procedure 1		P
For portable and transportable equipment, remote sensors, and controllers where the sensor is integral with or directly attached to the controller, the vibration shall be as follows: 10 Hz to 30 Hz, 1,0 mm total excursion, 31 Hz to 150 Hz, 19,6 m/s ² acceleration peak.		P
5.4.13.2.2 Procedure 2		N
For control units intended to be installed remotely from the sensor, the vibration shall be as follows: 10 Hz to 30 Hz, 1,0 mm total excursion, 31 Hz to 100 Hz, 19,6 m/s ² acceleration peak.		N
5.4.14 Drop test for portable and transportable equipment		
This test is applicable to portable equipment and transportable equipment. If the manufacturer recommends that the instrument be used in its protective casing, the test shall be carried out with the protective casing installed.	Without additional protective casing.	P
Before, and at the conclusion of the test, the equipment shall be exposed to clean air followed by the standard test gas.		P
Portable equipment shall be released, while operating, from a height of 1 meter -0/+0,1 meter above a concrete surface and allowed to free fall.		P
Transportable equipment with a mass less than 5 kg shall be released, while not operating, from a height of 0,3 meters -0/+0,03 meter above a concrete surface and allowed to free fall.		N
Other transportable equipment shall be released, while not operating, from a height of 0,1 meters -0/+0,01 meter above a concrete surface and allowed to free fall.		N
The test required above shall be performed three separate times, the portable equipment being released each time with a different side (surface) facing down at the time of release and the transportable equipment to be in an orientation for normal transport.		P
The equipment shall be considered to have failed this test if there is a loss of function (e.g. alarm, pump function, controls, display) after the test.	Short flicker on the display.	P
Automatic re-starting or shut-down of the equipment shall not occur during the test.	Short flicker on the display.	P

Requirement	Remark	Result
5.4.15 Warm-up time		P
An adjustable alarm set point shall be set to 20 % of the measuring range.		P
The equipment shall be switched off and left for at least 24 h in clean air. After the 24 h period, the equipment shall be switched on in clean air and the warm-up time measured.		P
Group I equipment, except spot-reading equipment, shall be switched off for a further 24 h in clean air. After this period, the equipment shall be exposed for 5 min to the standard test gas, then switched on in the presence of the test gas and the warm-up time measured.		N
5.4.16 Time of response (not applicable to spot-reading equipment)		P
The equipment shall be switched on in clean air and, after an interval corresponding to at least two times the warm-up time, as determined in accordance with 5.4.15, without switching off, the equipment or the sensor(s) shall be subjected to step changes from clean air to the standard test gas and from standard test gas to clean air. These changes shall be introduced by means of suitable equipment (see Annex B).		P
The times of response t(50) and t(90) for increasing concentration, and t(50) and t(10) for decreasing concentration shall be measured.	T50= 3s T90= 5s	P
The times of response shall apply to the equipment in the as supplied condition and without optional accessories, e.g. collecting cones, weather protection, attached to the sensor for special purposes.		P
For an optional sampling probe, an extra test is required to measure the additional delay. This shall be less than 3 s/m of the total length of the probe plus tubing or any greater value, which is stated in the instruction manual.	Only measured with handprobe	P
5.4.17 Minimum time to operate (spot-reading equipment)		N
The standard test gas shall be applied to the equipment simultaneously with the initiation of the measurement procedure.	Not a spot-reading device	N
Clean air shall then be applied to the equipment simultaneously with the initiation of the measurement procedure.	Not a spot-reading device	N
5.4.18 High gas concentration operation above the measuring range		P
This subclause applies to all equipment with an upper limit of the measuring range less than 100 % (v/v) gas.		P
The entire equipment, or the remote sensors of fixed or	5.4.18.2	P

Requirement	Remark	Result
transportable equipment, shall be subjected to the test given in 5.4.18.1 or 5.4.18.2 using a test equipment that simulates a step change between gas concentrations such as those described in Annex B.		
All gas concentrations above full scale shall be indicated by a full scale meter indication and, where fitted, an alarm. If the indication is digital, a clear indication shall be given that the upper limit of the measuring range has been exceeded.	>CH4	P
All gas alarms shall remain in operation at all gas concentrations above full scale. If the equipment provides a latching alarm feature, the latching feature shall be verified upon application of the high gas concentration operation.	Alarm	P
5.4.18.1 Spot-reading equipment		N
The equipment shall be subjected to 50 cycles, each cycle being an exposure of a volume fraction of 100 % (v/v) gas for the minimum time of operation as specified by the manufacturer, followed by exposure to clean air for the minimum time of operation. Following the final cycle, five operations in clean air shall be made, each operation equivalent to the minimum time of operation, and the equipment shall then be subjected to the standard test gas.	Not a spot-reading device	N
5.4.18.2 Equipment other than spot-reading equipment		P
The equipment, or remote sensor, shall be subjected to a step change from clean air to a volume fraction of 100 % (v/v) gas that shall be maintained for 3 minutes -0/+5 seconds. The sensor shall then be subjected to clean air for 20 minutes -0/+2 minutes, followed by the standard test gas.		P
5.4.19 Battery capacity		
5.4.19.1 Battery-powered portable continuous duty equipment		
5.4.19.1.1 Battery discharge		
With a battery fully charged at the beginning of the test, the equipment shall be operated at maximum load condition with consideration to quantity and type of sensors in clean air for a total period of a) 8 hours -0/+5 minutes, if fitted with a user-operable on/off switch, b) 10 hours -0/+5 minutes, if not so fitted, or c) any longer time as specified by the manufacturer.	a)	P
At the end of the specified period, the equipment is exposed to the standard test gas.		P

Requirement	Remark	Result
5.4.19.1.2 Low battery duration		
The equipment shall then continue to operate until an indication that the low battery condition has been reached. The equipment shall continue to operate for at least an additional 10 min. and then be exposed to the standard test gas.	After blinking battery sign >10 min.	P
5.4.19.2 Battery-powered portable spot-reading equipment		
5.4.19.2.1 Battery discharge		
With the battery fully charged at the beginning of the test, the equipment shall be operated in clean air 200 times.	No spot reading	N
The duration of each operation shall be equal to the minimum time of operation; 1 minute -0/+5 seconds shall elapse after each operation.		N
At the end of the 200 operations, the equipment shall be exposed to the test gas.		N
5.4.19.2.2 Low battery discharge		
The cycle of operations shall then be continued until an indication that the low battery condition has been reached. The equipment shall be operated for an additional 10 times and then be exposed to the standard test gas.		N
5.4.20 Power supply variations		
The equipment shall be set up under normal conditions (see 5.3), at nominal supply voltage and, where appropriate, rated frequency. For equipment with remote sensors, the test shall be performed with both maximum and minimum resistance of the interconnecting cable. The equipment shall then be subjected to the following tests.	Battery-powered	N
The equipment calibration shall be checked at both 115 % and 80 % of nominal supply voltage.		N
Where the manufacturer of the equipment specifies a supply range other than those specified above, the equipment shall be tested at the upper and lower limits of the supply voltage specified by the manufacturer.		N
It shall be verified at the minimum supply voltage that all output functions are working properly even at the maximum load conditions.		N
5.4.21 Power supply interruptions, voltage transients and step changes of voltage		
5.4.21.1 General		
The equipment shall be set up under normal conditions, in accordance with 5.3, and then shall be subjected to	Battery-powered	N

Requirement	Remark	Result
the tests specified in 5.4.21.2 to 5.4.21.4 in clean air only.		
An adjustable alarm set point shall be set to 20 % of the measuring range.		N
5.4.21.2 Short interruption of power supply		N
The power supply shall be interrupted for 10 ±1 ms, repeated 10 times at random time intervals having a mean value of 10 ±2 s.	Battery-powered	N
The equipment shall be tested according to IEC 61000-4-4, test severity 2. The test procedure for type tests performed in laboratories shall be used. The test duration shall be 60 ±0.5 s for each line or terminal to be tested.		N
5.4.21.3 Step changes of voltage without interruption		N
For a.c. and external d.c. powered equipment, the power voltage shall be increased by 10 %, maintained at this value until the equipment is stabilized, and then reduced to 15 % below nominal voltage. Each step change shall take place within 10 ms.	Battery-powered	N
5.4.22 Addition of sampling probe		
When it is intended to add a sampling probe, the equipment shall first be calibrated using clean air and the standard test gas without the sampling probe. The sampling probe shall then be added, and clean air and standard test gas applied again.	With handprobe tested	P
5.4.23 Additional requirements for performance under adverse environmental conditions		
5.4.23.1 Dust		P
For equipment claiming use in a Dust environment, this test shall be performed within a dust chamber as defined within IEC 60529. The equipment shall be mounted in its intended orientation, set to the lowest alarm level or 10 % of the measuring range, whichever is greater, and then calibrated in accordance with the manufacturer's recommendations. Any porous opening(s) shall be left open for the duration of the test. The test shall be performed in accordance with the claimed sensor environmental rating standard excluding any preconditioning requirements for a period of 2 hours -0/+5 minutes.	According DIN EN 60529:09-2014 Cl. 13.4 and 14.2.4 The voltage supply connector was not subject of the verification for the IP test.	P
The equipment shall not give any false alarms during the test. Upon completion of the exposure to dust, any trouble or fault conditions indicated may be cleared in accordance with the manufacturer's instructions and the		P

Requirement	Remark	Result
equipment shall be allowed to undergo any stated maintenance conditions in accordance with the manufacturer's recommendations related to environmental exposure. The equipment shall be exposed to the standard test gas, and the final value and t(90) shall be recorded.		
5.4.23.2 Water		P
For equipment claiming use in a Water environment, this test shall be performed in accordance with the claimed sensor environmental rating standard excluding any preconditioning requirements. The equipment shall be mounted in its intended orientation, set to the lowest alarm level or 10 % of the measuring range, whichever is greater, and then calibrated in accordance with the manufacturer's recommendations.	According DIN EN 60529:09-2014 Cl. 13.4 and 14.2.4 The voltage supply connector was not subject of the verification for the IP test.	P
The equipment shall not give any false alarms during the test. Upon completion of the exposure to water, any trouble or fault conditions indicated may be cleared in accordance with the manufacturer's instructions and the equipment shall be allowed to undergo any stated maintenance conditions in accordance with the manufacturer's recommendations related to environmental exposure. The equipment shall be exposed to the standard test gas, and the final value and t(90) shall be recorded.		P
5.4.24 Poisons and other gases		
5.4.24.1 Poisons (applicable only to group I equipment with catalytic or semiconductor sensors)		N
The equipment shall be exposed to a volume fraction of 1 % methane in air mixture containing a volume fraction of 10×10^{-6} of hexamethyldisiloxane and shall perform 40 min continuous operation for continuous duty equipment, or 100 tests for spot-reading equipment.	group II equipment	N
Certain materials that may be present in industrial atmospheres can lead to "poisoning" or other undesirable effects which may result in a change of sensitivity of a gas sensor.		N
5.4.24.2 Other gases		N
The equipment shall be tested separately with the following gas mixtures: a) group I equipment indicating up to a volume fraction of 5 % methane in air: 1) a methane volume fraction of the standard test gas + a volume fraction of 13 % oxygen	group II equipment	N

Requirement	Remark	Result
<p>in nitrogen,</p> <p>2) a methane volume fraction of the standard test gas + a volume fraction of 5 % carbon dioxide in air,</p> <p>3) a methane volume fraction of the standard test gas + a volume fraction of 0,075 % ethane in air,</p>		
<p>b) group I equipment indicating up to a volume fraction of 100 % methane:</p> <p>1) a volume fraction of 50 % methane + a volume fraction of 6,5 % oxygen in nitrogen,</p> <p>2) a volume fraction of 50 % methane + a volume fraction of 5 % carbon dioxide in nitrogen,</p> <p>3) a volume fraction of 50 % methane + a volume fraction of 2,5 % ethane in nitrogen.</p>		N
<p>The gas mixtures may be prepared by any suitable method. The tolerances on the volume fraction of each component shall be within ± 10 % of its nominal concentration.</p>		N
<p>The volume fraction of each component shall be known to a relative expanded uncertainty of ± 2 % of the stated value.</p>		N
5.4.25 Electromagnetic immunity		
<p>The equipment, including the sensor and interconnecting wiring, shall be subjected to a test method used in conducting EMC radiated immunity tests according to IEC 61000-4-1 and IEC 61000-4-3.</p>	<p>EMC was tested external with report REC-E704557 by DELTA</p>	N
<p>The test shall be carried out with severity level 2; test field strength 3 V/m.</p>		N
<p>An adjustable alarm set point shall be set to 20 % of measuring range when the test is carried out in clean air. A second test shall be carried out with the equipment exposed to the standard test gas.</p>		N
<p>For multi-gas portable equipment, this test shall be performed with a full set of typical sensors.</p>		N
<p>In the case of field systems with remote sensing where the control unit is intended for general purpose rack mounting or its equivalent, such a control unit shall be submitted to these tests in an enclosure supplied by the manufacturer.</p>		N
<p>The instruction manual shall inform the user that such equipment is to be used with the same enclosure to avoid adverse electromagnetic effects.</p>		N

Requirement	Remark	Result
5.4.26 Field calibration kit		
If a field calibration kit is provided with the equipment, carry out the following test: a) calibrate the equipment in accordance with 5.4.3.1 using the test conditions given in 5.3 and using the test equipment for the tests described in 5.4, b) use the field calibration kit in a manner corresponding to the manufacturer's instructions for checking the equipment response.		N
5.4.27 Software function		
Software controlled equipment shall be validated against the requirements of 4.2.9.	Tested with report 968/FSP 1342.00/16 by TÜV Rheinland	P

3.2 Practical test

The practical tests of Clause 5.4 of the standard EN 60079-29-1:2007 (incl. draft vers. 2016) Annex A was carried out in the test center of TÜV Rheinland.

As test samples were used specimens of:
 IRwin SXT DUT 5 and DUT 7

For the vibration test following specimens were used:
 IRwin SXT DUT 1 and DUT 3

For the IP test following specimen was used:
 IRwin SXT DUT 1

The tests acc. DIN EN 50104: 2011 and DIN EN 45544-1: 2015 were carried out according to the following requirements.
 Identical and similar requirements were, as far as possible, combined.

The test results are summarized in the test records.

**3.3 Test procedure, test of requirements
EN 45544-1:2015 including requirements of part 2**

The tests acc. the EN 45544-1: 2015 and part 2, for the device IRwin were carried out according to the following requirements. This standard is applicable for electrical apparatus used for the direct detection and direct concentration measurement of toxic gases and vapours like CO₂, CO and H₂S.

Identical and similar requirements with the DIN EN 50104 and DIN EN 60079-29-1 were summarized as far as possible.

Unless otherwise specified, the test results are related to all types of devices.

Test Requirements / Results	
Standard	EN 45544-1:2015 incl. part 2
Results given with: P – Pass N – Not applicable F – Fail	

Clause	Requirement	Remark	Result
5.4	Tests		
5.4.1	General		P
5.4.2	Unpowered storage	Performed acc EN 60079-29-1 -25°C to +60°C	P
5.4.3	Measurement of deviations	The CO ₂ sensor does not meet the requirements cl. 5.4.3.1 of EN 45544-1, but the requirement of cl. 5.4.3.2 is met.	P
5.4.4	Mechanical tests		P
5.4.4.1	Vibration	Procedure 1	P
5.4.4.2	Drop test	Without additional protective casing. 1m	P
5.4.5	Environmental tests		P
5.4.5.1	Temperature	-15 °C, -10 °C, 5 °C, 20 °C and 40 °C.	P
5.4.5.2	Pressure	80–90 kPa, 90–100 kPa, 100–110 kPa, 110–120 kPa.	P
5.4.5.3	Humidity	humidities of 20 %, 50 % and 90 % at 40 °C.	P

Clause	Requirement	Remark	Result
5.4.5.4	Air velocity	Not applicable because the system is a pump generated system. See flow rate.	N
5.4.6	Performance tests		P
5.4.6.1	Alarm set point(s)	Performed for type a)	P
5.4.6.2	Time to alarm or alarm reading	Dependance of the sensor.	P
5.4.6.3	Flow rate	Max flow around 110% and lowest around 75%. Normal flow rate around 20 l/h	P
5.4.6.4	Warm-up time	Dependance of the sensor.	P
5.4.6.5	Time of response	Aspirated apparatus	P
5.4.6.6	Time of recovery	Aspirated apparatus	P
5.4.6.7	Addition of sampling probe (portable and transportable apparatus only)	Additional tests with handprobe	P
5.4.6.8	Field calibration kit		N
5.4.6.9	Gas concentrations above the full scale indication	Portable apparatus. Indication over full scale is „>“	P
5.4.6.10	Extended operation in test gas	Portable apparatus	P
5.4.6.11	Orientation tests	Portable apparatus	P
5.4.7	Electrical tests		
5.4.7.1	Battery capacity for battery-powered apparatus		P
5.4.7.2	Power supply variations	Battery-powered apparatus	N
5.4.7.3	Electromagnetic compatibility	Separate tested by DELTA with report REC-E704557	N
5.4.7.4	Time-weighted average (TWA) function	TWA 15 minutes value	P
5.4.8	Stability		P
5.4.9	Verification of software and digital components	Tested with report 968/FSP 1342.00/16 by TÜV Rheinland	P

3.4 Practical test

The practical tests of the standard EN 45544-1 incl. part 2 was carried out in the test center of TÜV Rheinland.

As test samples were used specimens of:
IRwin SXT DUT 4, DUT 6, DUT 9, DUT 10 and DUT 11

For the vibration test following specimens were used:
IRwin SXT DUT 1 and DUT 3

For the IP test following specimen was used:
IRwin SXT DUT 1

The tests acc. DIN EN 50104: 2011 was carried out according to the following requirements. Identical and similar requirements were combined, as far as possible.

The test results are summarized in the test records.

3.5 Test procedure, test of requirements

EN 50104:2011

The tests acc. the EN 50104:2011, for the device Irwin were carried out according to the following requirements. This standard is applicable for electrical apparatus for the detection and measurement of oxygen.

Identical and similar requirements with the EN 45544-1: 2015 incl. part 2 and DIN EN 60079-29-1 were summarized, as far as possible.

Unless otherwise specified, the test results are related to all types of devices.

Test Requirements / Results	
Standard	EN 50104:2011
Results given with: P – Pass N – Not applicable F – Fail	

Clause	Requirement	Remark	Result
5.4	Test methods and performance requirements		
5.4.1	General		P
5.4.2	Unpowered storage	Performed acc EN 60079-29-1 -25°C to +60°C	P
5.4.3	Calibration, adjustment and repeatability		P
5.4.4	Stability (continuous duty apparatus only)	Portable apparatus, battery-powered	P

Clause	Requirement	Remark	Result
5.4.5	Stability (spot-reading apparatus only)		N
5.4.6	Alarm set point(s)	Performed for type a)	P
5.4.7	Temperature	At -15 °C, -10 °C, 5 °C, 20 °C and 40 °C.	P
5.4.8	Pressure	80–90 kPa, 90–100 kPa, 100–110 kPa, 110–120 kPa.	P
5.4.9	Humidity	humidities of 20 %, 50 % and 90 % at 40 °C.	P
5.4.10	Air velocity	Not applicable because the system is a pump generated system. See flow rate.	N
5.4.11	Flow rate	Max flow around 110% and lowest around 75%. Normal flow rate around 20 l/h	P
5.4.12	Orientation	Portable apparatus	P
5.4.13	Vibration	Procedure 1	P
5.4.14	Drop test	Without additional protective casing. From a height of 1 m. Short flicker on the display.	P
5.4.15	Warm-up time (not applicable to spot-reading apparatus)		P
5.4.16	Time of response (not applicable to spot-reading apparatus)	T20=8s T90=39s	P
5.4.17	Minimum time to operate (spot-reading apparatus)	Not a spot reading device	N
5.4.18	Battery capacity	Performed for type a) Continuous duty apparatus	P
5.4.19	Power supply variations	Portable apparatus, battery-powered	N
5.4.20	Electromagnetic compatibility	Separate tested by DELTA with report REC-E704557	N
5.4.21	Addition of sampling probe	With handprobe tested	P
5.4.22	Dust (for apparatus where the atmosphere is	IP test according	P

Clause	Requirement	Remark	Result
	sampled by diffusion only)	DIN EN 60529:09-2014 Cl. 13.4 and 14.2.4 The voltage supply connector was not subject of the verification.	
5.4.23	Poisons and other gases	Apparatus with electrochemical sensor	P
5.4.24	Field verification kit	Not applicated	N
5.4.25	Operation at or below the lower limit of the measuring range		P
5.4.26	Verification of software and digital components	Tested with report 968/FSP 1342.00/16 by TÜV Rheinland	P

3.6 Practical test

The practical tests of the standard EN 50104: 2011 was carried out in the test center of TÜV Rheinland.

As test samples were used specimens of:
IRwin SXT DUT 3 and DUT 8

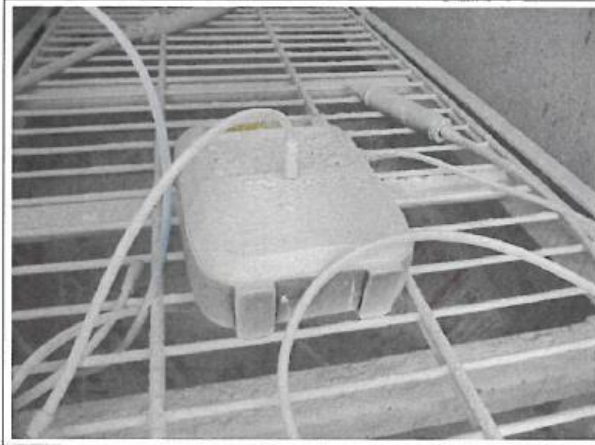
For the vibration test following specimens were used:
IRwin SXT DUT 1 and DUT 3

For the IP test following specimen was used:
IRwin SXT DUT 1

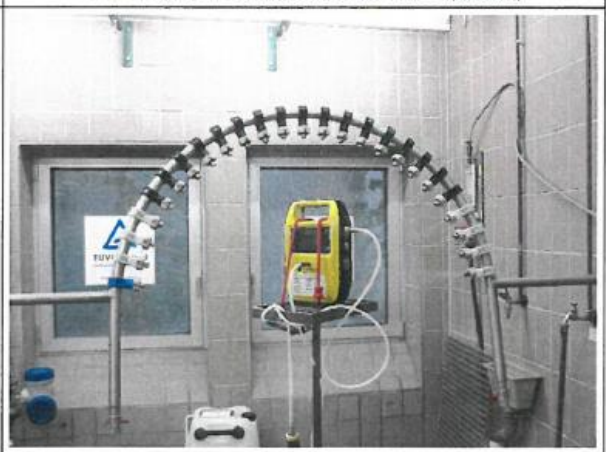
The test results are summarized in the test records.

IP test of IP 54

Dust IP 5X



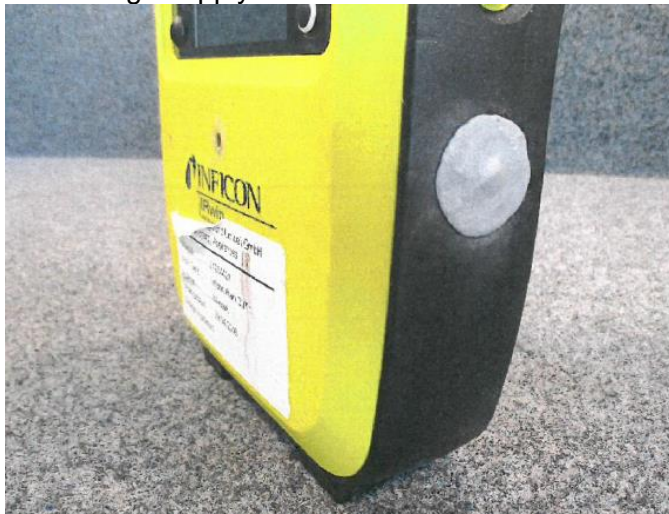
Water IP X4



View inside after IP 54 test.



The voltage supply connector was closed and not subject of the verification for the IP test.

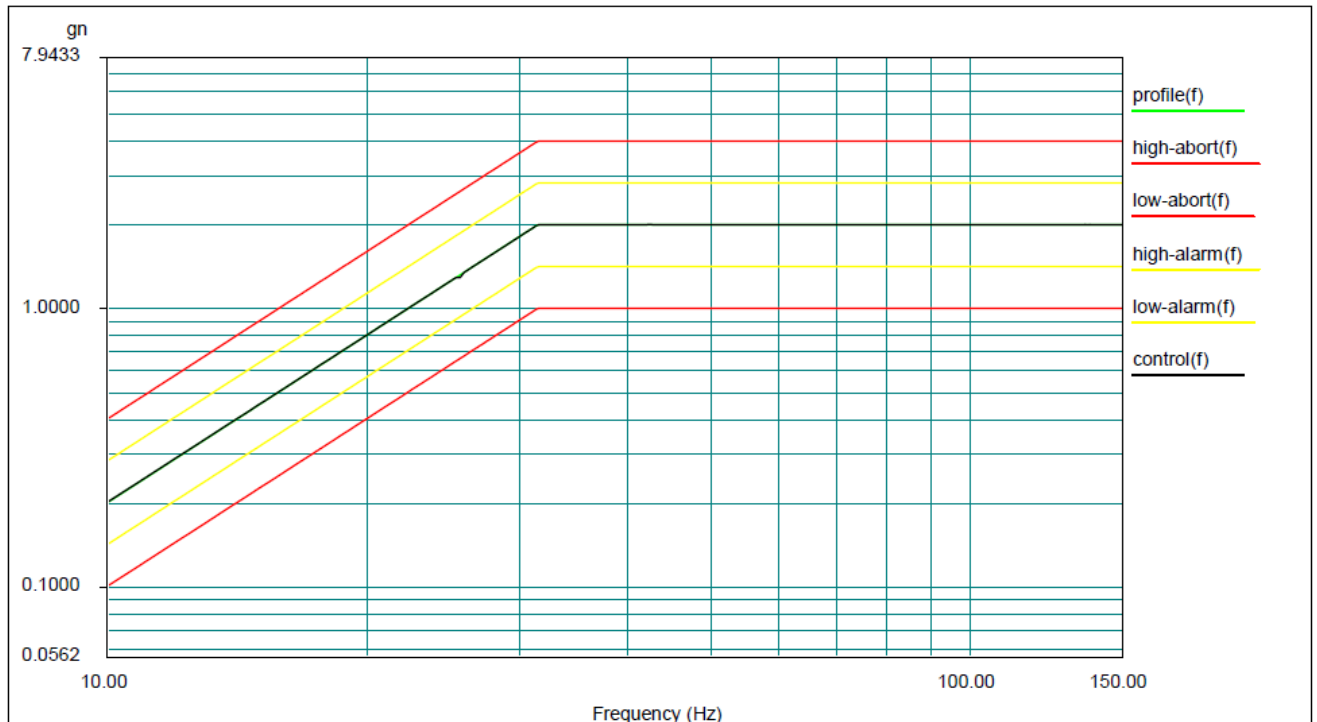


Vibration test Axes X / Y / Z

X-Axis



DUT: Gassensoren Fa. Inticon X - Achse (seitlich stehend)
 Serial Number: Prüfmuster IRwin Prüfmuster 1 (li), Prüfmuster 2 (re.)
 Project File Name: Sweep 10Hz-150Hz.prj
 Profile Name: DIN EN 50545-1 Kap. 6.20 Test Type: Swept Sine Run Folder.:RunDefault May 04, 2016 14-07-08

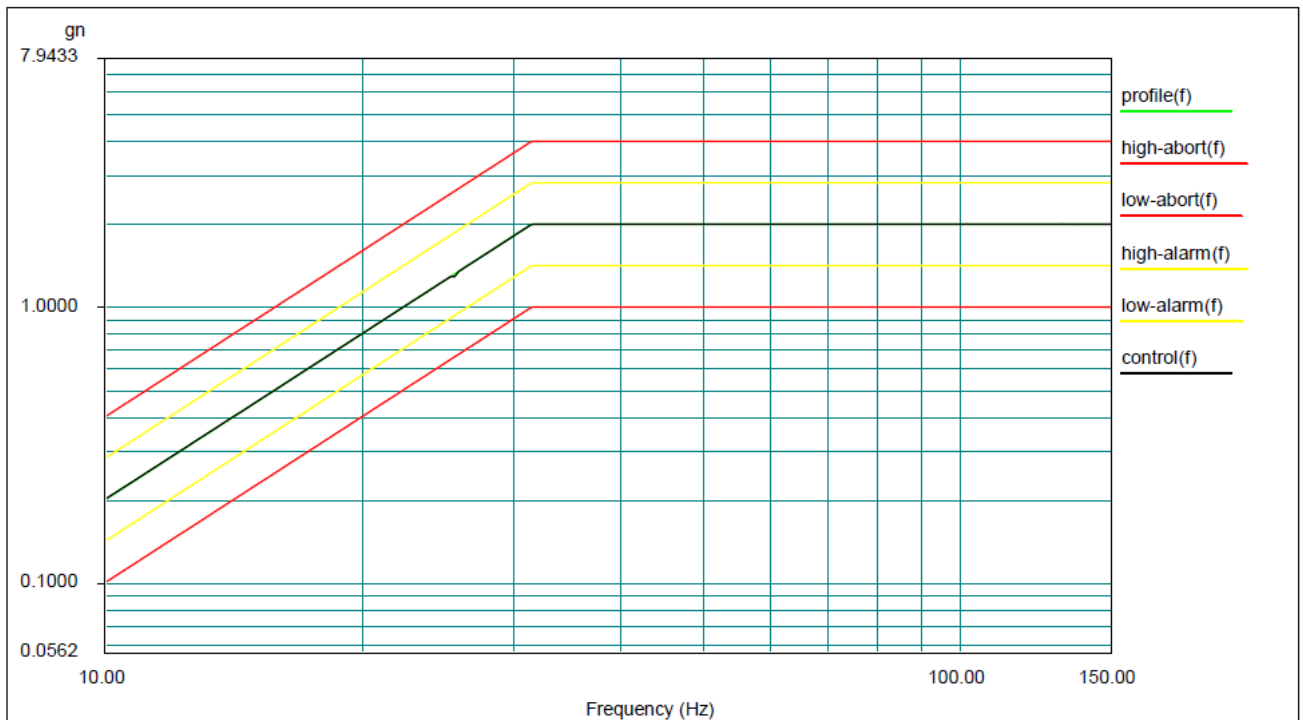


Level: 100 % Full Level Time: 01:00:00 Sweep Type: Linear
 Frequency: 25.486294 Hz Time Remaining: 00:00:00 Sweep Rate: 0.16 Hz/Second

Y-Axis



DUT: Gassensoren Fa. Inticon Y - Achse
 Serial Number: Prüfmuster IRwin Prüfmuster 1 (li), Prüfmuster 2 (re.)
 Project File Name: Sweep 10Hz-150Hz.prj
 Profile Name: DIN EN 50545-1 Kap. 6.20 Test Type: Swept Sine Run Folder: \RunDefault May 04, 2016 11-01-31

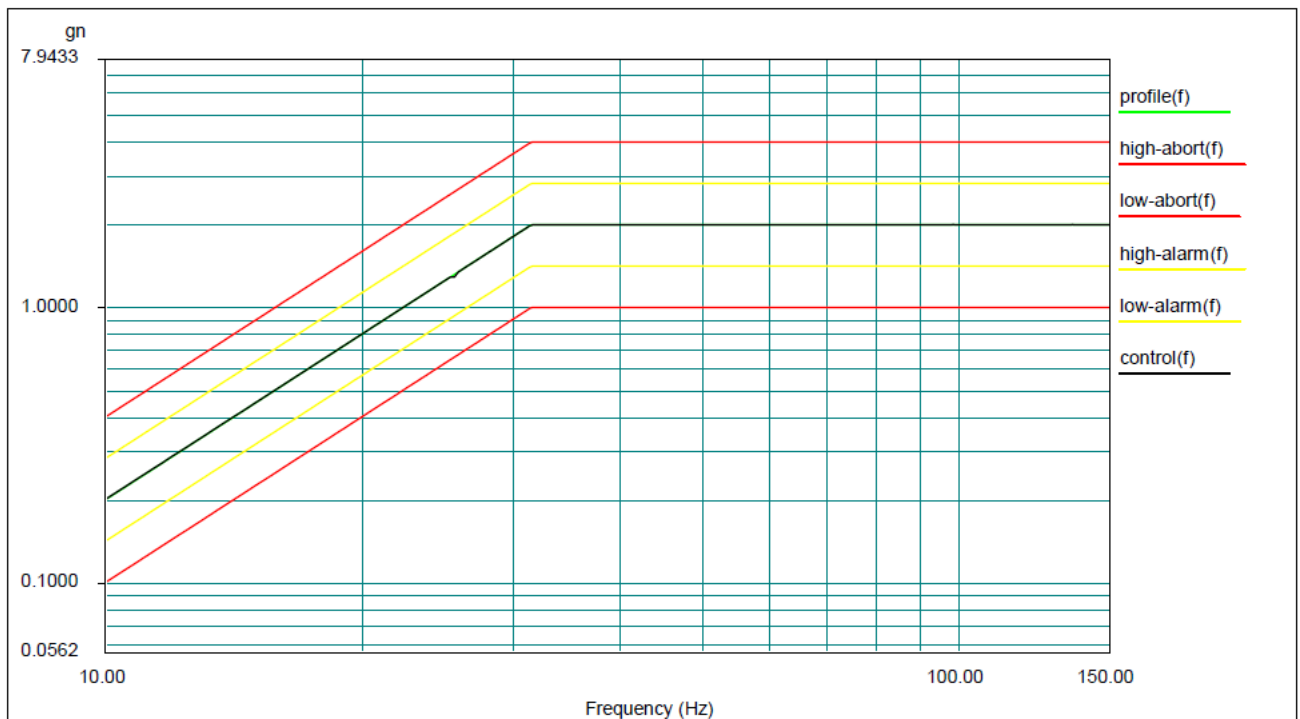


Level: 100 % Full Level Time: 01:00:00 Sweep Type: Linear
 Frequency: 25.484589 Hz Time Remaining: 00:00:00 Sweep Rate: 0.16 Hz/Second

Z-Axis



DUT: Gassensoren Fa. Inticon Z - Achse (stehend)
 Serial Number: Prüfmuster IRwin Prüfmuster 1 (li), Prüfmuster 2 (re.)
 Project File Name: Sweep 10Hz-150Hz.prj
 Profile Name: DIN EN 50545-1 Kap. 6.20 Test Type: Swept Sine Run Folder: \RunDefault May 04, 2016 12-10-45



Level: 100 % Full Level Time: 01:00:00 Sweep Type: Linear
 Frequency: 25.486294 Hz Time Remaining: 00:00:00 Sweep Rate: 0.16 Hz/Second

4 Test results, confirmation of conformity with test standard

The product: Electrical apparatus for the detection and measurement of oxygen, toxic and combustible gases.

Type: IRwin

of manufacturer: INFICON AB
58102 Linköping, Sweden

complies with the test standards:

EN 50104:2010, EN 45544-1:2015, EN 45544-2:2015 and
EN 60079-29-1:2007 / Annex A incl. draft version 2016.

This statement was given based on the documentation submitted by the manufacturer and the tested sample. The statement is valid only for products / appliances which are manufactured according to the tested specimen.

Deviating from the device specification, the working temperature range was tested from -15 °C to +40 °C.

The CO₂ sensor does not meet the requirements cl. 5.4.3.1 of EN 45544-1, but the requirement of cl. 5.4.3.2 is met.

EMC was proved separately with report REC-E704557
by DELTA Development Technology AB.

The standard EN 50270 is not within the scope of the laboratory accreditation, but all EMC basic standards to which the standard refers, are within the scope of the accreditation.

The report does not represent a general statement about the serial production of the test object and gives not an authorization for use of a TÜV Rheinland test- or certification mark.

Annex

Annex 1

List of test documentation

Encl. no.	Title:	Document no.:	Date:
A01	EX Sensor label IRwin SX	581-154 C	01.12.2016
A02	EX Sensor label IRwin SXG	581-155 C	01.12.2016
A03	EX Sensor label IRwin SXGT	581-156 C	01.12.2016
A04	EX Sensor label IRwin SXT	581-202 C	01.12.2016
A05	AD ranges incomplete	-	03.12.2015
A06	Coding standard for safety related software	5293	03.12.2015
A07	Project documentation IRwin compliance with EN 50271	PA1	18.11.2015
A08	Project documentation IRwin compliance with EN 50271	PA3	04.12.2015
A09	Project documentation IRwin compliance with EN 50271	PA3_1	03.12.2015
A10	IRwin Tools and coding standards updated	-	03.12.2015
A11	IRwin-Operating-instructions-mina66en1-01-(1603)	mina66en1-01-(1603)	23.03.2016
A12	IRwin-Operating-instructions-mina66en1-08-(1612)	mina66en1-08-(1612)	02.12.2016
A13	Testgases IRwin Rev A 20160118	-	18.01.2016
A14	Testgases IRwin Rev A 20160118	-	19.01.2016

The listed documents only stored in the Test Centre.

Annex 2 – Test protocol

encl.no.	content	document no.	pages	Date
B01	Test Protocol / Report IP Test	21253914_001	11	23.06.2016
B02	Test Protocol / Report EMC Test DELTA Development Technology AB	REC-E703557	34	23.08.2016
B03	Test Protocol / Report Software	968/FSP1342.00/ 16	13	28.11.2016
B04	Test Protocol / Report 1-3	21232555- 21234421	15	08.08.2016

The listed documents only stored in the Test Centre.

Annex 3 – Referred test reports

encl.no.	content	document no.	rev.	Date
	No referred test reports			

The listed documents only stored in the Test Centre.

Annex 4 - Measurement equipment

Measurement equipment Test Centre:

Messmittel /Messgröße	Hersteller	Typ	Index	Kalibrierung bis:
Hybrid Schreiber	Yokogawa	DR130	944	01.05.2017
Multimeter	Fluke	179	1645	01.02.2018
Temperaturschrank	Vötsch	VTM 7004	1834	01.08.2016
Klimaschrank	Weiss	SB22/500	393	01.08.2018

Test Gases:

Gas	Concentration	Stability
CH4 in air	4077 ppm	13.03.2021
CH4 in air	1.0 vol.%	05.03.2021
CH4 in air	2.2 vol.%	04.04.2021
CH4 in air	3.0 vol.%	05.03.2021
CH4 in air	3.53 vol.%	18.03.2021
CH4	100.0 vol.%	
CO in air	6.22 ppm	18.03.2019
CO in air	30.2 ppm	23.07.2017
CO in air	50.1 ppm	28.02.2021
CO in air	150.6 ppm	10.08.2019
CO in air	255.0 ppm	28.02.2021
CO in air	360.0 ppm	12.03.2021
CO in air	458.0 ppm	18.03.2021
O2 in N2	5.18 vol.%	05.03.2021
O2 in N2	10.03 vol.%	13.03.2021
O2 in N2	12.13 vol.%	13.03.2021
O2 in N2	25.10 vol.%	13.03.2021
N2	100.0 vol.%	
CO2 in air	1020 ppm	05.03.2019
CO2 in air	5019 ppm	12.09.2017
CO2 in air	1.536 vol.%	11.08.2019
CO2 in air	2.62 vol.%	06.03.2021
CO2 in air	3.62 vol.%	06.03.2021
CO2 in air	4.60 vol.%	06.03.2021
CO2 in air	4.96 vol.%	05.03.2021

Gas	Concentration	Stability
H2S in air	1.17 ppm	31.03.2017
H2S in air	4.53 ppm	22.10.2017
H2S in air	37.5 ppm	22.10.2017
H2S in air	115.0 ppm	10.05.2018
H2S in air	211.0 ppm	03.05.2018
H2S in air	286.0 ppm	06.05.2018
H2S in air	367.4 ppm	02.05.2018
C3H8 in air	4989 ppm	05.03.2021
C3H8 in air	1.0 vol.%	05.03.2021
C3H8 in air	1.22 vol.%	03.04.2021