IHFC CE

Ordering

Type no.	Description
IHFC R32	Refrigerant Gas Detector R32 0-1000 ppm, 24 Vdc
IHFC R134A	Refrigerant Gas Detector R134a 0-1000 ppm, 24 Vdc
IHFC R404A	Refrigerant Gas Detector R404a 0-1000 ppm, 24 Vdc
IHFC R410A	Refrigerant Gas Detector R410a 0-1000 ppm, 24 Vdc
IHFC R449a	Refrigerant Gas Detector R449a 0-1000 ppm, 24 Vdc
IHFC R454a	Refrigerant Gas Detector R454a 0-1000 ppm, 24 Vdc
IHFC R454b	Refrigerant Gas Detector R454b 0-1000 ppm, 24 Vdc
IHFC R454c	Refrigerant Gas Detector R454c 0-1000 ppm, 24 Vdc
IHFC R507a	Refrigerant Gas Detector R507a 0-1000 ppm, 24 Vdc
IHFC R514a	Refrigerant Gas Detector R514a 0-1000 ppm, 24 Vdc
24VAC	Option for 24 Vac supply
230VAC	Option for 230 Vac supply

Features

- **Metal oxide gas sensing element**
- **Range 0-1000 ppm**
- **Output**
  2 x 4-20 mA or 0-10 Vdc, user settable
- **RS485, Modbus RTU protocol**
- **Output relays**
  2 × SPST relays (closing contact),
  250 VAC / 30 VDC, 5 A max
- **Alarm set-points**
  Minimum 250 ppm
  Alarm 1: 250 ppm
  Alarm2: 500 ppm
- **Sound alarm, buzzer 85 dB**
- **Power supply 24 Vdc (11-30 Vdc)**
  options 24 Vac or 230 Vac
- **Sensor life time minimum 5 years**
- **Two relays with closing contact may be used for remote signaling or ventilation control. Also the internal buzzer gives sound alarms at two set-points.**

Technical data

Detected gases	R-12, R-123, R-125, R-134a, R-143, R-22, R-404a, R-407c, R-410a etc
Default calibration	R404a
Sensor type	long-life metal-oxide gas sensor
Sampling method	diffusion
Detection range	0-1000 ppm
Resolution	1 ppm
Signal update	every 1 second
Response time	~15 seconds
Maintenance interval	12 months
Sensor lifetime	> 5 years
Self-diagnostics	full functionality check at start-up
Warm-up time	≤ 1 min
Power supply	11-30 Vdc options 24 VAC or 230 Vac
Power consumption	< 2 VA
Digital interface	RS485, Modbus RTU protocol
Alarms	Buzzer 85 dB
Analog outputs	2 × 4-20 mA / 0-10 Vdc, user settable
Output relays	2 × SPST relays (closing contact), 250 VAC / 30 VDC, 5 A max
Alarm set-points	Minimum 250 ppm Alarm 1: 250 ppm, Alarm 2: 500 ppm
Enclosure	ABS plastic with ventilation slots, wall mount, protection class IP20
Dimensions	H85 × W85 × D37 mm
HJ&r fwprsl	Fhhtwimsl yt%7569485 4JZ%fsi%75694 8:4JZ1%JS%59>62926?7567 JS%65552;28?7575 1%JS%687;26?7568-JR H1%jr nxxrtsx. JS%65552;26?756>1%JS%65552;27?756>-JR H1%r r zsny~. JS%55<>27>26?756;1%JS%55<>27>27?756:%fsi%JS%55<>27>28?7569
Operating environment	residential, business and industrial indoor spaces (non ATEX rated)
Operating conditions	-30 to +60 °C, <95 %RH, non-condensing; 0.9...1,1 atm Explosion-safe areas Normal ambient oxygen level No strong mechanical shock, vibrations or EMI; Avoid exposure to corrosive gases or silicone containing products.

Hydrofluorocarbons

HFCs are relatively non-flammable, chemically stable, and nonreactive.

Classification of halocarbon refrigerants

Group	Refrigerants
Chlorofluorocarbons (CFC)	R11, R12
Hydrochlorofluorocarbons (HCFC)	R22, R141b, R142b
Hydrofluorocarbons (HFC)	R32, R125, R134a, R143a
Hydrofluoroolefins (HFO)	R514a, R1234ze, R1234yf, R1336mzz
Chlorine containing refrigerants (CFC and HCFC) are considered to be damaging to the ozone layer and contributing to the greenhouse effect. According to the Montreal Protocol, chlorine-containing halocarbons should be completely dismissed and their manufacturing closed down. Hydrofluorocarbons (HFC) contain no chlorine and are safer for the environment. Now hydrofluorocarbons are the most commonly used halocarbon refrigerants. Hydrofluoroolefins (HFO) is the last generation of refrigerants, more environmentally friendly than HFCs, but moderately flammable (A2L Class).	

Properties of selected halocarbons

Name	Type	Components	Components weight %	Boiling point
R12	CFC	CCl_2F_2	100	−29.8 °C
R22	CFC	$CHClF_2$	100	−40.8 °C
R125	HFC	CHF_2CF_3	100	−48.5 °C
R134a	HCFC	CF_3CH_2F	100	−26.2°C
R143a	HCFC	CF_3CH_3	100	-47.5 °C
R32	HFC	CH_2F_2	100	−52 °C
R1234yf	HFO	2,3,3,3-Tetrafluoropropene	100	-30 °C
R1234ze	HFO	1,3,3,3-Tetrafluoropropene	100	-19 °C
R404a	mixture	R125, R143a, R134a	44:52:4	−47.8 °C
R407c	mixture	R32, R125, R134a	23:25:52	−43 °C
R410a	mixture	R32, R125	50:50	−48.5 °C
Overexposure may cause dizziness and loss of concentration. At higher concentrations, CNS depression and cardiac arrhythmia may result from exposure. Vapors displace air and can cause asphyxiation in confined spaces. At higher temperatures (>250°C) decomposition products may include hydrofluoric acid (HF) and carbonyl halides. An escape of refrigerant through a leak may damage the refrigerating facilities.				

Description

IHFC is intended for early detection of leakages or accumulation of halocarbon refrigerants in confined spaces.

The instrument is based on a fully calibrated and temperature compensated semiconductor metal-oxide gas sensor with high repeatability stability and long lifetime.

IHFC series devices provide two independent analog outputs OUT1 and OUT2, user-selectable to 4-20 mA or 0-10 V, proportional to the gas concentration.
RS485 Modbus RTU digital communication interface allows easy instrument configuration and integration into various automation systems.

Two relays RE1 and RE2 with closing contacts can be used to switch 24 V or 230 V powered alarm sirens, ventilation fans, shut-off valves, or other actuators.

The device is equipped with an acoustic alarm.

Safety requirements

Misuse will impair the protection of the product. Always adhere to the safety provisions applicable in the country of use.

Do not perform any maintenance operation with the power on. Do not let water or foreign objects inside the device.

Removal of the PCB from the enclosure voids the warranty.
Do not touch the electronic components directly, as they are sensitive to static electricity.

Connection diagrams can be found in the installation and connections section.
The device might not perform correctly or be damaged if the wrong power supply is connected.

External circuits connected to the equipment should have sufficient insulation rating according to the environmental conditions and equipment power.

A disconnecting device that is marked as such and easily accessible should be included in the installation of this product.

Operating conditions

The device should be used in a non-hazardous (non-ATEX -rated) indoor area without aggressive gases in the atmosphere at the atmospheric pressure (85...110 kPa), <95 %RH, without condensation, and in a basic electromagnetic environment, where the latter is defined in EN 61326-1. Metal oxide semiconductor gas sensors cannot properly operate in a zero or low oxygen content atmosphere. Normal ambient oxygen concentration is recommended.

Avoid strong mechanical shock and vibrations.

Avoid areas highly contaminated with dust, oil mist, etc.
Keep the instrument away from direct sunlight.
A sudden temperature or humidity change might affect the sensitivity of the sensor.

Do not use the detectors in the rooms where silicone containing materials (silicone rubber/putty, hair grooming materials, adhesives) or other volatile silicon compounds may be present.

Adsorbed silicon-containing vapours may coat the sensing material of the sensor or clog the gas diffusion route, irreversibly inhibiting sensitivity.

Installation guidelines

There are no precise rules or standards to follow when installing gas detectors. The following points must be taken into account:

- Application (the instrument is intended for leakage control.)
- Properties of the space under investigation (room geometry, direction, and velocity of airflows, etc.),
- Halocarbons are heavier than air and tend to sink. The sensor should be placed near the floor.
- The device should be accessible for maintenance and repair.

The aforementioned conditions above will affect the coverage area of the device. however, the coverage area for a detector is usually between 2.5 to 5 meters radius.

For early leakage detection install the sensor as close as possible to the potential leakage sources (flanges, valves, pressure reducers, pumps, etc.), taking into consideration other points listed above.

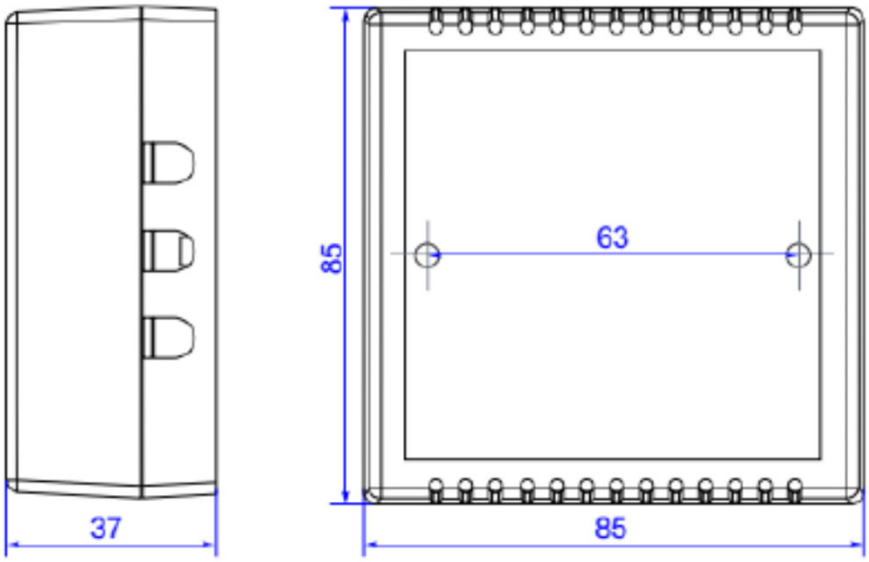
For general area monitoring without definite leakage sources, the detector should be distributed evenly in the room.

Do not locate the detector close to ventilation openings and strong air currents.
Avoid the areas without air circulation (corners, niches) as well.

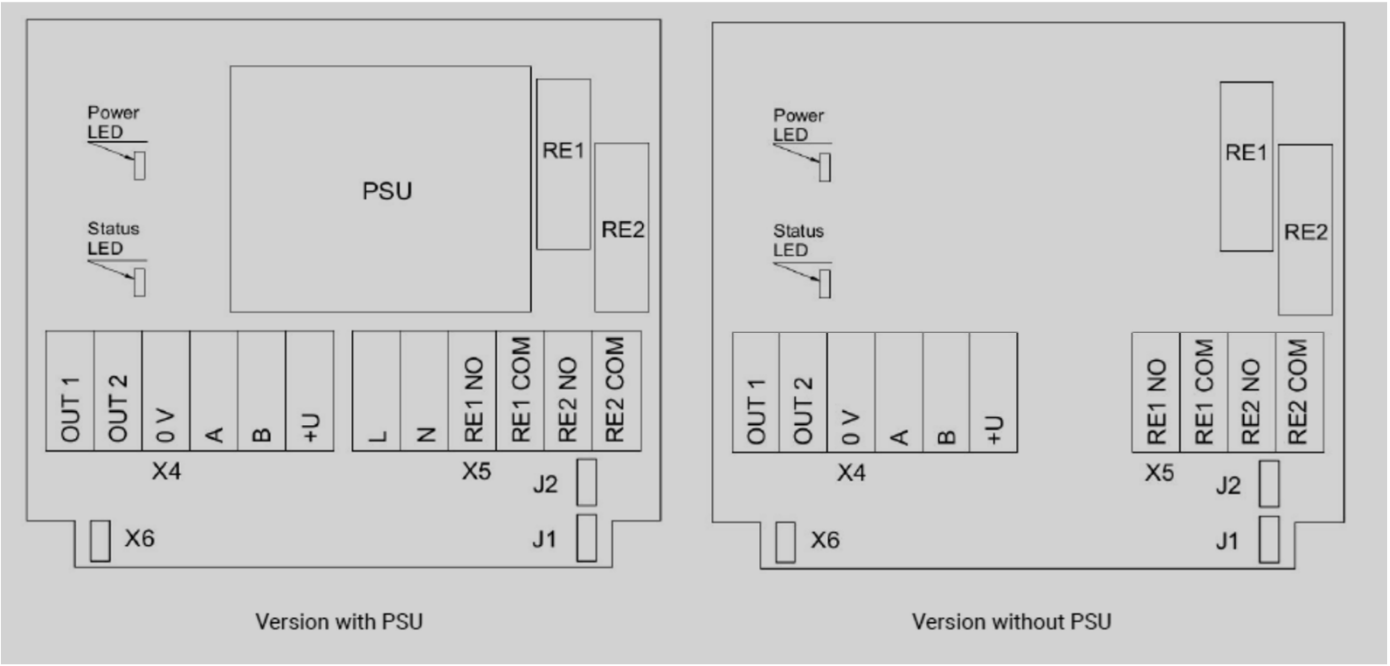
For personal safety control, the detectors are installed in the breathing zone (at the height of the head of people or animals).
The recommended sensor position is vertical, pointing downwards.

1.. Detach the base of the enclosure by gently pulling along four guiding pins

2.. Fix the base on the wall with two screws.



3.. Connect power supply, relay and output cables to the terminal blocks on the PCB as shown on the diagram below.



Jumpers

J1	OUT1 type (open: 4-20 mA; closed 0-10 V)
J2	OUT2 type (open: 4-20 mA; closed 0-10 V)
X6	Reset Modbus network parameters to default

X4 terminals

OUT1	4-20 mA / 0-10 V output
OUT2	4-20 mA / 0-10 V output
0V	0 V / 24 VAC Neutral (optional)
A	RS485 A / Data +
B	RS485 B / Data -
+U	+24 VDC / 24 VAC Phase (optional)

X5 terminals (optional)

L	90…265 VAC Phase
N	90…265 VAC Neutral
RE1 NO	Relay 1, normally open terminal
RE1 COM	Relay 1, common terminal
RE2 NO	Relay 2, normally open terminal
RE2 COM	Relay 2, common terminal

To power the instrument from an external 24 V power source, connect terminals 0 V and +U to the source.
If an integrated mains power supply module is used, connect terminals L and N to the mains.

NOTE! If the instrument is powered from mains, connect to 0 V and +U terminals only light external loads, which consume less than 30 mA in total, as the integrated mains supply module capacity is limited.

To use analog outputs, connect the terminals OUT1 and/or OUT2 and 0 V to the input of the secondary instrument (indicator or controller).

NOTE! The outputs are not galvanically isolated from the 24 V power supply and share a common 0 V.
Allowed load resistance limits are stated in the Specifications table.

The type of each analog output can be independently changed between 4-20 mA and 0-10 V with jumpers J1 (OUT1) and J2 (OUT2). With a closed jumper, the output is 0-10 V, with an open jumper the output is 4-20 mA.
By default, both outputs OUT1 and OUT2 are assigned to the gas concentration.
The output assignments and scales can be changed by Modbus commands.

To use relay outputs, connect the chosen actuators to the relay terminals RE1 and/or RE2.

NOTE! Actuator short-circuits shall be avoided, to protect the instrument relays using external fuses or safety switches.

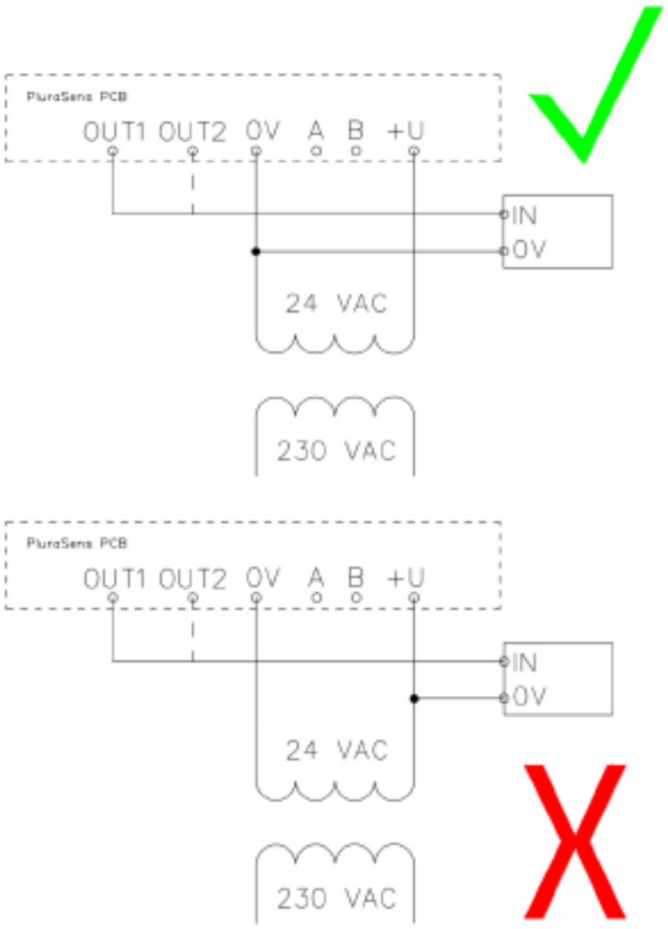
4. Turn on the power. It may take up to five minutes after switching on for the sensor to stabilize.
During this period relays, analog outputs, and Modbus interface are off.
A LED placed on the PCB of the device allows controlling the connection process.
The LED response to different processes is presented in the table below:

Mode	LED mode
During calibration mode or sensor heating period (if activated)	0.5 Hz (50% on, 50% off)
Relay 1 turned on	Blinking 1 Hz (50% on, 50% off)
Relay 2 turned on	Blinking 2 Hz (50% on, 50% off)
During the Modbus communication cycle	Short on-off pulses
Normal operating/measurement	Continuously on or off

NOTE! Pulse corresponding to Modbus response is visible only when diode light is on.

5. Push the enclosure to the base.

Correct and incorrect cabling for 24 Vac



Operation

For best stability, the gas detector should be powered permanently.
If the instrument is left for a long time in an unpowered state,
then after initial power-on the metal-oxide gas sensor needs some time to heat up and burn adsorbed contaminants.

So for the first tens of seconds of a few minutes, an alarm activation may be possible.

After this heating-up period, the instrument turns into normal mode.

When the concentration of the detected gas reaches the LOW alarm level, the control LED starts blinking and
the buzzer starts beeping with 1 Hz frequency.

When the HI alarm level is reached, the frequency of blinking/beeping is 2 Hz.

The alarm signal turns off automatically if gas concentration decreases to 80% of the alarm setpoint.

Maintenance

Do not perform any maintenance operation with the power on.

Clean the device with a soft damp cloth. Do not use any abrasive cleaning agents.

Do not immerse the device in water or any cleaning media.

Calibration

IHFC has been calibrated by the factory with standard gas mixtures before delivery.

The semiconductor gas sensor exhibits high stability and > 5 years' lifetime.

However, as the gas sensor is directly exposed to the environment,
the instrument requires at least annual field recalibration with a portable calibration kit.

Warranty

This product is warranted to be free from defects in material and workmanship for a period of one year from the date of the original sale.

During this warranty period, the Manufacturer will, at its option, either repair or replace a product that proves to be defective.

This warranty is void if the product has been operated in conditions outside ranges specified by the Manufacturer or damaged by customer error or negligence or if there has been an unauthorized modification.

RS485 communication interface

Databits: 8 Parity: none Stop bits: 1 or 2 Protocol: Modbus RTU	Supported Modbus functions: 03 – Read multiple registers 06 – Write a single register

Modbus registers (0-based, decimal format)

Reg	Description	Supported values
1	Hardware version	Read-only
2	Software version	Read-only
3	Product serial number	Read-only
4	Slave ID (network address)*	1...247, default 1
5	Baud Rate*	1200...57600 baud, default 9600
6	Response delay, ms	1...255 ms, default 10
7	Stop bits*	1 / 2, default 1
17	Restart	Write '42330' for soft restart
162	Temperature shift adjustment	-32000...+32000 T units (0,01 °C)
165	Gas channel shift adjustment	-32000...+32000 gas units, default 0
166	Gas channel slope adjustment	1...65535, default 512
167	Output change rate limit	1...32000 gas units/s, 0=no limit
168	Integrating filter time constant	1...32000 s, 0=no, integrating filter
201	Parameter assigned to OUT1	0=none, 1=T, 2=gas, 9=forced by 203
202	Parameter assigned to OUT2	0=none, 1=T, 2=gas, 9=forced by 204
203	Forced value for OUT1	0...1000 (0.0...100.0% of full scale)
204	Forced value for OUT2	0...1000 (0.0...100.0% of full scale)
211	Parameter assigned to RE1	0=none, 1=T, 2=gas, 9=forced by 213
212	Parameter assigned to RE2	0=none, 1=T, 2=gas, 9=forced by 214
213	Forced state for RE1	0=off, 1=on (relay control by Modbus)
214	Forced state for RE2	0=off, 1=on (relay control by Modbus)
215	Switch delay for RE1	0...1000 s, default 0

216	Switch delay for RE2	0...1000 s, default 0
217	Min on/off time for RE1	0...1000 s, default 0
218	Min on/off time for RE2	0...1000 s, default 0
219	Control logic for relay RE1	0:_, 1:_↓↑·P, 2:·P↑ ↓_, 3:_↑·P↓_, 4:·P↓_↑·P
220	Control logic for relay RE2	0:_, 1:_↓↑·P, 2:·P↑ ↓_, 3:_↑·P↓_, 4:·P↓_↑·P
221	LOW setpoint for relay RE1	-32000...+32000, gas or T units
222	HIGH setpoint for relay RE1	-32000...+32000, gas or T units
223	LOW setpoint for relay RE2	-32000...+32000, gas or T units
224	HIGH setpoint for relay RE2	-32000...+32000, gas or T units
258	Measured temperature	-4000...+12500 T units (0,01 °C)
259	Gas concentration	0...65535 gas units
261	0% value of OUT1	-32000...+32000 gas units/integer °C
262	100% value of OUT1	-32000...+32000 gas units/integer °C
263	0% value of OUT2	-32000...+32000 gas units/integer °C
264	100% value of OUT2	-32000...+32000 gas units/integer °C

* - the new value is applied after restart,

Broadcast ID=0 may be used to assign a new ID to a device with an unknown ID

Factory settings

Target gas	R404a
Gas unit	ppm
OUT1 assignment and scale	gas, 0 - 1000
OUT2 assignment and scale	gas, 0 - 1000
RE1 assignment and logic	gas, on at high values
RE1 HIGH setpoint (set)	100
RE1 LOW setpoint (release)	80
RE2 assignment and logic	gas, on at high values
RE2 HIGH setpoint (set)	500
RE2 LOW setpoint (release)	400