



Operating Manual
Incl. EU Declaration of Conformity

IE414, IE514

Integration Sensors and Temperature Resistant Gauge Head Cables

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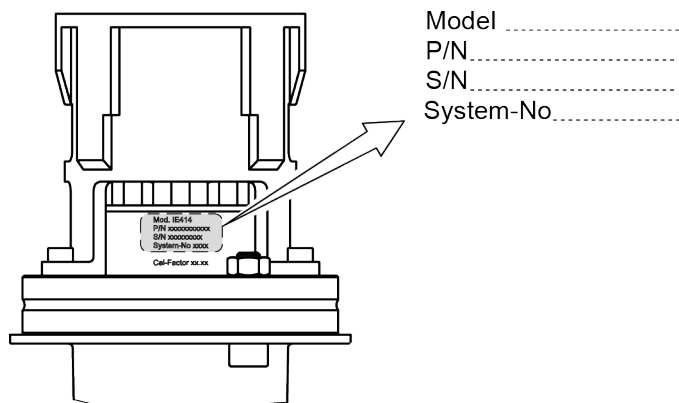
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For cross-references within this document, the symbol (→  XY) is used; for cross-references to further documents listed under 'Literature', use is made of the symbol (→  [Z]).

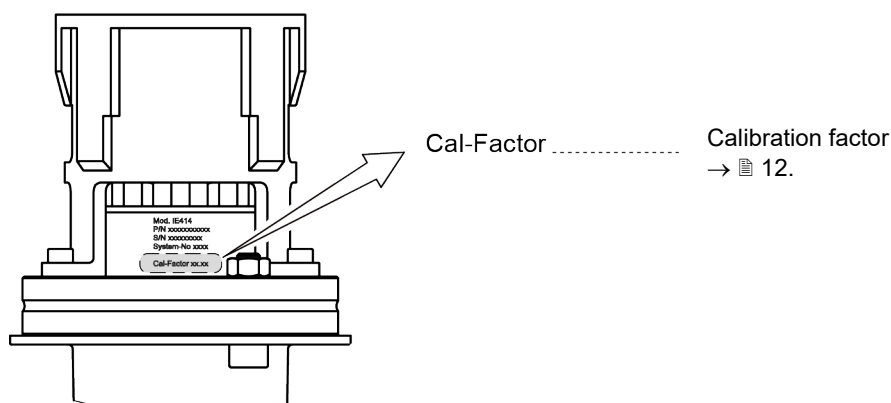
1 General

1.1 Product Identification

In all communications with INFICON, please specify the information on the product nameplate.



Calibration factor <Cal-Factor>



1.2 Validity

This document applies to products with part numbers

399-661 (IE414 sensor)
399-663 (IE514 sensor)

The part number (P/N:) can be taken from the product nameplate.

If not indicated otherwise in the legends, the illustrations in this document correspond to the sensor IE414. They apply to the IE514 by analogy.

We reserve the right to make technical changes without prior notice.

All dimensions in mm.

The references to diagrams, e.g. (2/3), consist of the fig. no. and the item no. in that order.

1.3 Description

The IE414 is a Bayard-Alpert measurement system and the IE514 is an extractor measurement system for connection to an IM540 operating unit. Operation of these passive sensors is based on the hot cathode ionization effect.

The temperature resistant gauge head cable must not be exposed to a temperature exceeding 200 °C max. (250 °C at the flange of the sensor).

1.4 Intended Use

The IE414 and IE514 sensors may only be used for the measurement of total pressures in vacuum systems and this only in connection with the Vacuum Gauge Controller IM540.

1.5 Scope of Delivery

Sensors

Sensor
Supplement with QR code

Temperature resistant
gauge head cables

Gauge head cable with plug fitted on the equipment side and with touch protection
Housing with cover (supplied separately)
Ion collector cable
Mounting bolts (supplied separately)
Supplement with QR-Code

2 Safety

2.1 Symbols Used

Symbols for residual risks



DANGER

Information on preventing any kind of physical injury.



WARNING

Information on preventing extensive equipment and environmental damage.



Caution

Information on correct handling or use. Disregard can lead to malfunctions or minor equipment damage.



Notice

2.2 Personnel Qualifications



Skilled personnel

All work described in this document may only be carried out by persons who have suitable technical training and the necessary experience or who have been instructed by the end-user of the product.

2.3 General Safety Instructions

- Adhere to the applicable regulations and take the necessary precautions for the process media used.
Consider possible reactions with the product materials (→ 6).
- Adhere to the applicable regulations and take the necessary precautions for all work you are going to do and consider the safety instructions in this document.
- Before beginning to work, find out whether any vacuum components are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.

Communicate the safety instructions to all other users.

2.4 Liability and Warranty

INFICON assumes no liability and the warranty is rendered null and void if the end-user or third parties

- disregard the information in this document
- use the product in a non-conforming manner
- make any kind of interventions (modifications, alterations etc.) on the product
- use the product with accessories not listed in the corresponding product documentation.

3 Technical Data

General gauge head data

	IE414	IE514
Materials		
Lead-in pins	NiFe	
Insulator	Al ₂ O ₃ ceramic	
Pin sealing plate	NiFe	
Flange	stainless steel	
Cathode	iridium with yttrium oxide coating	
Anode	molybdenum	stainless steel 1.4404
Collector	tungsten	
Reflector	NiFe	
Flange connection	DN 40 CF	
Electrode system configuration	Bayard-Alpert	Extractor
Ambient temperature during operation	+20 ... +80 °C	
Max. flange temperature with temperature resistant gauge head cable	250 °C	
Max. bake-out temperature without plug	400 °C	
Storage temperature	+20 ... +50 °C	
Relative humidity		
Annual average	≤65% (non-condensing)	
On 60 days	≤85% (non-condensing)	
Use	within indoor rooms only, altitude up to 2000 meters above sea level	
X-ray limit	<1×10 ⁻¹¹ mbar	<1×10 ⁻¹² mbar
Upper limit of measuring range	1×10 ⁻² mbar	1×10 ⁻⁴ mbar
Lower limit of measuring range	2×10 ⁻¹¹ mbar	2×10 ⁻¹² mbar

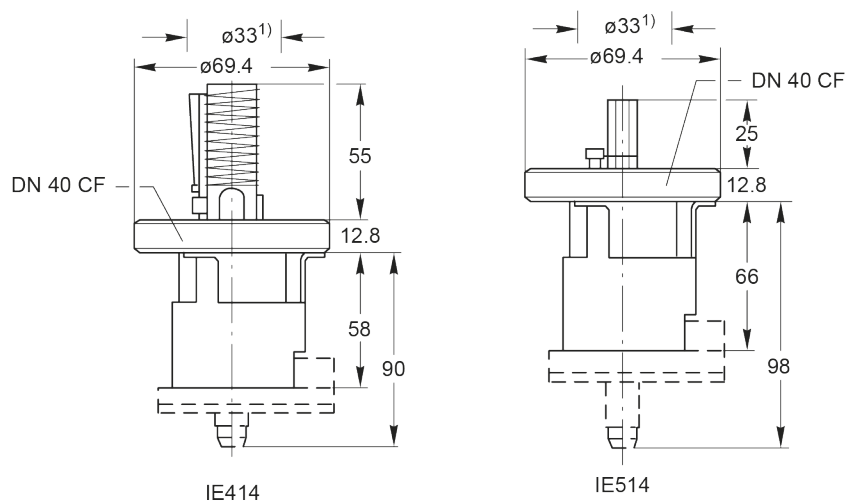
Heat resistant gauge head cable

Max. bake-out temperature	200 °C (250 °C at the gauge head flange)
Insulation materials used	PTFE, PEEK
Length	
399-686	3 m
399-687	5 m
399-688	10 m
399-690	50 m

Operating characteristics when used with control unit IM540

	IE414	IE514
Collector potential	0 V	
Cathode potential	+80 V	+100 V
Anode potential	+220 V	+220 V
Reflector potential	–	+205 V
Emission current range	0.1 ... 10 mA	1.6 mA
Cathode heater current	1.5 A (typ.)	
Cathode heater voltage	3 V (typ.)	3.7 V (typ.)
Sensitivity for nitrogen	17 mbar (typ.)	6.25 mbar (typ.)
Max. power when baking out	90 mA / 480 V	45 mA / 480 V

Dimensions [mm]



¹⁾ Diameter electrical feedthrough vacuum side.

Fig. 1 Dimensions in mm

4 Installation

4.1 Installation



Caution



As a rule, all ionisation measurement systems must only be operated in connection with a properly earthed pump system.

Installation and mounting may only be carried out with the operating unit switched off.

When connecting the vacuum gauges to the vacuum system it must be strictly observed that during operation the gauges are not subjected to mechanical oscillations, impact or vibrations.

The mounting position of the gauge heads has no influence on proper operation. It is not permissible to install a venting valve in the immediate vicinity. The then suddenly occurring air flow may result in mechanical damage to the sensitive cathode.

When installing several gauge heads at one common component (T-piece or cross for example) an optical separation is required. The gauge heads may not directly "see" each other. Interactions may cause incorrect measurements.



Humidity at the insulators (2/14) caused by condensing water for example, can give rise to incorrect measurements due to leakage currents.

Connecting the gauge head cable

Do not use force to connect the plug. When plugging in make sure first that all pins are lined up in parallel and are straight. Otherwise the current feedthrough can suffer damage.



DANGER



Live voltages

If during operation the IM540 suffers a malfunction then a live voltage may be present at the gauge head cable connection (CH 1, CH 2).

Affix the touch protection component at the IM540 (BNC plug). The touch protection component is supplied together with the gauge head cable.

4.2 Connecting the Temperature Resistant Gauge Head Cable



Caution



Switch the sensor off first before working at the gauge cable. After switching off, wait for at least 15 seconds.

Disassembling the gauge head for connecting the temperature resistant gauge head cable

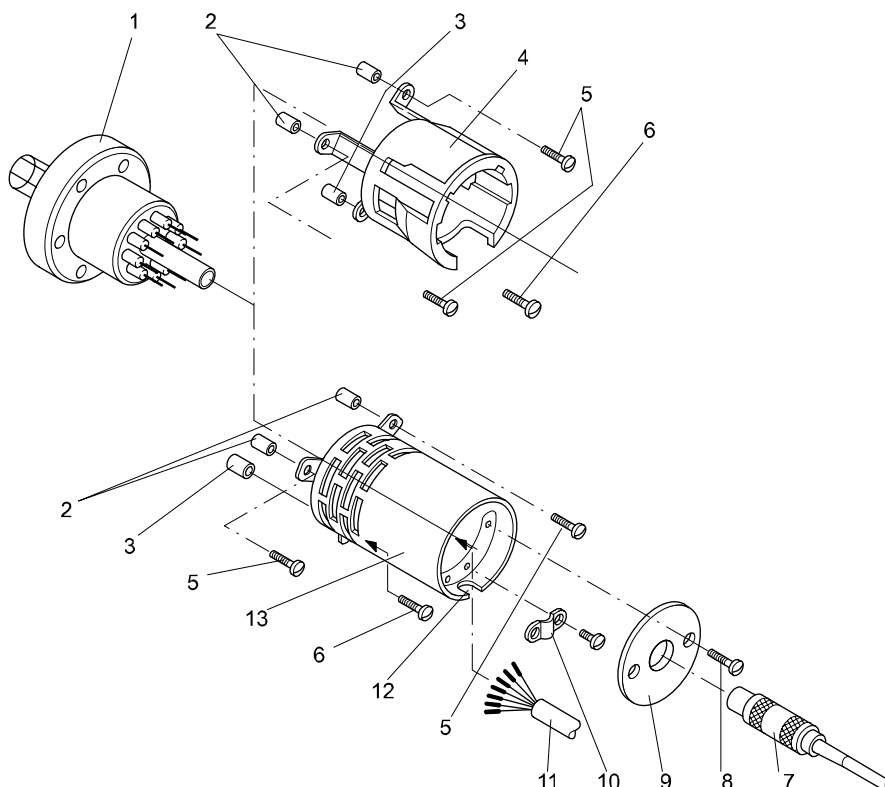
Remove the plug guide (2/4) by unscrewing the cylinder head screws (2/5 and 2/6) from the gauge head (2/1).

The gauge head IE414 has been designed in accordance with the VDE regulations with a greater distance between gauge head flange (2/1) and plug guide (2/4).

For this reason, three spacers have been fitted between gauge head flange (2/1) and the plug guide (2/4). Positioning of the plug guide is defined through the different bolt diameters on the gauge head (2/1).



The temperature resistant gauge head cable may also be connected after the gauge head has already been installed.



- 1 Gauge head
- 2 Spacer for M3 screw
- 3 Spacer for M4 screw
- 4 Plug guide
- 5 Cylinder head screw M3
- 6 Cylinder head screw M4
- 7 Ion collector cable (coax.)
- 8 Countersunk screws (M3 × 15)
- 9 Lid
- 10 Strain relief
- 11 Temperature resistant gauge head cable
- 12 Cable groove
- 13 Housing
- 14 Insulators (10 pcs.)

Fig. 2 Connection of the gauge head

Connecting the temperature resistant gauge head cable to the flange on the gauge head

- 1 Via the high-temperature cable pull the housing (2/13) over the connection plugs so that these may thereafter be screwed back onto the gauge head flange (2/1).
- 2 Connect the temperature resistant gauge head cable to the gauge head as depicted in fig. 3. The individual wires of the gauge head cable are colour-coded
- 3 Bolt the housing (2/13) onto the gauge head flange (2/1) again with the bolts (2/5 and 2/6) and the 3 spacers. Secure the entire cable with the strain relief (2/10).



- 4** Now the ion collector cable (2/7) can be inserted at the centre of the gauge head.



- 5** Secure the cover (2/9) with the bolts (2/8).



Fitting the gauge head including the temperature resistant gauge head cable

The gauge head including the temperature resistant gauge head cable can be now inserted into the vacuum chamber and bolted on.



Before connecting, we recommend to pump down the system and if possible run a vacuum test or a direct leak search.

For removing or replacing the gauge head proceed in the reverse order. The plug must be unlocked in the gauge head housing, and for this reason unscrew the cover (2/9) first.



Especially note the pin assignment. Provide the connection with great care. Do not subject the pin contacts to any bending forces! (Risk: damaging of the current feedthrough/leak)



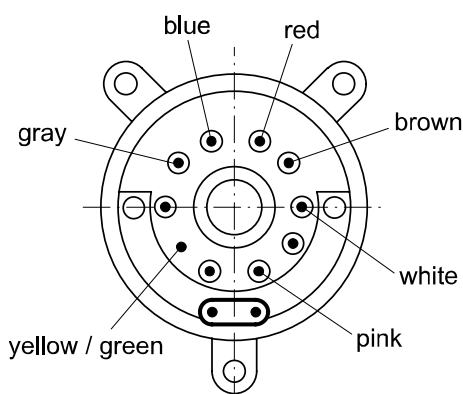
DANGER



Live voltages

If during operation the IM540 suffers a malfunction then a live voltage may be present at the gauge head cable connection (CH 1, CH 2).

Affix the touch protection component at the IM540 (BNC plug). The touch protection component is supplied together with the gauge head cable.



Color	IE514	IE414
ye / green	LP ²⁾	LP ²⁾
grey	jumper	— ¹⁾
blue	reflector	— ¹⁾
red	anode	anode
brown	cathode	cathode
white	cathode	cathode
pink	jumper	— ¹⁾

¹⁾ Function not available for IE414 but must be connected.

²⁾ LP (longest pin) = protective earth conductor (for facilitating installation)

Fig. 3 View onto the gauge head

5 Operation

Calibration

Each IE414 / IE514 gauge head has been individually calibrated in the course of final factory testing. This ensures a high accuracy of the pressure readout.

For this purpose, the calibration factor must be set with the "Cal_Full" parameter on the IM540 device (calibration factor <Cal-Factor> → 3). For setting procedure see Operating Manual tinb18e1 for the IM540.

Operation



In the presence of halogen gases like fluorine, chlorine, bromine and iodine and their compounds, the yttrium oxide coating will suffer rapid wear. As a result of this, the cathodes will burn out.



Humidity at the insulators (2/14) caused by condensing water for example, can give rise to incorrect measurements due to leakage currents.

6 Maintenance



DANGER

Contaminated parts

Contaminated parts can be detrimental to health and environment.

Before you begin to work, find out whether any parts are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.



Caution



Vacuum component

Dirt and damages impair the function of the vacuum component.

When handling vacuum components, take appropriate measures to ensure cleanliness and prevent damages.



Caution



Dirt sensitive area

Touching the product or parts thereof with bare hands increases the desorption rate.

Always wear clean, lint-free gloves and use clean tools when working in this area.

6.1 Exchanging the Cathode



The cathode is supplied on a plate under a cover. The cathode must only be exchanged in a room which is free of dust. Wearing of clean gloves is mandatory.

Preparation

- 1 Switch off the operating unit.
- 2 Detach the gauge head cable from the gauge head.
- 3 Remove the gauge head from the vacuum system.
- 4 After loosening the hex screws at both terminals remove the faulty cathode.
- 5 Open the transport packaging, remove the replacement cathode in the same way and install it in the place of the old cathode.

The required 0.89 mm screwdriver is included with the replacement cathode.

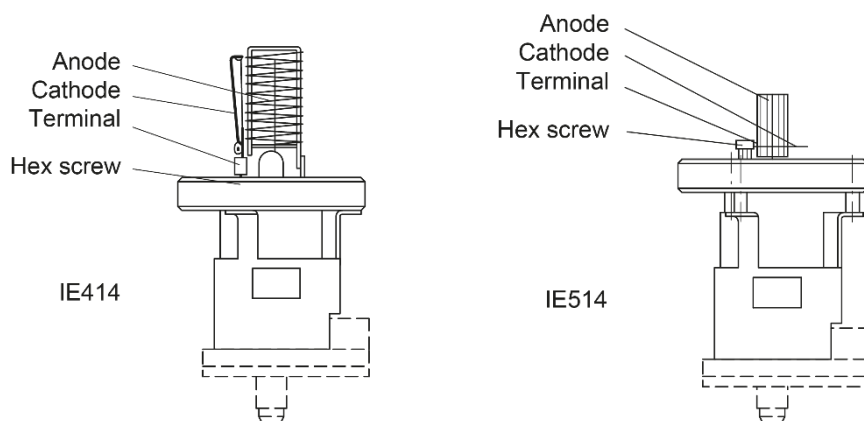


Fig. 4 View onto the gauge head

The cathode should be positioned as parallel as possible with respect to the anode. The initially applicable calibration values do not apply any longer after exchanging the cathode. Deviations up to 15% may occur.

7 Spare Parts, Accessories

Spare parts list

When ordering spare parts, always indicate:

- all information on the product nameplate
- description and ordering number according to the spare parts list

	Ordering number
Replacement cathode for IE414	399-676
Replacement cathode for IE514	399-677

Gauge head cables, 80 °C

	Ordering number
3 m with touch protection	399-680
5 m with touch protection	399-681
10 m with touch protection	399-682
50 m with touch protection	399-685

Gauge head cables, temperature resistant 200 °C

	Ordering number
3 m with touch protection	399-686
5 m with touch protection	399-687
10 m with touch protection	399-688
50 m with touch protection	399-690

8 Storage



Caution



Vacuum component

Inappropriate storage leads to an increase of the desorption rate and/or may result in mechanical damage of the product.

Cover the vacuum ports of the product with protective lids or grease free aluminum foil. Do not exceed the admissible storage temperature range (→ 6).

9 Returning the Product



WARNING



Forwarding contaminated products


Products returned to Pfeiffer Vacuum for service or repair should, if possible, be free of harmful substances (e.g. radioactive, toxic, caustic or microbiological). Otherwise, the type of contamination must be declared.

Adhere to the forwarding regulations of all involved countries and forwarding companies and enclose a completed contamination declaration (Form under www.inficon.com).

Products that are not clearly declared as "free of harmful substances" are decontaminated at the expense of the customer.


Products not accompanied by a duly completed declaration of contamination are returned to the sender at his own expense.

10 Disposal



STOP DANGER

Contaminated parts
 Contaminated parts can be detrimental to health and environment.
 Before beginning to work, find out whether any parts are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.



WARNING

Substances detrimental to the environment
 Products or parts thereof (mechanical and electric components, operating fluids etc.) can be detrimental to the environment.
 Dispose of such substances in accordance with the relevant local regulations.

Separating the components

After disassembling the product, separate its components according to the following criteria:

Contaminated components

Contaminated components (radioactive, toxic, caustic or biological hazard etc.) must be decontaminated in accordance with the relevant national regulations, separated according to their materials, and disposed of.

Other components

Such components must be separated according to their materials and recycled.

Appendix


A: Conversion Table

Pressure units
(vacuum technology)

	mbar	Bar	Pa	hPa	kPa	Torr mm HG
mbar	1	1×10^{-3}	100	1	0.1	0.75
Bar	1×10^3	1	1×10^5	1×10^3	100	750
Pa	0.01	1×10^{-5}	1	0.01	1×10^{-3}	7.5×10^{-3}
hPa	1	1×10^{-3}	100	1	0.1	0.75
kPa	10	0.01	1×10^3	10	1	7.5
Torr mm HG	1.332	1.332×10^{-3}	133.32	1.3332	0.1332	1

$$1 \text{ Pa} = 1 \text{ N/m}^2$$

B: Literature

-  [1] Operating Manual
 Vacuum Gauge Controller IM540
 tinb18d1 (German)
 tinb18e1 (English)
 INFICON AG, LI-9496 Balzers, Liechtenstein

EU Declaration of Conformity



Manufacturer: INFICON AG, Alte Landstraße 6, LI-9496 Balzers

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Products: IE414, IE514
(operation with Vacuum Gauge Controller IM540)

The products of the declaration described above are in conformity with following Union harmonization legislation:

- 2014/35/EU, Abl. L 96/357, 29.3.2014
(LV Directive; Directive relating to electrical equipment designed for use within certain voltage limits)
- 2014/30/EU, Abl. L 96/79, 29.3.2014
(EMC Directive; Directive relating to electromagnetic compatibility)
- 2011/65/EU, OJ L 174/88, 1.7.2011
(RoHS Directive; Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment)

Harmonized and international/national standards and specifications:

- EN 61000-6-2:2005
(EMC: generic immunity standard for industrial environment)
- EN 61000-6-4:2007 + A1:2011
(EMC: generic emission standard for industrial environment)
- EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019
(Safety requirements for electrical equipment for measurement, control and laboratory use)
- EN 61326-1:2013; Group 1, Class A
(EMC requirements for electrical equipment for measurement, control and laboratory use)
- EN IEC 63000:2018
(RoHS: technical documentation)

Signed for and on behalf of:

INFICON AG, Alte Landstraße 6, LI-9496 Balzers

Balzers, 2025-03-31



William Opie
Managing Director

Balzers, 2025-03-31



Roberto Salemm
Product Manager

UKCA Declaration of Conformity



Manufacturer: INFICON AG, Alte Landstraße 6, LI-9496 Balzers

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Products: IE414, IE514
(operation with Vacuum Gauge Controller IM540)

The products of the declaration described above are in conformity with the relevant UK Statutory Instruments:

- S.I. 2016/1101, 11.2016
(The electrical equipment (safety) regulations 2016)
- S.I. 2016/1091, 11.2016
(The electromagnetic compatibility regulations 2016)
- S.I. 2012/3032, 12.2012
(The restriction of the use of certain hazardous substances in electrical and electronic equipment regulations 2012)

Harmonized and international/national standards and specifications:

- EN 61000-6-2:2005
(EMC: generic immunity standard for industrial environment)
- EN 61000-6-4:2007 + A1:2011
(EMC: generic emission standard for industrial environment)
- EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019
(Safety requirements for electrical equipment for measurement, control and laboratory use)
- EN 61326-1:2013; Group 1, Class A
(EMC requirements for electrical equipment for measurement, control and laboratory use)
- EN IEC 63000:2018
(RoHS: technical documentation)

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