Ion Reference Gauge IRG080

The accurate and reproducible standard in vacuum pressure measurement.

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# The accurate and reproducible standard in vacuum pressure measurement.

Precise and stable vacuum pressure measurement is an essential but demanding feature in advanced industrial production processes and metrology.

Ionization gauges are the only instruments capable to measure total pressure in the ultra-high vacuum range. They are versatile and have little changed since the 1950s.

Ion Reference Gauge IRG080 and the corresponding controller IRC081 set a new standard within the ion gauges panorama, offering unprecedented accuracy, repeatability, reproducibility and long-term stability within a robust design.

- The IRG080 is the first gauge complying to the new ISO standard TS 6737 for ionisation vacuum gauges.

- Developed in collaboration with a pan-European consortium of vacuum institutes spanning from metrology to High Energy Physics.

- Stable electron emission, known ionization path, lack of influence from ESD or X-ray effects and predictable sensitivity for gas species are among the numerous innovation features.

- The IRC081 operating and display interface gives precise and practical control of the IRG080 gauge parameters - the user has full control.
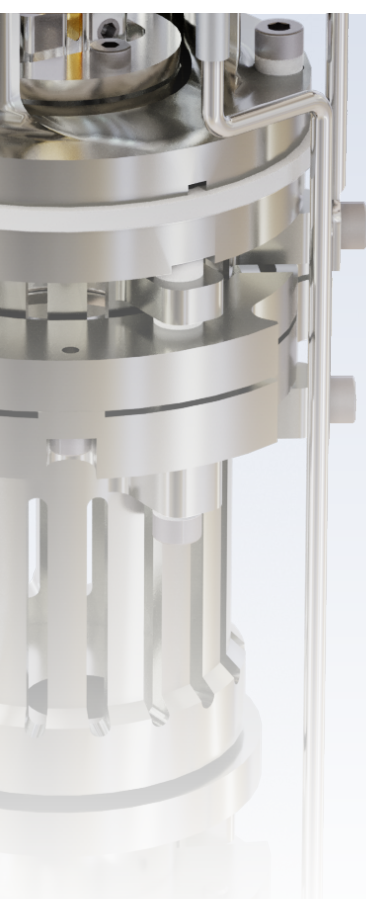
PUBLICATIONS

Electrons on a straight path:
A novel ionisation vacuum gauge suitable as reference standard
K. Jousten, et al.
Vacuum 189 (2021), 110239

Development of a design for an ionisation vacuum gauge suitable as a reference standard
B. Jenninger et al.
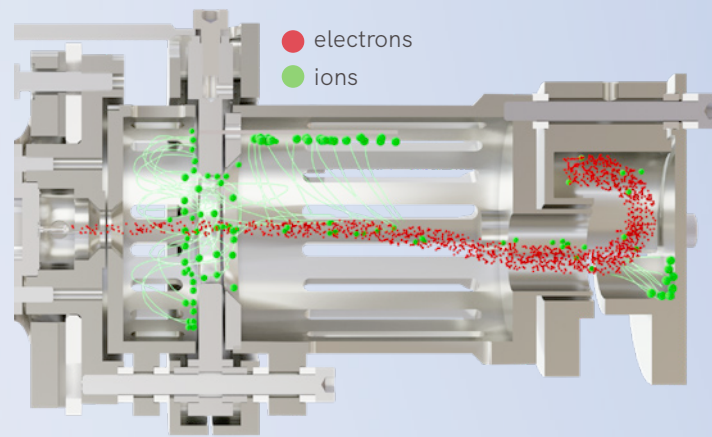Vacuum 183 (2021), 109884

Metrological performance of a novel ionisation vacuum gauge suitable as reference standard
K. Jousten, et al.
Measurement 210 (2023), 112552

Novel ionisation vacuum gauge suitable as a reference standard:
Influence of primary electron trajectories on the operation
N. Bundaleski et al.
Vacuum 201 (2022), 111041

MEASUREMENT PRINCIPLE

Electrons leave the cathode (left side), are accelerated by the anode to 200 eV, and are focused by the Wehnelt electrode potential. They travers the ionization space and end up in a Faraday cup. The length of the electron path is well characterized and so the sensitivity of the gauge is predictable. Ions generated by electrons within the anode cage are accelerated to the collector and measured as a current. Ions generated outside the anode grid are caught by the deflector.

- ● electrons
- ● ions

USER INTERFACE

Your single control view via the IRC081 User Interface

- Measurement and emission control
- Full graph display
- Warning and instruction message area

Full gauge configuration

- Gas type
- Sensor sensitivity [mbar^{-1}]
- Maximum filament heater current

A NEW STANDARD OF IONIZATION VACUUM GAUGE

- The hot cathode emits electrons travelling on a straight path into a Faraday cup
- Stable electron emission, known electron path
- No more influence from ESD or X-ray effects
- Electrode system configuration complies with ISO TS 6737

REFERENCE STANDARD

- Accuracy below 1 % for N_2
- Predictable gas sensitivity, with a very small spread (< 1.5%)
- True total pressure measurement
- Very good short-term repeatability (< 0.06%) and reproducibility (< 1%)

APPLICATIONS

- Demanding processes requiring precise vacuum pressure measurement for quality assurance
- Advanced industrial applications pursing no calibration or process readjustments
- Calibration of other vacuum gauges and mass spectrometers, pump speed measurement
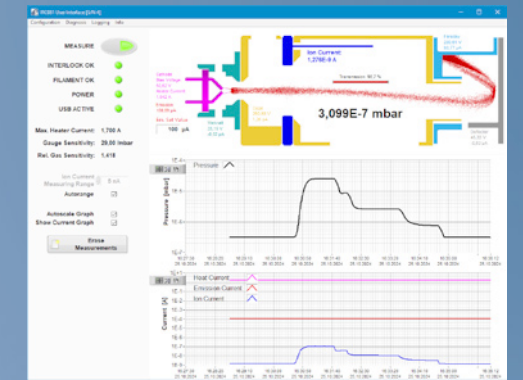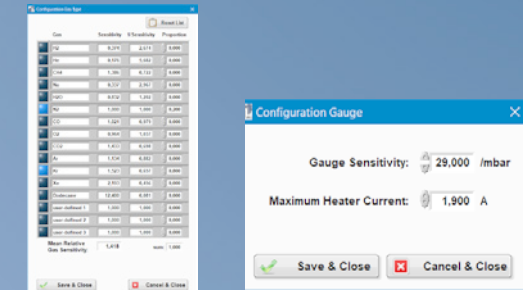- Metrology, transfer standard for comparisons to national and calibration laboratories

PORTABLE TOOLKIT FOR A VACUUM EXPERT

- Unmatched stability to transport, venting and bake-out
- No recalibration needed – even when changing the cathode
- Supplied in a transport case

COMPLETE PACKAGE

- Operating and display interface via the Ion Reference gauge Controller IRC081
- Settings and measurement values displayed in IRC081 User Interface software (LabVIEW™)
- Data and parameter logging functionality

ION REFERENCE GAUGE CONTROLLER IRC081

- Operation, display and control of the full IRG080 gauge parameters set
- USB interface for read-out and switch functions
- Data log/parameter log functionality

Ion Reference Gauge IRG080

suitable as reference standard in the range of 10^{-8} mbar (10^{-6} Pa)
to 10^{-4} mbar (10^{-2} Pa)

- Developed for applications requiring high measurement accuracy in the high and ultra-high vacuum range
- True pressure for all gas species thanks to predictable relative gas sensitivity with small uncertainty
- Stable electron emission and lack of influence from ESD or X-ray effects
- Reproducible and robust to transport
- Bakeable to 165 °C (with temperature resistant cable) or up to 400 °C without connector unit
- Mu-metal intermediate piece available for magnetic shielding

Ion Reference Controller IRC081

precise total pressure measurement and local control for the IRG080

- Operating and display solution for the Ion Reference Gauge IRG080
- User control on all IRG080 gauge parameters set
- Simple manual operation with 5 potentiometers
- User Interface connection via USB-B port to PC
- PC Software in LabVIEW™
- Data log and parameter log functionality
- External port for status and vacuum interlock

COMPARISON IRG080 WITH BAYARD-ALPERT

IRG080	Bayard-Alpert
8x sensitivity (28 mbar^{-1})	sensitivity (3.5 mbar^{-1})
15x accuracy (1 %)	accuracy (15 %)
13x sensitivity repeatability (1 %)	sensitivity repeatability (20 %)
robust and long-term stable	less long-term stable
size (DN 63 flange)	size (DN 25 flange)

ION REFERENCE GAUGE IRG080 AND CONTROLLER IRC081

Features	Ion Reference Gauge IRG080
Measurement system	hot cathode ionization
Electrode system configuration	according ISO/WD TS 6737
Measurement range (N_2)	$<1\times10^{-8} \dots 1\times10^{-4}$ mbar $<1\times10^{-6} \dots 1\times10^{-2}$ Pa
Sensitivity (N_2, typical)	29 $mbar^{-1}$
Accuracy (N_2, typical)	± 1% of reading
Repeatability (typical)	1% of reading
Ambient temperature, in operation	+20 … +80 °C
Bake-out temperature	
with temp. resistant gauge head cable set	+165 °C
without plug and connector plate unit	+400 °C
without plug and connector plate unit, with mu-metal int. piece	+200 °C
Flange connection	DN 63 CF-R
Ion collector	Bayonet (BNC)
Interface to Sensor (IS)	Push-pull self-latching, 7-pin
Materials exposed to vacuum	stainless steel, NiFeCo, Al_2O_3, Ta, W, Kovar
Weight	4.3kg

Features	Controller IRC081
Measurement channel	1
Measurement rate	1 Hz
User interface	Front panel, PC-software
Manual control	5 knobs
Remote control	via USB 2.0 with PC software "IRC081 User Interface"
Measurement unit (selectable)	mbar, Torr, Pa
Cathode bias	20 … 60 V (dc)
Wehnelt	20 … 60 V (dc) / ≤1 mA
Anode	200 … 400 V (dc) / ≤1 mA
Deflector	20 … 60 V (dc) / ≤1 mA
Faraday	200 … 400 V (dc) / ≤1 mA
Emission range	100 µ, 1 mA
Heater	controlled by emission current
Measuring sockets	7 (2 x filament, Wehnelt, anode, deflector, Faraday, GND)
Vacuum interlock / status port	1 × sensors status, 1 × external vacuum interlock
Interface (digital)	USB 2.0
Power supply	100 … 240 V (ac), 50 … 60 Hz

CE

DIMENSIONS IRG080
mm

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