

IONIVAC Sensors IE 414 and IE 514



These passive sensors use hot cathode ionization technology.

IE 414

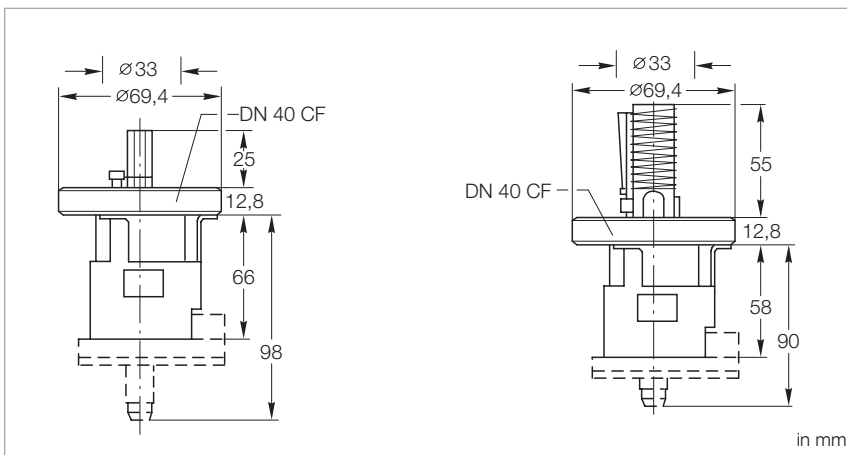
- Bayard-Alpert sensing system
- Measurement range to 2×10^{-11} mbar (1.5×10^{-11} Torr)
- Protection shield welded in place

IE 514

- Extractor sensing system
- Reliable to 1×10^{-12} mbar (0.75×10^{-12} Torr)
- Significant reduction of X-ray and ion desorption effects

Advantages to the User

- Exchangeable cathode
- High accuracy of the measurements due to individually calibrated sensing system



Dimensional drawing for the IE 414 (left) and IE 514 (right)

Technical Data

IE 414

IE 514

Measurement range	mbar (Torr)	2×10^{-11} to 10^{-2} (1.5×10^{-11} to 10^{-2})	10^{-12} to 1×10^{-4} (10^{-12} to 7.5×10^{-5})
X-ray limit	mbar (Torr)	$\leq 10^{-11}$ ($\leq 10^{-11}$)	$\leq 10^{-12}$ ($\leq 10^{-12}$)
Operating temperature range	°C	0 to +80	
Degassing temperature at the flange, max.	°C	250 ¹⁾ / 400 ²⁾	
Material			
Cathode		Iridium with yttric oxid coating	Iridium with yttric oxid coating
Feedthrough pins		NiFe 42	NiFe 42
Anode		Pt/Ir 90/10/pt wire	Stainless Steel 1.4404
Vacuum connection	DN	40 CF	
Adjustment data			
Ion detector potential	V	0	0
Cathode potential	V	80	100
Anode potential	V	220	220
Emission current	mA	0.06 to 0,6	1.6
Hot cathode current	A	1.4	
Hot cathode voltage	V	2.7	3.7
Sensitivity for Nitrogen	mbar ⁻¹	17.0	6.6
Bake out operation, Electron bombardment	V / mA	700 / 30	
Operating units		IM 540, CM 52	

Ordering Information

IE 414

IE 514

	Part No.	Part No.
IONIVAC sensors	158 66	158 67
Replacement cathode	158 63	158 61

¹⁾ With bakeable gauge head cable

²⁾ With gauge head cable detached

Operating Unit for Passive Sensors

COMBIVAC CM 51/CM 52



The COMBIVAC CM 51 covers the complete pressure range between 10^{-9} and 1000 mbar by combining two measurement principles - THERMOVAC and PENNINGVAC - providing both monitoring and control functions.

The COMBIVAC CM 52 offers by combining two UHV principles of measurement (THERMOVAC absolute pressure sensor and Bayard-Alpert measurement system IE 414 or extractor measurement system IE 514) measurements of vacuum pressures in the range between 10^{-12} and 1000 mbar.



Rear side of the COMBIVAC CM 51 (left) and CM 52 (right)

Advantages to the User

- Compact 3 channel operating unit for a pressure range for passive sensors of
 - 10^{-9} to 1000 mbar (CM 51)
 - 10^{-12} to 1000 mbar (CM 52)
- Automatic switchover from THERMOVAC operation to
 - Penning (cold cathode) operation (CM 51)
 - UHV sensors (Bayard-Alpert measurement system IE 414 or extractor measurement system IE 514 (CM 52)
- Measurement cable lengths up to 100 meters are possible depending on the type of application
- Easy to operate
- Keyboard locking through SOFT-LOCK
- Two adjustable switching thresholds with a relay contact for each measurement channel
- Logarithmic chart recorder output 0 – 10 V or 2 – 10 V
- Wide range power supply 100 – 240 V
- Unit of pressure selectable between mbar, Torr und Pascal
- Compact, rugged Penning sensor insensitive to operation at high pressures (see para. "Sensors")
- Aligned and temperature compensated THERMOVAC sensors (see para. "Sensors")
- Cost-effective replacement sensors and electrodes
- Error message for each channel, for example in the case of broken filament, defective sensor line or failed plasma discharge
- Compact benchtop enclosure (1/4 19", 3 HU) made of metal for installation in front panel cut outs and 19" racks
- RS 232 C and Profibus interface
- CE mark
- RoHS-compliant

Typical Applications

- Universal monitoring the operation of high vacuum pump systems like:
 - Turbomolecular pump systems
 - Diffusion pump systems
 - Cryogenic pump systems
- Annealing, melting, brazing and hardening furnaces
- Coating systems
- Analytical instrumentation
- Deployment in thermal radiation resistant and degassable systems is possible
- Particle accelerators

Connectable Sensors

THERMOVAC

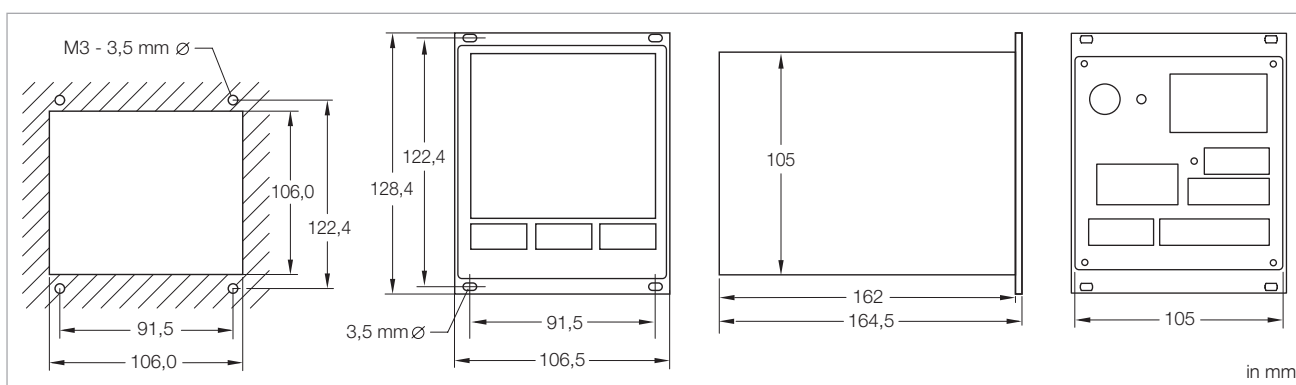
- TR 211
- TR 211 NPT
- TR 212
- TR 216

PENNINGVAC (only CM 51)

- PR 25
- PR 26
- PR 27
- PR 28

IONIVAC (only CM 52)

- IE 414
- IE 514



Front panel cut-out (left) and dimensional drawing (right) for the COMBIVAC CM 51 and CM 52

Technical Data

COMBIVAC

CM 51

CM 52

Number of measurement channels		3	3
Measurement range			
Channel 1, 2 (THERMOVAC)	mbar (Torr)	5 x 10 ⁻⁴ to 1000 (3.5 x 10 ⁻⁴ to 750)	5 x 10 ⁻⁴ to 1000 (3.5 x 10 ⁻⁴ to 750)
Channel 3 (PENNINGVAC)	mbar (Torr)	10 ⁻⁹ to 10 ⁻² (10 ⁻⁹ to 10 ⁻²)	–
Channel 3			
(IE 414 Bayard-Alpert)	mbar (Torr)	–	2 x 10 ⁻¹¹ to 1 x 10 ⁻² (1.5 x 10 ⁻¹¹ to 0.75 x 10 ⁻²)
(IE 514 Extraktor)	mbar (Torr)	–	2 x 10 ⁻¹² to 1 x 10 ⁻⁴ (1.5 x 10 ⁻¹² to 0.75 x 10 ⁻⁴)
Unit of measurement (selectable)		mbar, Torr, Pa	
Measurement uncertainty			
THERMOVAC		≤ 20% of the measured value in the range 10 ⁻³ to 10 ⁻² mbar (± 20%) in the range 10 ⁻² to 10 ² mbar (± 15%)	≤ 20% of the measured value in the range 10 ⁻³ to 10 ⁻² mbar (± 20%) in the range 10 ⁻² to 10 ² mbar (± 15%)
PENNINGVAC		± 30% of the measured value in the range 10 ⁻⁸ to 10 ⁻⁴ mbar	–
IE 414/514		–	± 10% of the displayed value (however, this value may increase depending on the type of application)
Measurement cable	m	up to 100 (application dependent)	
Display for measured values		digital, 7 segment LED, 4 digit mantissa and 2 digit exponent	
Type of gas (selectable)		factor adjustable	
Switching thresholds		2 per channel single, interval-trigger	2 per channel single, interval-trigger
Operating mode			
Adjustable switching thresholds			
THERMOVAC	mbar (Torr)	5 x 10 ⁻³ to 500 (5 x 10 ⁻³ to 375)	5 x 10 ⁻³ to 500 (5 x 10 ⁻³ to 375)
PENNINGVAC	mbar (Torr)	1 x 10 ⁻⁸ to 9.9 x 10 ⁻³ (0.75 x 10 ⁻⁸ to 7.4 x 10 ⁻³)	–
Bayard-Alpert	mbar (Torr)	–	1 x 10 ⁻⁸ to 5 x 10 ⁻³ (0.75 x 10 ⁻⁸ to 3.75 x 10 ⁻³)
Extraktor	mbar (Torr)	–	1 x 10 ⁻¹¹ to 1 x 10 ⁻¹¹ (0.75 x 10 ⁻¹¹ to 0.75 x 10 ⁻¹¹)
Switching relay hysteresis		10% of the trigger value (default), freely adjustable for THERMOVAC and PENNINGVAC	10% of the trigger value (default), freely adjustable for THERMOVAC and IE 414 oder 514
Relay contact load rating		AC/DC, max. 30 V / 1 A	
Chart recorder output (default)			
THERMOVAC		0 to 10 V, log. divisions linear: 3 decades, approximately 10.5 V in case of a failure, logarithmic: (1 x 10 ⁻³ mbar), 1.67 V/decade	0 to 10 V, log. divisions linear: 3 decades, approximately 10.5 V in case of a failure, logarithmic: (1 x 10 ⁻³ mbar), 1.67 V/decade
PENNINGVAC		logarithmic: (1 x 10 ⁻⁹ mbar), 1.43 V/decade	–
IE 414 oder 514		–	logarithmic: (1 x 10 ⁻¹² mbar), 1.00 V/decade
Interface		RS 232 C, RS 485 and Profibus	
Mains connection 50/60 Hz	V AC	100 – 240	
Power consumption	W	< 10	65
Storage temperature range	°C	-20 to +60	
Nominal temperature range	°C	+5 to +50	
Max. rel. humidity	% n.c.	80	
Weight	kg (lbs)	1.4 (3.09)	
Dimension (W x H x D)	mm	106.4 x 128.5 x 164.5	
Installation depth	mm	approx. 220	
Protection class	IP	40	

Ordering Information

COMBIVAC

	CM 51	CM 52
	Part No.	Part No.
Operating unit COMBIVAC CM 51/52 including EURO and US mains cord, 2 m with RS 232 C / 485 with Profibus DB	230 110 230 111	230 115 230 116
Cable adapter CM 31 – CM 51	230 112 V01	–
Options		
19" installation frame	161 00	
1/4 19" blank panel	161 02	
THERMOVAC sensors for CM 51/52		
TR 211, DN 16 ISO-KF	157 85	
TR 211, 1/8" NPT	896 33	
TR 212, DN 16 ISO-KF	158 52	
TR 212, DN 16 CF	157 86	
TR 216, DN 16 ISO-KF	157 87	
Gauge head cables for TR sensors		
5 m	162 26	
10 m	162 27	
15 m	124 34	
20 m	162 28	
30 m	124 35	
50 m	124 37	
75 m	124 38	
100 m	124 39	
PENNINGVAC sensors for CM 51		
PR 25, DN 25 ISO-KF	157 52	–
PR 26, DN 40 ISO-KF	136 46	–
PR 27, DN 40 CF	136 47	–
PR 28, DN 40 CF, bakeable	136 48	–
Gauge cables for PR sensors		
5 m	162 88	–
10 m	162 89	–
15 m	124 49	–
20 m	157 56	–
30 m	124 50	–
50 m	124 52	–
75 m	124 53	–
100 m	124 54	–
IONIVAC sensors for CM 52		
IE 414, DN 40 CF	–	158 66
IE 514, DN 40 CF	–	158 67
Mains cable		
3 m (US)	800 102 V1002	
Gauge head cables for IE sensors		
5 m	–	158 68
10 m	–	150 88
15 m	–	230 670 V01
5 m, bakeable to 200 °C	–	158 44
10 m, bakeable to 200 °C	–	230 671 V01
Extension cables for IE 414/514		
10 m	–	245 002
20 m	–	200 02 937
30 m	–	245 011 V01
50 m	–	245 010 V01
up to 100 m (application dependent)	–	upon request

IONIVAC IM 540



The 3-channel display and operating unit IONIVAC IM 540 offers, by combination of up to 4 different principles of measurement – Pirani, capacitive, Bayard-Alpert and Extractor –, complete coverage and control of the vacuum pressure in the range between 10^{-12} mbar and atmospheric pressure.

Advantages to the User

- Precise UHV pressure measurements with the Bayard-Alpert sensor IE 414 (offering excellent longterm stability) or the Extractor sensor IE 514 (offering an extremely low X-ray limit of $< 1 \times 10^{-12}$ mbar)
- 1 measurement channel for IONIVAC sensor (Bayard-Alpert or Extractor)
- Possibility of simultaneously connecting a second IONIVAC sensor
- Degassing of the anode through electron bombardment with time-limit
- Continuous UHV measurement also during the degassing phase (up to $+250^\circ\text{C}$ with bakeable gauge head cable)
- 2 measurement channels for direct connection of transmitters from the series THERMOVAC TTR and CERA VAC CTR
- Selectable pressure units (mbar, Torr, Pascal, Micron)
- Display of a single measurement channel with pressure trend through analogue bargraph or simultaneous display of all measurement channels
- Two adjustable thresholds with adjustable hysteresis and freely assignable to the measurement channels

- Compact benchtop enclosure (1/2 19", 3 HU)
- RS 232 C interface provided as standard
- Simple software updates possible through the RS 232 interface
- Profibus interface (optional)
- CE mark

Typical Applications

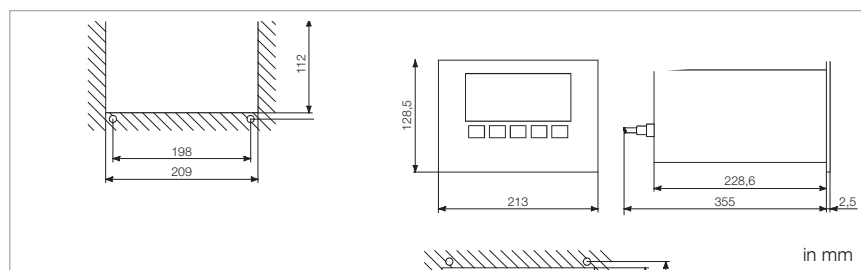
- Pressure measurement and control in the UHV range
- Measurement of ultimate pressure in UHV systems
- Checking of ultimate pressure in semiconductor production
- Total pressure measurements in the area of cryo technology
- Total pressure measurements in calibration systems

Connectable Sensors

- Bayard-Alpert sensor IE 414
- Extractor sensor IE 514 (see Chapter "Additional Sensors") combined with
- THERMOVAC TTR 211, TTR 216 S, TTR 90, TTR 91 and TTR 96 S
- CERA VAC CTR 90, CTR 91 and CTR 100 (see Chapter "Active Sensors")

Two passive sensors working with ionization technology (IE 414 and/or IE 514) could be connected simultaneously to the IONIVAC IM 540 while only one is in operation.

A pressure dependent emission control of these sensors is possible if a THERMOVAC TTR or CERA VAC CTR 100/CTR 91 of suitable range overlap is connected



Front panel cut-out (left) and dimensional drawing (right) for the IONIVAC IM 540

Technical Data

IONIVAC IM 540

Number of measurement channels		3
Bayard-Alpert / Extractor		Channel 1 or 2
THERMOVAC / CERA-VAC		Channel 3 and 4
Measurement range	mbar (Torr)	1×10^{-12} to 1100 (0.75×10^{-12} to 825)
Measurement range Extractor	mbar (Torr)	1×10^{-12} to 1×10^{-4} (0.75×10^{-12} to 0.75×10^{-4})
Measurement range Bayard-Alpert	mbar (Torr)	1×10^{-11} to 1×10^{-2} (0.75×10^{-11} to 0.75×10^{-2})
Measurement range switching		automatic or decade pre-select
Units of measurement (selectable)		mbar, Torr, microns, Pa
Measurement uncertainty	%	± 10 of the value displayed
Trend indication		bargraph
Measurement value display rate		1×10^{-10} to 1×10^{-2} mbar, 5 s^{-1} 1×10^{-12} to 1×10^{-10} mbar, 0.5 s^{-1}
Emission current		
Extractor sensor	mA	1.6
Bayard sensor	mA	0.1 to 10; automatic control
Emission current shutdown at		$p > 1 \times 10^{-2}$ mbar, broken cathode, short-circuit, interruption of the electric circuit
Bake out power		
Extractor / Bayard-Alpert	W	20 / 40
Sensor power supply, potential for		anode Extractor / Bayard-Alpert: 220 V, cathode Extractor / Bayard-Alpert: 100 V/80 V, Reflector Extractor: 205 V
Sensor connections		Bayard-Alpert and Extractor - single operation is possible 2 x Bayard-Alpert or Extractor (redundant operation)
Measurement system detection		automatically
Measurement system switchover		automatically, pressure dependent, error dependent
Chart recorder outputs		logarithmic 0 to 10 V (1 V / dec.) or linear 0 to 10 Volt error indication $U > 10.5 \text{ V}$
Extractor / Bayard-Alpert ($R_a = 2,5 \text{ k}\Omega$)		
Interface (standard / optional)		RS 232 C / Profibus
Switching thresholds (single operation or interval)		2 with floating changeover contact
Mains connection	V AC / Hz	90 – 264 / 50/60
Storage temperature range	°C	-40 to +60
Nominal temperature range	°C	+5 to +50
Dimensions of the benchtop instrument, (W x H x D)	mm	213 x 128.5 x 250
Weight, approx.	kg (lbs)	3.0 (6.62)

Ordering Information

IONIVAC IM 540

	Part No.
IONIVAC IM 540 with mains cord 2 m (EURO and US)	230 100
Options Profibus DP interface	230 101
Calibration	see chapter "Miscellaneous", para. "Leybold Calibration Service"
IONIVAC sensors IE 414, DN 40 CF Replacement cathode IE 414 IE 514, DN 40 CF Replacement cathode IE 514	158 66 158 63 158 67 158 61
Gauge head cables for IE 414/514 5 m 10 m 15 m 5 m, bakeable to 200 °C 10 m, bakeable to 200 °C	158 68 150 88 230 670 V01 158 44 230 671 V01
Extension cables for IE 414/514 10 m 20 m	245 002 200 02 937
THERMOVAC transmitter TTR	see chapter "Products", para. "Active Sensors"
Connection cable for THERMOVAC (Type A)	see chapter "Products", para. "Connection Cable for Active Sensors"
CERAVAC transmitter CTR	see chapter "Products", para. "Active Sensors"
Connection cable for CERAVAC (Type B)	see chapter "Products", para. "Connection Cable for Active Sensors"