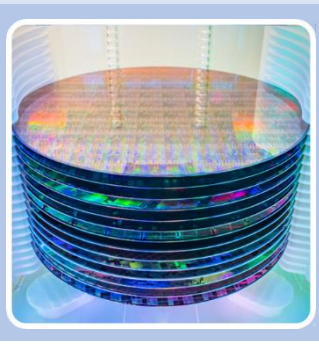
VDM-5 DiCAP™ vacuum transducer

Capacitance and Piezo diaphragm combination gauge with 5.0E-3 to 1333 mbar measuring range.

Benefits & features

- Wide measuring range of 6 decades from 5.0E-3 to 1333 mbar
- Dual sensor provides measurement range of two traditional CDG's
- Gas independent measurement throughout the pressure range
- Easy configuration with USB programmer
- 0-10 VDC programmable voltage output
- Digital RS-232 or RS-485 interface
- Optional Ceramic or Parylene sensor protection for corrosive applications
- Optional solid state setpoint relay for external controlling
- Drop-in replacement with other vendors' vacuum gauges



Typical applications

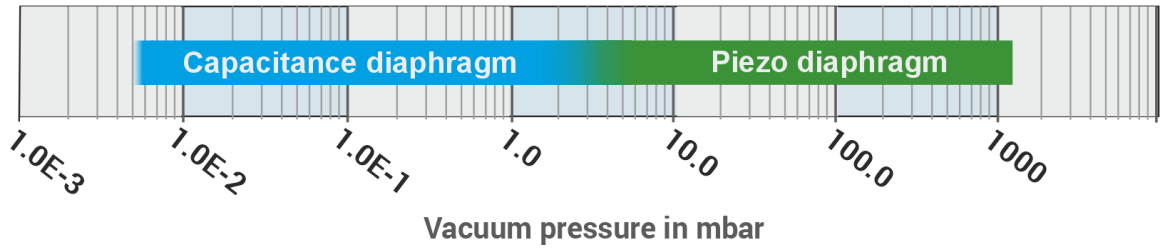
- Medical Device Sterilization
- Semiconductor Processing
- PVD Coating
- CVD Processing
- Analytical Instrumentation
- Vacuum Furnaces
- Space simulation

Product datasheet

SENS4

Consolidate two gauges with one solution multi-sensor solution

The VDM-5 DiCAP™ transducer sets new benchmarks with its comprehensive measurement range tailored for a diverse range of vacuum applications. Distinguished from other vacuum gauges, it provides a cost-effective, gas-independent measurement range from 5.0E-3 to 1333 mbar (3.75E-3 to 1000 Torr).



In vacuum applications where the gas composition or type can change, traditional gas dependent Pirani gauges will result in measurement deviation from the actual pressure. The VDM-5 transducer uses a precision ceramic capacitance diaphragm gauge (CDG) sensor and Piezo diaphragm sensor that eliminates the gas dependency and provides accurate measurements also when the gas properties change.

Enabling use in harsh environments

The VDM-5 can also be used in tough vacuum applications where corrosive, and media may be present. is engineered not only for clean nitrogen vented load-lock applications in the semiconductor industry, but also for applications where particulates and aggressive media may be present. For applications where the sensors can be exposed to corrosive or aggressive gases, the SmartPirani™ is available with conformal protective coating serving as an effective barrier.

Depending on the actual application, the VDM-5 transducer series offers a choice between an optional ceramic or Parylene protective barrier to guard against corrosion or oxidation of sensor materials.

Ceramic is highly corrosion resistant and is a well-proven material for vacuum sensor diaphragms in capacitance diaphragm gauges.

Parylene, a unique polymer with highly corrosion resistant and hydrophobic properties, is specifically designed for medical applications such as lyophilization and hydroperoxide plasma sterilization of medical devices.

In vacuum systems and processes, where vacuum sensors may be prone to damage from particulates, the VDM-5 DiCap™ transducers are available with a protective baffle, acting as an efficient barrier against macroscopic particles. Combining these protective coating options, the DiCAP™ transducers are well-equipped to handle challenging vacuum environments.

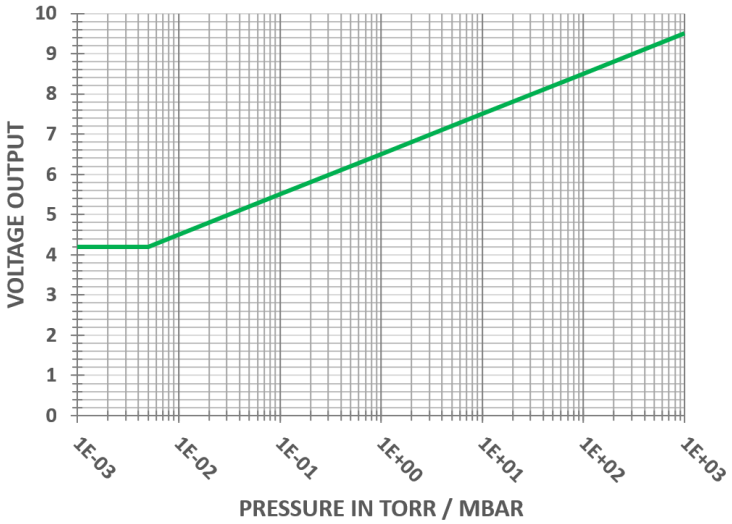
Other vendor compatibility

The drop-in replacement vacuum transducers are designed with connector pin-out compatibility, enabling seamless replacement of other vendor gauges without change of cabling.
Additionally, these transducers emulate the analog output scaling and range of equivalent products from other manufacturers. Moreover, Sens4 transducers have the capability to emulate the digital serial communication protocol, facilitating easy installation without requiring adjustments to the communication software of the vacuum equipment. This digital protocol emulation ensures compatibility with power supply and controller display units from different vendors.

Measure and control of advanced vacuum processes

The VDM-5 TriCAP™ transducer is meticulously designed to offer best-in-class measurement and control of vacuum gas pressure. It boasts several output options that deliver more than just a pressure measurement signal.

Analog voltage output
The analog output provides a voltage signal for external pressure readout or controls.
The VDM-5 comes with a default voltage output signal of 1VDC/decade for mbar, Torr, or Pascal. Additionally, it provides flexibility for user configuration or can be preconfigured with a diverse range of analog output options, allowing for seamless replacement of gauges from various vendors.



Digital interface

The RS-232 and RS-485 serial interfaces facilitate the transfer of measurement data without being affected by signal degradation over extended cable lengths or interference from electrical noise.
The digital interface enables diagnostics, predictive maintenance, service, calibration, setpoint configuration, analog output scaling and acquisition of real-time vacuum pressure measurements for on-screen visualization.

Reliable and robust setpoint relay control

The three independent solid-state switch relays serve to externally manage pumps, valves, safety interlock circuits, and other equipment. Their primary control functionality includes on/off regulation, featuring a programmable setpoint and hysteresis value.
Compared to electro-mechanical relays, solid-state relays offer heightened reliability and faster switching times. They boast arc-free contacts and produce no electromagnetic interference (EMI) during contact switching. The SmartPirani™ relays are engineered for robustness and hold UL listing, CSA recognition, and EN/IEC 60950-1 certification. This guarantees utmost confidence when utilizing them to supervise critical vacuum processes and high-cycle load-lock applications.

Temperature measurement

The VDM-5 DiCAP™ is designed for measuring pressure, yet it additionally provides a temperature measurement of the vacuum gas. This temperature data can be utilized for monitoring and diagnosing vacuum processes, and access to this information is available through the digital interface.

Typical applications

The DiCAP™ transducer is compact multi-sensor transducer designed for reliable measurement and control of advanced vacuum processes and is suitable for a wide range of applications in industry and science.

Semiconductor Industry

The VDM-5 transducer can substitute a 1000 Torr and a 10 Torr standalone Capacitance Diaphragm Gauges and thereby provide a cost-effective integrated solution for measurement and control of fore-line pressure in semiconductor equipment.

The ceramic corrosion resistant sensor option enables use where residuals of corrosive process gases can be present. Additionally, the baffle barrier can provide protection against macroscopic particles.

Short Path Distillation

Short Path Distillation is a vacuum assisted process where a low temperature boiling point is obtained to prevent degradation or decomposition of heat-sensitive compounds during distillation process.

The VDM-5 measuring range covers the typical process pressure during short path distillation. The optional corrosive resistant coating of either Parylene or Ceramic provides compatibility with a variety of vapors and compounds.

Short path distillation is widely used in industries such as pharmaceuticals, food and beverage.

Hydrogen Peroxide Plasma Sterilization

Hydrogen peroxide plasma sterilization is widely used in the medical field to sterilize medical equipment and devices. The low temperature methode uses vacuum pressure to form hydrogen peroxide vapor and in combination with gas plasma it kills microorganisms on device surfaces.

The VDM-5 transducer offers gas independent measurement when exposed to H_2O_2 and plasma and covers the entire vacuum pressure range utilized in the Plasma Sterilization equipment with a single transducer.

The optional conformal Parylene sensor coating offers compatibility and longlivity in the harsh environment present during Hydrogen Peroxide Plasma Sterilization process.

Technical data

Specifications	
Measuring range in mbar	5×10^{-3} to 1333 mbar (3.75×10^{-3} to 1000 Torr)
Measuring principle 5×10^{-3} to 3.99 mbar	Capacitance diaphragm gauge (CDG)
Measuring principle 4 to 5 mbar	Blended CDG / Piezo reading
Measuring principle 5 to 1333 mbar	MEMS piezo resistive diaphragm
Accuracy 5×10^{-2} to 800 mbar	0.5% of reading
Accuracy 800 to 1099 mbar	0.25% of reading
Accuracy 1100 to 1200 mbar	0.5% of reading
Accuracy 100 to 800 mbar	0.5% of reading
Accuracy 800 to 1099 mbar	0.25% of reading
Accuracy 1100 to 1200 mbar	0.5% reading
Hysteresis 1×10^{-2} to 10 mbar (ISO19685:2017)	1%
Hysteresis 10 to 1200 mbar (ISO19685:2017)	0.1%
Vacuum temperature sensor range	-20 to + 85°C
Vacuum temperature sensor accuracy	+/- 1.5 °C
Transducer temperature sensor range	-20 to + 85°C
Transducer temperature sensor accuracy	+/- 1.5 °C
Analog output resolution	16 bit (150 µV)
Analog output update rate	124 Hz
Response time (ISO 19685:2017)	<20 ms
Temperature compensation	+10 to +50 °C
Solid state relay set point range	5×10^{-6} to 1333 mbar (3.75×10^{-6} to 1000 Torr)
Solid state relay contact rating	50 V, 100 mA_{rms} / mA_{DC}
Solid state relay contact endurance	Unlimited (no mechanical wear)
Solid state relay approvals	UL Recognized: File E76270 CSA Certified: Certificate 1175739 EN/IEC 60950-1 Certified
Environment conditions	
Operating ambient temperature	-20 to +50 °C
Media temperature	-20 to +50 °C
Storage ambient temperature	-40 to +80 °C
Bake-out temperature (non-operating)	+80 °C
Maximum media pressure(3)	4 bar absolute
Mounting position	Arbitrary
Protection rating, EN 60529/A2:2013	IP40
Humidity, IEC 68-2-38	98%, non-condensing
Power supply	
Supply voltage	12-30 VDC
Power consumption	240 mW (max)
Reverse polarity protection	Yes
Overvoltage protection	Yes
Internal fuse	100 mA (thermal recoverable)
Materials	
Enclosure	SS 1.4307 / AISI 304L / Aluminum 6061
Vacuum Process flange (media wetted)	SS 1.4401 / AISI 316
Vacuum exposed materials (media wetted) Standard version	316 Stainless steel, Viton®, silicon, vitreous silica, low out-gassing epoxy resin, solder, RO4305
Vacuum exposed materials (media wetted) Parylene protected version	316 Stainless steel, Viton®, Parylene
Vacuum exposed materials (media wetted) Ceramic protected version	316 Stainless steel, Viton®, Aluminum oxide ceramic (Al_2O_3)
Process leak tightness	$<1\cdot10^{-9}$ mbar·l/s
Approvals	
CE	EMC directive 2014/30/EU
RoHS compliance	Directive EU 2015/863

(1) Accuracy specifications are typical values at stable temperature after zero adjustment.
(2) Viton® is a trademark of THE CHEMOURS COMPANY FC, LLC
(3) Overpressure limits only applicable when using fittings rated to the specified pressure.

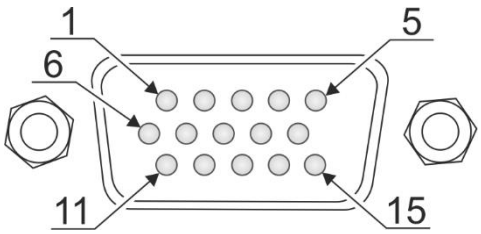
Specifications are subject to change without further notice.

Connector Pin outs

15 Pin HD D-sub RS-232 / RS-485

Pin	Description
1	RS-232 Transmit / RS-485 (-)
2	RS-232 Receive / RS-485 (+)
3	Supply voltage 12-30 VDC
4	Supply voltage – (return)
5	Analog voltage signal +
6	Analog voltage signal – (return)
7	Relay 1 NO (normally open contact) (4)
8	Relay 1 Common (1)
9	Relay 1 NC (normally closed contact) (4)
10	Relay 2 NC (normally closed contact) (4)
11	Relay 2 Common (1)
12	Relay 2 NO (normally open contact) (4)
13	Relay 3 NO (normally open contact) (4) or analog out 2 (5)
14	Relay 3 Common (1)
15	Relay 3 NO (normally open contact) (4)

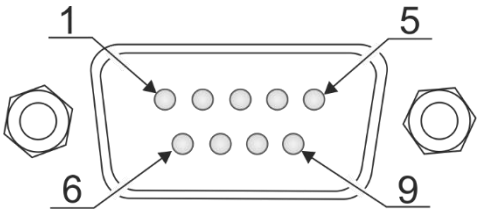
(1) Optional relay
(2) Optional secondary analog voltage output



9 Pin D-sub RS-232 / RS-485

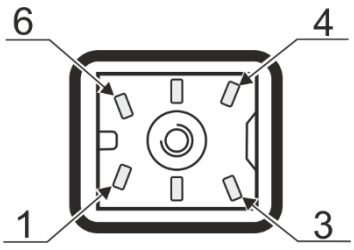
Pin	Description
1	Relay 1 NO (normally open contact) (6)
2	Relay 1 NC (normally closed contact) (6)
3	Supply voltage 12-30 VDC
4	Supply voltage – (return)
5	Analog voltage signal +
6	Relay 1 Common (6)
7	RS-232 Transmit / RS-485 (-)
8	Analog voltage signal – (return)
9	RS-232 Receive / RS-485 (+)

(3) Optional relay



6 Pin Hirschmann connector

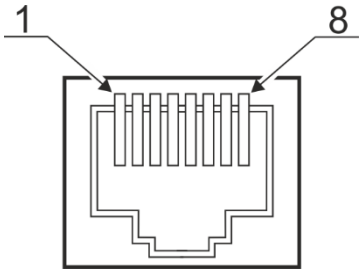
Pin	Description
1	Identification resistor (3K)
2	Analog voltage signal +
3	Analog voltage signal – (return)
4	Supply voltage 12-30 VDC
5	Supply voltage – (return)
6	Chassis



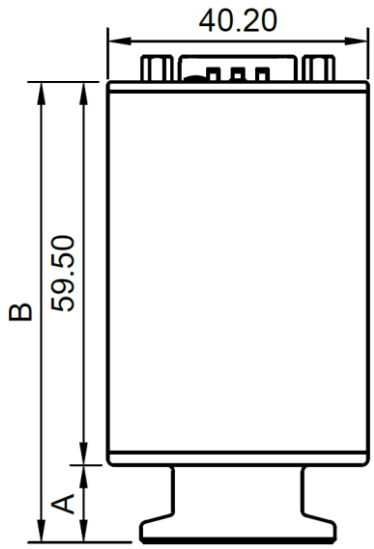
8 Pin RJ45 / 8P8C

Pin	Description
1	Supply voltage 12-30 VDC
2	Supply voltage – (return)
3	Analog pressure voltage signal +
4	Identification resistor
5	Analog pressure voltage signal – (return)
6	Relay 2 NO (normally open contact) (7)
7	Relay 1 NO (normally open contact) (7)
8	Relay COMMON (7)

(4) Optional relay



Dimensions



Flange type	A [mm]	B [mm]	A [inch.]	B [inch.]
DN16KF (P/N: VDM-5-1…)	12.00	71.50	0.47	2.81
DN25KF (P/N: VDM-5-2…)	12.00	71.50	0.47	2.81
VCR4[1] (P/N: VDM-5-4…)	28.50	88.00	1.12	3.46
VCR8[1] (P/N: VDM-5-5…)	30.80	90.30	1.21	3.56
1/8" NPT (P/N: VDM-5-3…)	37.00	65.00	1.45	2.56
DN16CF (P/N: VDM-5-6…)	21.83	81.33	0.86	3.20

DN16KF flange / D-SUB Connector

DN25KF flange / D-SUB Connector

VCR4F flange / D-SUB Connector

VCR8F flange / D-SUB Connector

1/8" NPT flange / D-SUB Connector

DN16CF flange / D-SUB Connector

DN16KF Extended flange / D-SUB Connector

Order guide

VDM-5-	1	0	1	0	1	2	3	2

Vacuum flange / sensor protection		
DN16KF	1	0
DN25KF	2	0
NPT 1/8"	3	0
VCR4 female	4	0
VCR8 female	5	0
DN16KF Extended	8	0
DN16KF with light baffle	1	1
DN16KF with heavy duty baffle	1	2
DN25KF with light baffle	2	1
DN25KF with heavy duty baffle	2	2
DN16KF, Ceramic protected sensors	1	3
DN25KF, Ceramic protected sensors	2	3
NPT 1/8", Ceramic protected sensors	3	3
VCR4 female, Ceramic protected sensors	4	3
VCR8 female, Ceramic protected sensors	5	3
DN16CF rotateble, Ceramic	6	3
DN16KF Extended, Ceramic	8	3
DN16KF with light baffle, Ceramic	1	4
DN16KF with heavy duty baffle, Ceramic	1	5
DN25KF with light baffle, Ceramic	1	4
DN16KF, Parylene protected sensors	1	6
DN25KF, Parylene protected sensors	2	6
NPT 1/8", Parylene protected sensors	3	6
VCR4 female, Parylene protected sensors	4	6
VCR8 female, Parylene protected sensors	5	6
DN16CF rotateble Parylene protected sensors	6	6
DN16KF Extended, Parylene protected sensors	8	6
DN16KF with light baffle, Parylene	1	7
DN16KF with heavy duty baffle, Parylene	1	8
DN25KF with light baffle, Parylene	2	7
DN25KF with heavy duty baffle, Parylene	2	8

Digital interface	
RS-232 / S4-Connect™ (9 and 15 pin D-sub)	1
RS-485 / S4-Connect™ (9 and 15 pin D-sub)	2
S4-Connect™ (RJ45/FCC68 and Hirschmann)	3

Analog Output		
0.5 - 9.5 (1 V/dec)	0	1
1.0-9 VDC 1 VDC/Dec (MKS 901P/925/910)	0	2
0.375 to 5.659 VDC (MKS GP275)	0	3
0.5V DC (MKS 523)	0	4
1.9-10 VDC (Inficon PSG55x, Leybold TTR91)	0	5
1.5-8.5 VDC (Pfeiffer TPR260/27x/28x)	0	6
1.9-9.1VDC (Edwards APG100XLC)	0	7
1.9-9.1VDC (Edwards APG100XM)	0	8
2-10VDC (Edwards APG-L)	0	9
0-10 VDC 0.1Torr FS Capacitance manometer	1	0
0-10 VDC 1 Torr FS Capacitance manometer	1	1
0-10 VDC 10 Torr FS Capacitance manometer	1	2
0-10 VDC 100 Torr Capacitance manometer	1	3
0-10 VDC 1000 Torr Capacitance manometer	1	4
2.0-8.6 VDC (MPG400/Pfeiffer PKR251, PKR261)	1	5
0.61-10.2 VDC (Leybold TTR101N)	3	5
1.8-8.6 VDC (Pfeiffer PKR251)	3	6
0-10VDC 0.1 mbar FS Capacitance manometer	5	0
0-10VDC 1 mbar FS Capacitance manometer	5	1
0-10VDC 2 mbar FS Capacitance manometer	5	2
0-10VDC 5 mbar FS Capacitance manometer	5	3
0-10VDC 10 mbar FS Capacitance manometer	5	4
0-10VDC 20 mbar FS Capacitance manometer	5	5
0-10VDC 50 mbar FS Capacitance manometer	5	6
0-10VDC 100 mbar FS Capacitance manometer	5	7
0-10VDC 200 mbar FS Capacitance manometer	5	8
0-10VDC 500 mbar FS Capacitance manometer	6	9
0-10VDC 1100 mbar Capacitance manometer	6	0
0-10VDC 1000 mbar Capacitance manometer	6	1

Connection	
1	9 Pin D-sub male
2	15 pin HD D-sub male
3	15 pin HD D-Sub male / dual analog out
4	6 pin Hirschmann, ID res 3K
5	6 pin Hirschmann, ID res 5.1K
6	6 pin Hirschmann, ID res 9.1K/11.1K
7	8 pin RJ45 / FCC68, ID Res 27K
8	8 pin RJ45 / FCC68, ID Res 36K
9	8 pin RJ45 / FCC68, ID Res 43K
A	8 pin RJ45 / FCC68, ID Res 71K5

Setpoints	
0	None
1	1x Solid-State Relay (Only 9 pin D-sub)
2	2x Solid State Relays (Only RJ45/FCC68)
3	3x Solid State Relays (Only 15 pin HD D-sub)

Unit	
1	torr
2	mbar
3	Pascal

Accessories

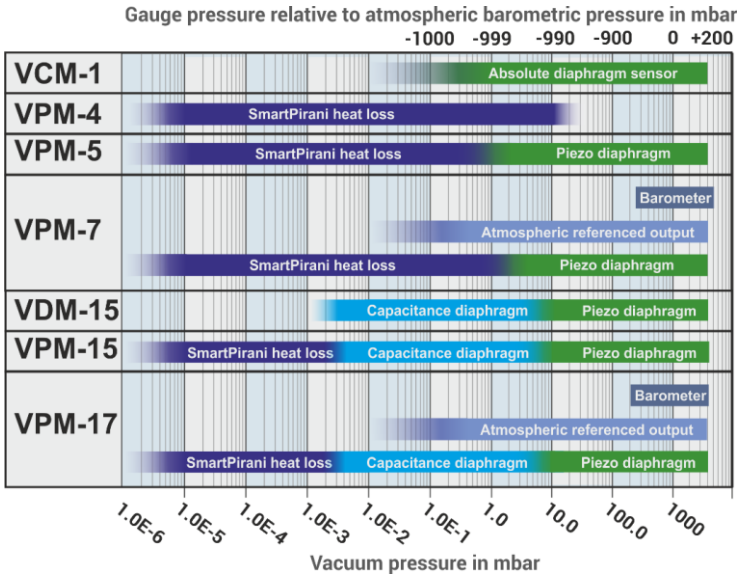
RS-232 / RS-485 to USB converter with wall plug power supply

USB-to-Serial converter for VPM-5 SmartPirani transducers with wall plug power supply.

Part number	Description
PRG-WPRS2-15DS-01	RS-232 to USB, 15 pin HD D-sub, Power supply (90-230VAC)
PRG-WPRS4-15DS-01	RS-485 to USB, 15 pin HD D-sub, Power supply (90-230VAC)
PRG-WPRS2-9DS-01	RS-232 to USB, 9 pin D-sub, Power supply (90-230VAC)
PRG-WPRS4-9DS-01	RS-485 communicator USB, 9 pin D-sub, Power supply (90-230VAC)

Other vacuum measurement products

The Sens4 vacuum transducer product range offers the market's most advanced multi-sensor transducers for use in a wide selection of industrial and scientific vacuum applications.



VPM-17 TriCAP™ ATM transducer

The VPM-17 TriCAP™ transducer is a unique multi-sensor transducer that provides gas independent measurement from 5.0E-3 to 1333 mbar, which can be an advantage in applications where gas composition or type can change.

For demanding applications, the VPM-17 TriCAP™ ATM is available with corrosion resistant ceramic or Parylene coated sensors.

About

Sens4 is a Danish technology company that develops, manufactures, markets, and distributes vacuum, pressure and temperature measuring equipment for industrial and scientific applications worldwide. It's our mission to provide compelling product solutions that fit our customers' needs and enable them to efficiently measure and control advanced processes around the world.

Learn more about Sens4 on: **sens4.com**

Connect on social media

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VDM-5 Datasheet – REV1.1 April 2024