Model selection table

I	II	III	IV	V	VI	VII	VIII	Example: SPG5AT11HD500500
Basic model No.	Type	Additional function	Pressure range	Self-heating temperature	Coupling	Event 1 setting	Event 2 setting	
SPG								Sapphire capacitance diaphragm gauge
	5							Standard model
	6							Extra high-temperature model *1
	7							Vacuum freeze-drying process model *1 *2
		A						Standard model
		B						Atomic Layer Deposition model *3 (Only model SPG6_)
		C						ANTI-Deposition Model
			_ _ _					Refer to the table on the left
				R				Without self-heating function
				A				45 °C
				C				100 °C
				D				125 °C
				E				150 °C
				F				160 °C
				G				180 °C
				H				200 °C
					A			1/2 inch gauge port
					D			8 VCR (female) equivalent (SUS316L with electrolytic grinding)
					E			NW16
					J			IDF 2S ferrule
					P			1/2 inch gauge port, with traceability certificate
					S			8 VCR (female) equivalent (SUS316L with electrolytic grinding), with traceability certificate
					T			NW16, with traceability certificate
					Y			IDF 2S ferrule, with traceability certificate
						***		**.* %FS Always OFF if "NNN" is specified.
							***	**.* %FS Always OFF if "NNN" is specified.

Pressure code	FS pressure ranges (absolute pressure)	
T1R	13.332	Pa
T2R	26.664	Pa
T2S	33.331	Pa
T10	133.32	Pa
T20	266.64	Pa
T30	399.96	Pa
T11	1333.2	Pa
T21	2666.4	Pa
T31	3999.6	Pa
T12	13332	Pa
T22	26664	Pa
T13	133.32	kPa

Pressure code	FS pressure ranges (absolute pressure)	
P21	20	Pa
P2S	25	Pa
P12	100	Pa
P22	200	Pa
P32	300	Pa
P13	1000	Pa
P23	2000	Pa
P33	3000	Pa
P14	10000	Pa
P24	20000	Pa
P15	100	kPa

*1 Can not select the model without self-heating function
*2 The coupling can be selected only J, Y
*3 The coupling can be selected only D, S

Possible model No. combinations

I + II	III: A	III: B	III: C
SPG5	✓		✓
SPG6	✓	✓	✓
SPG7	✓		

I + II + III	IV: Pressure range											
	T1R	T2R	T2S	T10	T20	T30	T11	T21	T31	T12	T22	T13
		P21	P2S	P12	P22	P32	P13	P23	P33	P14	P24	P15
SPG5A				✓	✓	✓	✓	✓	✓	✓	✓	✓
SPG5C	✓	✓	✓	✓		✓	✓			✓	✓	✓
SPG6A				✓	✓	✓	✓	✓	✓	✓	✓	✓
SPG6B	✓	✓	✓			✓	✓					✓
SPG6C	✓	✓	✓	✓		✓	✓			✓	✓	✓
SPG7A				✓	✓		✓	✓	✓	✓	✓	✓

I + II + III	V: Self-heating temperature							
	R	A	C	D	E	F	G	H
SPG5A	✓			✓	✓	✓	✓	✓
SPG5C		✓*	✓*		✓			✓
SPG6A				✓	✓	✓	✓	✓
SPG6B			✓*		✓			✓
SPG6C			✓*		✓			✓
SPG7A				✓				

I + II + III	VI: Coupling							
	A	D	E	J	P	S	T	Y
SPG5A	✓	✓	✓	✓	✓	✓	✓	✓
SPG5C		✓	✓			✓	✓	
SPG6A	✓	✓	✓	✓	✓	✓	✓	✓
SPG6B		✓				✓		
SPG6C		✓	✓			✓	✓	
SPG7A				✓				✓

* This combination can be selected only when pressure range (IV) is less than 100 Pa.
Note: If a model No. combination that is not listed as possible is needed, please contact the azbil Group.

Peripheral tools (sold separately)

Items	Model No.
Smart Loader Package (with loader cable)	SLP-SP5J70

Please read "Terms and Conditions" from the following URL before ordering and use.
https://www.azbil.com/products/factory/order.html

Export Control & Compliance

Products in this Specification ("Products") are subject to laws and regulations of Japan and any other applicable jurisdiction with respect to export of the Products.
In order for Azbil Corporation to apply for the appropriate export license in Japan, your cooperation may be asked for the provision of details on end user, end use and any other related information.
Further, in case of export from Japan by an exporter ("Exporter") or re-export from any other countries, you are required to obtain the appropriate export license from the government of Japan or such other countries.
In addition, in case of re-export of the Products, any re-exporter is required to obtain the prior consent of the Exporter.

Azbil Corporation
Advanced Automation Company

Yamatake Corporation changed its name to Azbil Corporation on April 1, 2012.

1-12-2 Kawana, Fujisawa
Kanagawa 251-8522 Japan
URL: https://www.azbil.com

1st Edition : Sep. 2015-SO
5th Edition : Oct. 2018-SO
CP-PC-1572E

azbil

Sapphire Capacitance Diaphragm Gauge

Model SPG 5_/6_/7_

Setting a New Global Standard

This Sapphire Capacitance Diaphragm Gauge Will Revolutionize Vacuum Processes.

Sapphire Capacitance Diaphragm Gauge

Model SPG5_
standard model

Model SPG6_
extra high-temperature model

Model SPG7_
vacuum freeze-drying process model

Feature **01** | **Better product quality**

Stable zero point means stable control, helping to assure product quality.

Feature **02** | **Better productivity**

Reduces equipment downtime, raising productivity.

Feature **03** | **Better process**

Information visualization, from test runs to actual operation.

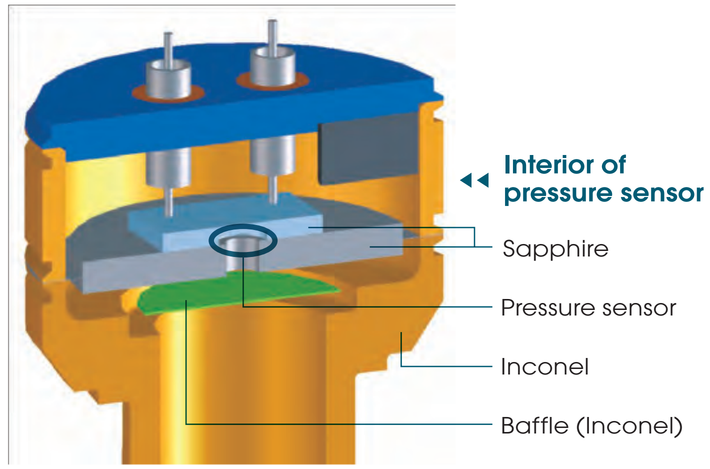
Feature

01 Better product quality

Vacuum gauges are often used in harsh environments where various factors can cause the zero point to shift, affecting controllability and thus the quality of the final product. The sapphire capacitance diaphragm gauge is **built to keep the zero point from shifting.**

Pressure sensing is in the center, where deposition has the least effect

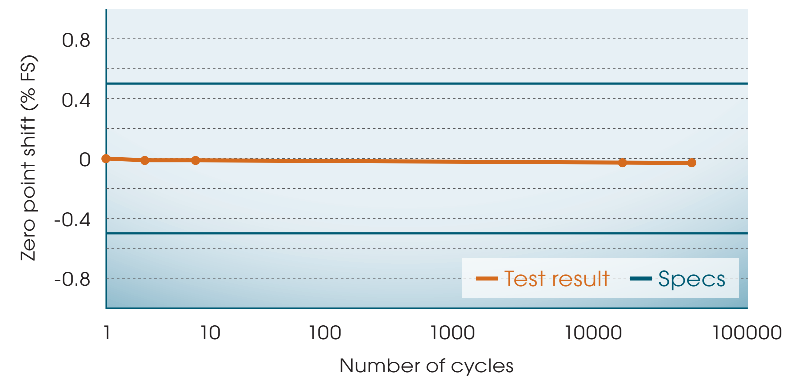
Deposition on the pressure sensor during the film deposition process in semiconductor manufacturing causes the zero point to shift. Since deposition is most likely to occur in the corners, we put the pressure sensor in the center.



Resistant to effects of the vacuum-atmosphere cycle

Alternating exposure of pressure sensors to vacuum and atmosphere leads to zero point shift. The use of sapphire, which has excellent mechanical strength, in this pressure sensor makes it less susceptible to this type of stress.

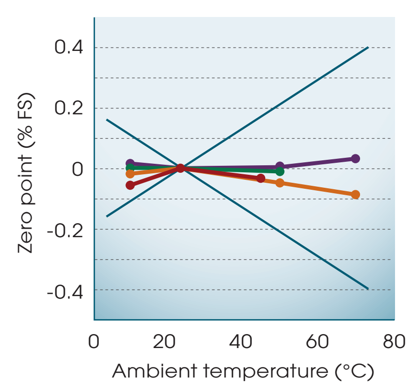
Test results for 300 Pa abs to 1 atm cycle



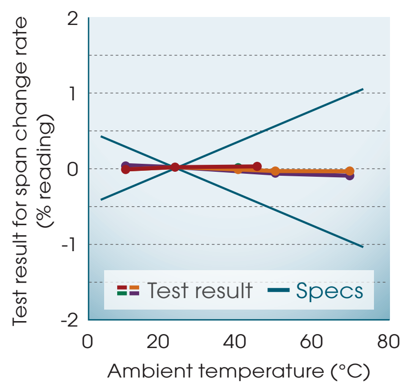
Almost unaffected by temperature changes

In ordinary diaphragm gauges, changes in ambient temperature and in the temperature of the pressure sensor cause the output and zero point to shift. For stable measurement in spite of such changes, temperature sensors are located both at the base and at the pressure sensor, and the output is corrected for temperature changes.

Test result for zero point change



Test result for span change



Feature

02 Better productivity

This gauge reduces equipment downtime, and is equipped with functions to cut wasted time.

Faster zero point adjustment

Zero point is simple to adjust

When the sapphire capacitance diaphragm gauge is in its normal mode, a 3-second press of a button adjusts the zero point. There is no need to fiddle with the zero point using a precision screwdriver. Fine adjustment of the zero point can also be done.

Wider zero point adjustment range

The zero point adjustment range is a wide ±20%FS, allowing long replacement/calibration intervals and lower running costs.

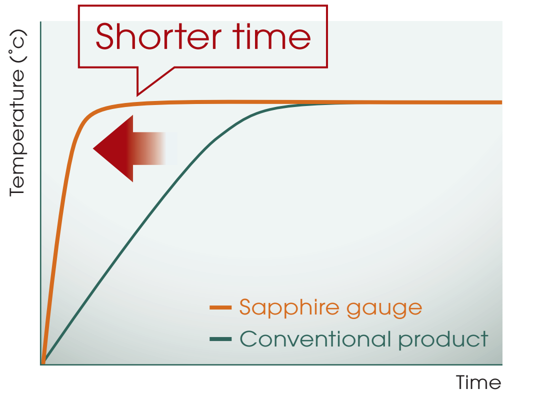
Simple zero adjustment with the push of a button

Zero point adjustment button

Quick warm-up

Microprocessor-based digital PID calculation speeds warm-up, cutting down the startup time.

Shorter time



Warm-up time	Standard 30 min [max. 1 h]

Calibration and adjustment

We have in-house calibration equipment for calibration and adjustment.

Calibration equipment

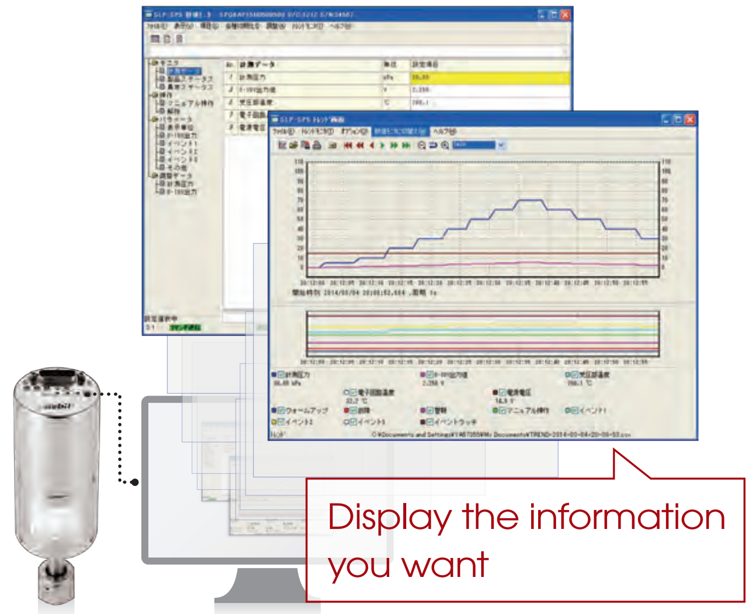
Feature

03 Better process

We help to improve your processes by visualizing various types of information that conventionally could only be inferred from changes in the pressure signal.

Monitoring/operation/setting tools

By connecting a dedicated PC loader, it is easy to display the desired information and to change settings. The loader also makes it possible to provide process improvement information and to significantly reduce the load during loop checks.



Display the information you want

Data that can be displayed

■ Measurement data
Measured pressure, output voltage, pressure sensor temperature, electronic circuit temperature, power-supply voltage, etc.

■ Product status
Warm-up state, faults, alarms, events, etc.

■ Abnormal status
Fault state (heater, memory, circuit), alarm state (temperature, power supply), etc.

Changing settings

■ Output scaling, output voltage if state is abnormal

■ Event type and setting

Reduction of load during loop check

■ Loop check by inputting dummy measured pressure

■ Loop check by manual output at 0 to 10 V

Status display

LEDs show event output status and vacuum gauge status at a glance.

Examples of status indication

(●:Lit green) Normal state
(●:Lit orange) Warm-up in progress
(●:Lit red) Abnormal
(◉:Blinking green) Zero point adjusted at ±5% FS or less
(◉:Blinking orange) Zero point adjusted at ±5–20% FS

Three event outputs

Equipped with 3 event relays that can be used for interlocks, this gauge outputs equipment status and alarms.

Can output 3 events

Sample event settings

■ Instrument abnormality ■ Warm-up finished

■ Upper/lower pressure limits, etc.

Sample applications

Use this gauge in systems like the following.

Example **1**

Film deposition equipment

Customer's comment

Because the zero point does not shift much at all, wafer yield has improved and costs were significantly cut.

Example **2**

Freeze-drying equipment

Customer's comment

Device has enabled stable control with less zero point shift.

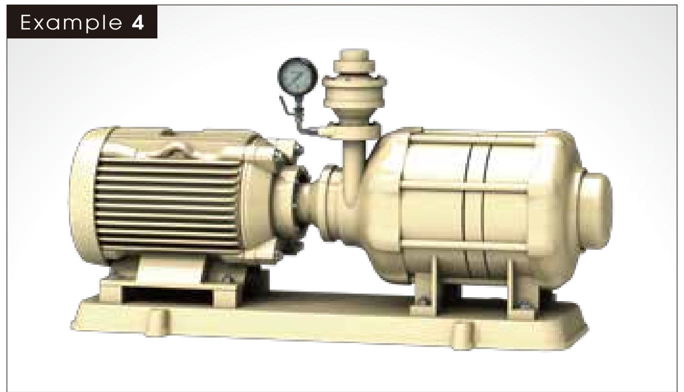
Example **3**

Vacuum furnace

Customer's comment

Test run time was significantly cut using the PC loader.

Example **4**



Vacuum pump evaluation equipment

Customer's comment

Now with high-accuracy measurements we are able to do more correct evaluations.

Vacuum gauge types and features

Pressure level	Measurement range		
10^5 Pa abs			
10^3 Pa abs			
10^1 Pa abs			
10^{-1} Pa abs			
10^{-3} Pa abs			
10^{-5} Pa abs			
10^{-7} Pa abs			
Name	**Diaphragm gauges**	**Pirani gauges**	**Ionization vacuum gauges**
Features	■Excellent corrosion resistance ■High accuracy ■Accuracy example: ±0.25% rdg	■Often used for roughing pump lines or back pressure lines ■Affected by type or components of gas ■Accuracy example: ±15% FS	■Measurement of high vacuum is possible.

Specifications

Item	Specifications		
Pressure range	0-20 Pa, 0-25 Pa, 0-100 Pa, 0-200 Pa, 0-300 Pa, 0-1000 Pa, 0-2000 Pa, 0-3000 Pa, 0-10000 Pa, 0-20000 Pa, 0-100 kPa, 0-13.332 Pa, 0-26.664 Pa, 0-33.331 Pa, 0-133.32 Pa, 0-266.64 Pa, 0-399.96 Pa, 0-1333.2 Pa, 0-2666.4 Pa, 0-3999.6 Pa, 0-13332 Pa, 0-26664 Pa, 0-133.32 kPa		
Self-heating temperature	Non self-heating/45/100/125/150/160/180/200 ˚C		
Accuracy	Accuracy	Pressure range	Self-heating temperature range
	0.25 % Reading	10 Pa to 33.331 Pa	45 °C
	0.5 % Reading		80 °C or more
	0.25 % Reading	100 Pa to 133.32 kPa	No self-heating or less than 160 °C
	0.5 % Reading		160 °C or more
Temperature coefficients zero	Temperature coefficients zero	Pressure range	Self-heating temperature range
	0.008 %FS/°C	10 Pa to 33.331 Pa	45 °C
	0.016 %FS/°C		80 °C or more
	0.008 %FS/°C	100 Pa to 133.32 Pa	No self-heating or less than 160 °C
	0.016 %FS/°C		160 °C or more
	0.004 %FS/°C	200 Pa to 133.32 kPa	No self-heating or less than 160 °C
	0.008 %FS/°C		160 °C or more
Temperature coefficients span	0.02% Reading/˚C		
Resolution	1/10000 FS		
Operating temperature range	**Model SPG5_** (standard model) **Model SPG7_** (vacuum freeze-drying process model)	Models whose self-heating temperature is 80 °C or more: 10 to 45 °C (Cooling air with a velocity of 0.5 m/s or more is required at 35 °C or more.) Models whose self-heating temperature is 45 °C: 10 to 40 °C (Cooling air with a velocity of 0.5 m/s or more is required at 35 °C or more.) Non–self-heating models: 0 to 60 °C	
	Model SPG6_ (extra high-temperature model)	10 to 65 °C (when mounted vertically), 10 to 70 °C (when mounted horizontally) (Cooling air with a velocity of 0.5 m/s or more is required at 45 °C or more.)	
Operating humidity range	10 to 90% RH (without condensation)		
Storage temperature and humidity range	-20 to +80 ˚C, 10 to 95% RH		
Response time	Model SPG_A: 35 ms Model SPG_B: 50 ms (Models with pressure range of 1000 Pa or more), 60 ms (Models with pressure range of less than 1000 Pa) Model SPG_C: 40 ms (Models with pressure range of 100 Pa or more), 50 ms (Models with pressure range of less than 100 Pa)		
Gas-contacting materials	Sapphire, DSALOY (equivalent to Inconel), SUS316L		
Allowable pressure *1	300 kPa abs MAX.: SPG7 only 200 kPa abs MAX.: pressure range of 100 kPa or more 110 kPa abs MAX.: pressure range of less than 100 kPa		
Marginal pressure*2	300 kPa abs MAX.		
Burst pressure*3	700 kPa abs MAX.		
Input power-supply voltage range	Voltage range: ±15 Vdc ±10% (dual power supplies) or 24 Vdc ±10% (single power supply) Allowable ripple voltage: 0.5 V p-p max.		
Output signal	O to 10 Vdc		
I/O connectors	D-sub 15-pin connector (male), setscrew #4-40 UNC		
Warm-up time	30 min (nominal), 1 h max.		
Zero point adjustable range	±20% FS		
Leakage rate	1×10^{-10} Pa m³/s or less (except IDF 2S ferrule model), 1×10^{-9} Pa m³/s or less (IDF 2S ferrule model)		
Mounting angle	Unrestricted		
Allowable cable length	10 m max.		
Event relay	3		
Standards compliance	CE-marked (EN 61326-1), KC-marked		

*1. At the allowable pressure, the performance level of the gauge can be maintained.
*2. At the marginal pressure, the gauge will continue to function.
*3: At the burst pressure, the gauge will break.

External dimensions