

Models SPG5A and SPG6A

Sapphire capacitance diaphragm gauge

Overview

The SPG5A/6A is a capacitance diaphragm vacuum gauge that uses a sapphire capacitance pressure sensor to achieve high accuracy and reliability, compact size, and light weight. Self-heating and nonself-heating models are available.

The SPG5A/6A is especially suited for use in semiconductor manufacturing.

Features

- **Uses a single-crystal sapphire for excellent resistance to corrosion and high temperatures**

Highly corrosion-resistant and heat-resistant single-crystal sapphire pressure sensing material also has excellent mechanical characteristics. Capacitive measurement has high repeatability even when used at 125-200°C.

- **Highly accurate measurement**

Advanced signal processing technology contributes to excellent temperature characteristics and linearity of measurement.

- **Compact and light weight**

Small in size and light in weight, thanks to micromachining technology.

- **Easy zero point adjustment**

Zero point is adjusted with automatic adjustment button or up/down buttons.

- **Device status indicator**

Device status (normal, warm-up, and abnormal) can be easily checked with the status LED.



- **Fast warm-up time and stable sensor temperature control**

Microprocessor-based digital PID control provides fast warm-up and stable sensor temperature (self-heating models).

- **Compatible with Smart Loader Package**

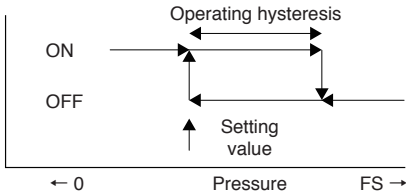
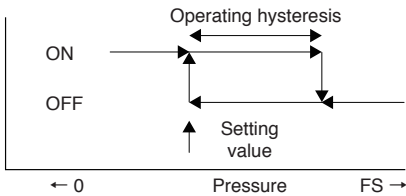
Working from a PC, users can monitor the SPG5A/6A and easily change its settings using the SLP-SP5J60 Smart Loader Package (sold separately).

- **CE-marked**

Conformity to IEC directives; CE-marked; compliant with EN 61326 and EN 55011.

Specifications

Items	Specifications		
Pressure range	0-100 Pa, 0-200 Pa, 0-300 Pa, 0-1000 Pa, 0-2000 Pa, 0-10000 Pa, 0-20000 Pa, 0-100 kPa 0-133.32 Pa, 0-266.64 Pa, 0-399.96 Pa, 0-1333.2 Pa, 0-2666.4 Pa, 0-13332 Pa, 0-26664 Pa, 0-133.32 kPa		
Self-heating temperature	125/150/160/180/200°C		
Accuracy	0.25% of rdg.: no self-heating or self-heating temperature under 160°C 0.5% of rdg.: models with self-heating temperature of 160°C or more		
Zero temperature characteristics		Self-heating temperature	Pressure range
	0.004%FS/°C	No self-heating, or less than 160°C	200 Pa or more
	0.008%FS/°C		Less than 200 Pa
	0.008%FS/°C	160°C or more	200 Pa or more
0.08%FS/°C	Less than 200 Pa		
Span temperature characteristics	0.02% rdg./°C		
Resolution	1/10000 FS		
Operating temperature range	SPG5A (standard model) Self-heating models: 10 to 45°C (0.5 m/s min. cooling air is required at 35°C or more) Nonself-heating models: 0 to 60°C		
	SPG6A (extra high-temperature model) 10 to 65°C (when mounted vertically), 10 to 70°C (when mounted horizontally) (0.5 m/s min. cooling air 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 (without condensation)		
Response time	35 ms		

Items	Specifications				
Gas-contacting materials	Sapphire, Inconel, SUS316L				
Internal capacity	4.6 cm ³ : 1/2 inch gauge port connection 7 cm ³ : 8 VCR connection 7 cm ³ : NW16 connection 5 cm ³ : IDF 2S ferrule connection				
Allowable pressure *1	200 kPa abs max.: Models with pressure range of 100 kPa or more 110 kPa abs max.: Models with 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: ±15Vdc ±10% (dual power supplies) or 24Vdc ±10% (single power supply) Allowable ripple voltage: 0.5 V p-p max.				
Power consumption/ power current *4 *5	Self-heating temperature	Power consumption		Power current	
			During normal operation	During warm-up	With 15Vdc supply
	(Non-self-heating model)	3 W max.	3 W max.	0.12 A max.	0.14 A max.
	125°C	10 W max.	14 W max.	0.6 A max.	0.7 A max.
	150°C	12 W max.	16 W max.	0.6 A max.	0.8 A max.
	160°C	13 W max.	17 W max.	0.7 A max.	0.8 A max.
180°C	15 W max.	19 W max.	0.8 A max.	0.9 A max.	
200°C	16 W max.	23 W max.	0.9 A max.	1.1 A max.	
Output signal	0 to 10Vdc Allowable load resistance: 10 kΩ min. Measurement output range: -0.5 to +11Vdc *6 Output during warm-up or abnormal status: Output depends on the measured pressure *7				
I/O connector	D-sub 15-pin connector (male), retaining screw #4-40UNC				
Mass	450 g: 1/2 inch gauge port connection 520 g: 8 VCR connection 470 g: NW16 connection 650 g: IDF 2S ferrule connection				
Warm-up time	30 min (nominal), 1 h max.				
Zero point adjustable range	±20%FS				
Coupling	1/2 inch gauge port, 8 VCR (female) equivalent, NW16, IDF2S ferrule				
Leak rate	1×10 ⁻¹⁰ Pa m ³ /s or less				
Mounting angle	Unrestricted *8				
Allowable cable length	10 m max.				
Event relay ratings	Number of relays: 3 max. Contact form: 1c (both N.O. and N.C. contacts) Maximum load: 1A 30Vdc resistive load Minimum load: 10 μA 10 mVdc *9 Mechanical service life: 50 million cycles min. Electrical service life: 100 thousand cycles min. (at 1 A, 30Vdc resistive load) Certifications: UL, CSA				
Event relay functions (default setting) *10	<p>Event relay 1: Pressure low limit (direct action) Setting: value is assigned by model No. Operating hysteresis: 0.5%FS Operation is always linked with pressure during warm-up or abnormal status.</p>  <p>Event relay 2: Pressure low limit (direct action) Setting: value is assigned by model No. Operating hysteresis: 0.5%FS Always operates together with pressure during warm-up or abnormal status.</p>  <p>Event relay 3: ON if warm-up is complete, OFF if warm-up is incomplete or status is abnormal Event relay LED: Green when event relay ON, off when event relay OFF</p>				
Status LED display operation	Lit green	Normal operation status (after warm-up)			
	Lit orange	Warm-up in progress (device temperature is not yet stable)			
	Lit red	Abnormal status (device problem)			
	Flashing red (0.3 s, 0.3 s)	Abnormal status (operating environment problem, such as excessive ambient temperature or wrong power voltage)			

Items	Specifications	
Status LED display operation	3 green flashes (0.3 s, 0.3 s)	Automatic zero point adjustment (after button pressed) is complete, and bias adjustment is within $\pm 5\%$ FS.
	3 orange flashes (0.3 s, 0.3 s)	Automatic zero point adjustment (after button pressed) is complete, and bias adjustment is between ± 5 and $\pm 20\%$ FS.
	Flashing green (0.1 s, 0.1 s)	Zero point is being adjusted with up/down zero point adjustment buttons, and bias adjustment is within $\pm 5\%$ FS.
	Flashing orange (0.1 s, 0.1 s)	Zero point is being adjusted with up/down zero point adjustment buttons, and bias adjustment is between ± 5 and $\pm 20\%$ FS.
	Flashing red (0.1 s, 0.1 s)	During zero point adjustment with up/down zero point adjustment buttons, bias adjustment reached the maximum adjustable range of $\pm 20\%$ FS.
	Lit alternately red and orange 3 times (0.3 s, 0.3 s)	Because of device conditions, neither auto zero point adjustment nor manual zero point adjustment is possible.
	Lit alternately green and orange 3 times (0.3 s, 0.3 s)	Bias adjustment value has been reset.
	Alternating green and orange with occasional red (1.9 s, 0.1 s)	The event relay is latched. *11
	Lit alternately green and red (0.3 s, 0.3 s)	Output is manually being controlled. *12
	Off	The device is not powered up.
Standards compliance	CE-marked (EN 61326, EN 55011), KC-marked	

- *1 At the allowable pressure, the performance level of this unit can be maintained. However, if the SPG is repeatedly subjected to the allowable pressure, adjust the zero point periodically.
- *2 At the marginal pressure, this unit will continue to function. If the SPG is subjected to the marginal pressure, readjust the zero point. If more accurate measurement is required, return the unit to Azbil Corporation for calibration. If the marginal pressure is exceeded, the proper operation of this unit can no longer be guaranteed. In this case, replace the unit with a new one.
- *3 The burst pressure is the pressure at which this device will break. To avoid an accident, never apply pressure equaling or exceeding the burst pressure.
- *4 Use an appropriate power supply with a rated current exceeding the max. power current value.
- *5 PID control is used to regulate the temperature and keep the rate of current supplied to the heater as constant as possible. Additionally, the maximum power current is varied depending on the power voltage, so that power consumption remains constant even during warm-up, irrespective of the power voltage. (Self-heating models)
- *6 Since a negative voltage is generated inside this unit, a negative voltage output is available even with only a single-output power supply.
- *7 The conditions and voltage can be changed using the Smart Loader.
- *8 This unit was calibrated at the factory in a vertical position. Shift of the zero point may have occurred, depending on the mounting angle. In such a case, accuracy can be recovered by adjusting the zero point after installation. Vertical installation is recommended to prevent contaminants from accumulating on the sensor unit.
- *9 The minimum load specification is an estimate of the minimum load at which the event relay is able to open and close. This value can vary depending on the frequency of operation, environmental conditions, and the expected reliability level. Before actual use, a check of the relay's operation using the actual load is recommended.
- *10 The event relay functions can be changed using the Smart Loader.
- *11 Latching of the event relay must be set up with the Smart Loader (sold separately).
- *12 Output can be manually controlled with the Smart Loader (sold separately).

Model selection table

I II III IV V VI VII VIII Example: SPG5AT11HD500500

I	II	III	IV	V	VI	VII	VIII	Description
Basic model No.	Type	Added 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
		A						Event configuration model
			□□□					Refer to the table on the left
				R				Without self-heating function
				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)	Pressure code	FS pressure ranges (absolute pressure)
T10	133.32 Pa	P12	100 Pa
T20	266.64 Pa	P22	200 Pa
T30	399.96 Pa	P32	300 Pa
T11	1333.2 Pa	P13	1000 Pa
T21	2666.4 Pa	P23	2000 Pa
T12	13332 Pa	P14	10000 Pa
T22	26664 Pa	P24	20000 Pa
T13	133.32 kPa	P15	100 kPa

* For details about other pressure ranges, contact the Sales Dept. at Azbil Corporation.

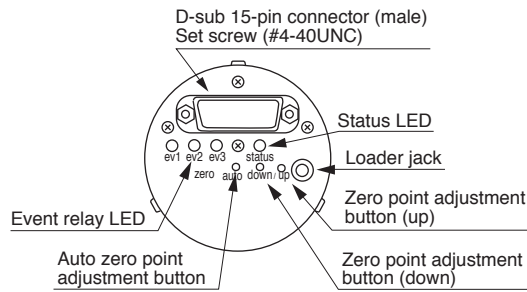
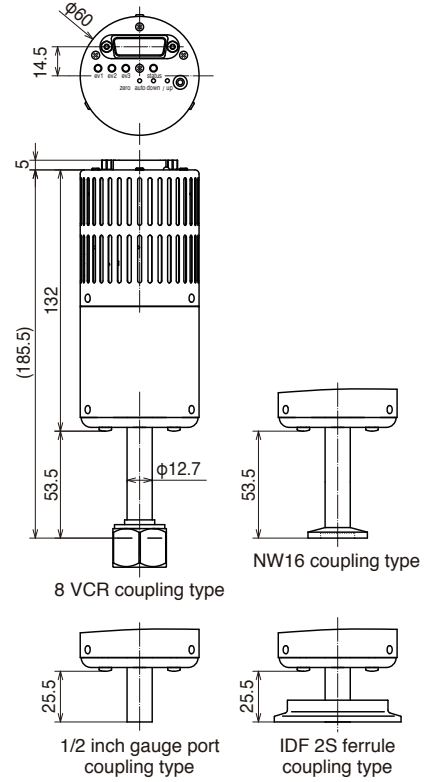
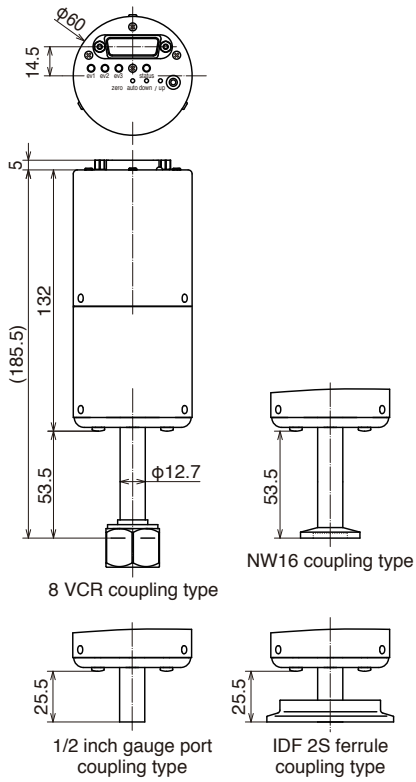
*1 Available only for self-heating models.

External dimensions

(Unit: mm)

● SPG5A (standard model)

● SPG6A (extra high-temperature model)



Connector pin assignments

(D-sub 15-pin, male)

	Name
1	Event relay 3 (COM)
2	Output (+)
3	Power supply (COM) *1 *2
4	Event relay 2 (COM)
5	Power supply (-) *1
6	Event relay 3 (NO)
7	Power supply (+)
8	Event relay 3 (NC)
9	Event relay 2 (NO)
10	Event relay 2 (NC)
11	Event relay 1 (COM)
12	Output (COM) *2
13	Event relay 1 (NO)
14	Event relay 1 (NC)
15	FG *3

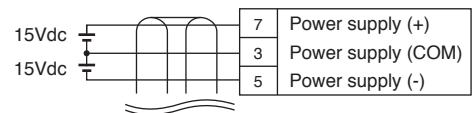
*1 If using a single 24Vdc input power supply, connect the power COM to the power “-”.

*2 The power COM and output COM are internally connected. If using a single 24Vdc input power supply, do not connect the power COM and output COM together. Also, take care to avoid any wrong wiring that may cause a short circuit in other equipment. If the wiring is connected incorrectly, current from the power supply will also flow through the output line, and the voltage drop from wiring resistance may cause a measurement error.

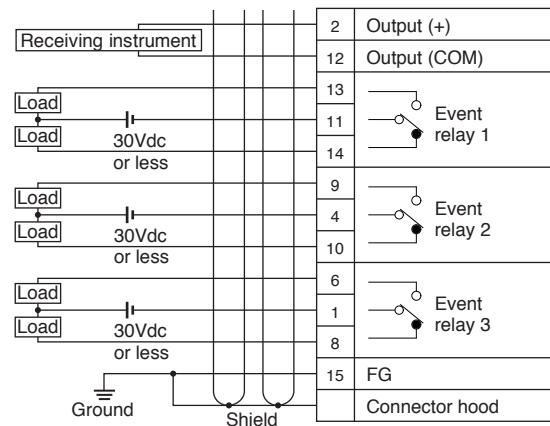
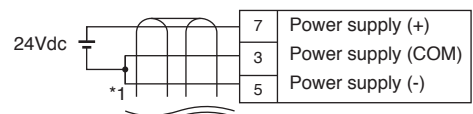
*3 FG is electrically continuous with the case, but is isolated from the power COM, output COM, and other terminals.

● Example of external connection

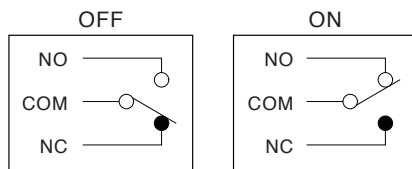
• ±15Vdc (dual power supplies)



• 24Vdc (single power supply)



Note: Event relay connection



When the power supply is turned off, the event relay is turned off.

Please read the "Terms and Conditions" from the following URL before ordering or use:

<http://www.azbil.com/products/bi/order.html>

Specifications are subject to change without notice.

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Azbil Corporation
Advanced Automation Company

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

1st Edition: Issued in Jan. 2013

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