

2271A

Automated Pressure Calibrator

Product Specifications

Specifications

General Specifications

Mains

Power Requirements	100 V ac to 240 V ac, 47 Hz to 63 Hz
Fuse	T2A 250 V ac
Max Power Consumption.....	100 W

Environment

Operating Ambient Temperature Range.....	15 °C to 35 °C
Storage Temperature.....	-20 °C to 70 °C
Relative Humidity	
Operating	<80 % to 30 °C, <70 % to 35 °C
Storage	<95 %, non-condensing. A power stabilization period of four days may be required after extended storage at high temperature and humidity.
Vibration.....	MIL-T-28800D CLASS 3
Altitude (Operation).....	<2000 m
Warmup Time	15 minutes after power up or module installation, when items previously stored within Operating Ambient Temperature

Electromagnetic Compatibility (EMC)

International	IEC 61326-1: Controlled Electromagnetic Environment
	CISPR 11: Group 1, Class A
	<i>Group 1: Equipment has intentionally generated and/or uses conductively-coupled radio frequency energy that is necessary for the internal function of the equipment itself.</i>
	<i>Class A: Equipment is suitable for use in all establishments other than domestic and those directly connected to a low-voltage power supply network that supplies buildings used for domestic purposes. There may be potential difficulties in ensuring electromagnetic compatibility in other environments due to conducted and radiated disturbances.</i>
	<i>Emissions that exceed the levels required by CISPR 11 can occur when the equipment is connected to a test object.</i>
Korea (KCC)	Class A Equipment (Industrial Broadcasting & Communication Equipment)
	<i>Class A: Equipment meets requirements for industrial electromagnetic wave equipment and the seller or user should take notice of it. This equipment is intended for use in business environments and not to be used in homes.</i>
USA (FCC).....	47 CFR 15 subpart B. This product is considered an exempt device per clause 15.103.

Compliance

Ingress Protection	IEC 60529: IP20
Safety.....	IEC 61010-1, Installation Category II, Pollution degree 2

Dimensions and Weights

Dimensions

Height	2271A-NPT-STD	305 mm (12 in)
	2271A-BSP-STD	305 mm (12 in)
	2271A-NPT-P3000	237 mm (9.33 in)
	2271A-BSP-P3000	237 mm (9.33 in)
Width.....		442 mm (17.40 in)
Depth		446 mm (17.55 in)

Weight

Chassis only	15 kg (33.06 lbs)
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Communication Interfaces

Primary remote Interfaces Ethernet, RS232, USB
 Electrical Measurement Module (EMM)
 Connection Banana Jack
 Maximum 30 V dc w.r.t. chassis ground
 Aux Drivers 4 external Solenoid Drivers
 24 V dc. 100 % duty cycle when turned, reducing to 40 % shortly after.

Performance Specifications

The performance specifications describe the complete instrumental uncertainty of the Product. The specifications include all relevant error components (linearity, hysteresis, repeatability, resolution, reference standard measurement uncertainty, 1-year drift, and temperature effects). The specifications are provided at a level of confidence of 95 %, k=2, normally distributed for the pressure modules and 99 %, k=2.58, normally distributed for electrical module. Precision uncertainty includes linearity, hysteresis, repeatability, resolution, and temperature effects.

PM200 Modules

Specifications are valid from 18 °C to 28 °C. For temperatures from 15 °C to 18 °C and 28 °C to 35 °C, add 0.003 % FS/°C.

Table 1. PM200 Module Measurement Specifications

Model	Range (SI Units)	Range (Imperial Units)	Measurement Mode ¹	1-Year Instrumental Uncertainty % FS	Precision Uncertainty % FS
PM200-BG2.5K	-2.5 kPa to 2.5 kPa	-10 inH ₂ O to 10 inH ₂ O	bi-directional gauge	0.2	0.055
PM200-BG35K	-35 kPa to 35 kPa	-5 psi to 5 psi	bi-directional gauge	0.05	0.015
PM200-BG40K	-40 kPa to 40 kPa	-6 psi to 6 psi	bi-directional gauge	0.05	0.015
PM200-BG60K	-60 kPa to 60 kPa	-8.7 psi to 8.7 psi	bi-directional gauge	0.05	0.015
PM200-BG100K	-100 kPa to 100 kPa	-15 psi to 15 psi	bi-directional gauge	0.02	0.01
PM200-A100K	2 kPa to 100 kPa	0.3 psi to 15 psi	absolute	0.1	0.02
PM200-A200K	2 kPa to 200 kPa	0.3 psi to 30 psi	absolute	0.1	0.02
PM200-BG200K	-100 kPa to 200 kPa	-15 psi to 30 psi	bi-directional gauge	0.02	0.01
PM200-BG250K	-100 kPa to 250 kPa	-15 psi to 36 psi	bi-directional gauge	0.02	0.01
PM200-G400K	0 kPa to 400 kPa	0 psi to 60 psi	gauge	0.02	0.01
PM200-G700K	0 kPa to 700 kPa	0 psi to 100 psi	gauge	0.02	0.01
PM200-G1M	0 MPa to 1 MPa	0 psi to 150 psi	gauge	0.02	0.01
PM200-G1.4M	0 MPa to 1.4 MPa	0 psi to 200 psi	gauge	0.02	0.01
PM200-G2M	0 MPa to 2 MPa	0 psi to 300 psi	gauge	0.02	0.01
PM200-G2.5M	0 MPa to 2.5 MPa	0 psi to 360 psi	gauge	0.02	0.01
PM200-G3.5M	0 MPa to 3.5 MPa	0 psi to 500 psi	gauge	0.02	0.01
PM200-G4M	0 MPa to 4 MPa	0 psi to 580 psi	gauge	0.02	0.01
PM200-G7M	0 MPa to 7 MPa	0 psi to 1000 psi	gauge	0.02	0.01
PM200-G10M	0 MPa to 10 MPa	0 psi to 1500 psi	gauge	0.02	0.01
PM200-G14M	0 MPa to 14 MPa	0 psi to 2000 psi	gauge	0.02	0.01
PM200-G20M	0 MPa to 20 MPa	0 psi to 3000 psi	gauge	0.02	0.01
Notes					
1. PM200 gauge mode modules support absolute mode measurement when used with a barometric reference module. Instrumental uncertainty for gauge mode modules used in absolute mode by addition of a barometric reference module is calculated as the uncertainty of the gauge mode module root sum squared with the uncertainty of the barometric reference module. Uncertainty for gauge mode assumes routine zeroing which is default operating mode when used in a chassis. Uncertainty for absolute mode modules includes 1-year zero stability. This specification can be reduced to 0.05 % FS if the PM200 module is zeroed on a continuing basis to remove the 1-year zero stability component.					

PM500 Modules

Specifications are valid from 15 °C to 35 °C.

Table 2. PM500 Module Measurement Specifications

Model	Range (SI Units)	Range (Imperial Units)	Measurement Mode ²	1-Year Instrumental Uncertainty (% of reading or % FS, whichever is greater) unless otherwise stated	1-Year Zero Instrumental Drift % FS, RSS with 1-Year Instrumental Uncertainty ¹	Precision Uncertainty (% of reading or % FS, whichever is greater)
PM500-G100K	0 kPa to 100 kPa	0 psi to 15 psi	gauge	0.01 or 0.005	-	0.007 or 0.0035
PM500-G200K	0 kPa to 200 kPa	0 psi to 30 psi	gauge	0.01 or 0.005	-	0.007 or 0.0035
PM500-G250K	0 kPa to 250 kPa	0 psi to 36 psi	gauge	0.01 or 0.005	-	0.007 or 0.0035
PM500-G350K	0 kPa to 350 kPa	0 psi to 50 psi	gauge	0.01 or 0.005	-	0.007 or 0.0035
PM500-G400K	0 kPa to 400 kPa	0 psi to 60 psi	gauge	0.01 or 0.005	-	0.007 or 0.0035
PM500-G600K	0 kPa to 600 kPa	0 psi to 90 psi	gauge	0.01 or 0.005	-	0.007 or 0.0035
PM500-G700K	0 kPa to 700 kPa	0 psi to 100 psi	gauge	0.01 or 0.005	-	0.007 or 0.0035
PM500-BG1M	-0.1 MPa to 1 MPa	-15 psi to 150 psi	bi-directional gauge	0.01 or 0.005	-	0.007 or 0.0035
PM500-BG1.4M	-0.1 MPa to 1.4 MPa	-15 psi to 200 psi	bi-directional gauge	0.01 or 0.005	-	0.007 or 0.0035
PM500-BG2M	-0.1 MPa to 2 MPa	-15 psi to 300 psi	bi-directional gauge	0.01 or 0.005	-	0.007 or 0.0035
PM500-BG2.5M	-0.1 MPa to 2.5 MPa	-15 psi to 400 psi	bi-directional gauge	0.01 or 0.005	-	0.007 or 0.0035
PM500-BG3.5M	-0.1 MPa to 3.5 MPa	-15 psi to 500 psi	bi-directional gauge	0.01 or 0.005	-	0.007 or 0.0035
PM500-BG4M	-0.1 MPa to 4 MPa	-15 psi to 600 psi	bi-directional gauge	0.01 or 0.005	-	0.007 or 0.0035
PM500-BG7M	-0.1 MPa to 7 MPa	-15 psi to 1000 psi	bi-directional gauge	0.01 or 0.005	-	0.007 or 0.0035
PM500-BG10M	-0.1 MPa to 10 MPa	-15 psi to 1500 psi	bi-directional gauge	0.01 or 0.005	-	0.007 or 0.0035
PM500-BG14M	-0.1 MPa to 14 MPa	-15 psi to 2000 psi	bi-directional gauge	0.01 or 0.005	-	0.007 or 0.0035
PM500-BG20M	-0.1 MPa to 20 MPa	-15 psi to 3000 psi	bi-directional gauge	0.01 or 0.005	-	0.007 or 0.0035
PM500-BA120K	60 kPa to 120 kPa	8 psi to 17 psi	absolute	0.01 % of reading	0.05	0.005 % of reading
PM500-A120K	0.08 kPa to 120 kPa	0.01 psi to 16 psi	absolute	0.01 or 0.005	0.05	0.007 or 0.0035
PM500-A160K	0.08 kPa to 160 kPa	0.01 psi to 23 psi	absolute	0.01 or 0.005	0.05	0.007 or 0.0035
PM500-A200K	0.08 kPa to 200 kPa	0.01 psi to 30 psi	absolute	0.01 or 0.005	0.05	0.007 or 0.0035
PM500-A350K	0.08 kPa to 350 kPa	0.01 psi to 50 psi	absolute	0.01 or 0.005	0.03	0.007 or 0.0035
PM500-A700K	0.08 kPa to 700 kPa	0.01 psi to 100 psi	absolute	0.01 or 0.005	0.025	0.007 or 0.0035
PM500-A1.4M	0.035 MPa to 1.4 MPa	5 psi to 200 psi	absolute	0.01 or 0.005	0.015	0.007 or 0.0035
PM500-A2M	0.07 MPa to 2 MPa	10 psi to 300 psi	absolute	0.01 or 0.005	0.015	0.007 or 0.0035

				(% FS + % of reading)		(% FS + % of reading)
PM500-G2.5K	0 kPa to 2.5 kPa	0 inH ₂ O to 10 inH ₂ O	gauge	0.03 + 0.02	-	0.015 + 0.01
PM500-G7K	0 kPa to 7 kPa	0 inH ₂ O to 30 inH ₂ O	gauge	0.01 + 0.01	-	0.005 + 0.005
PM500-G14K	0 kPa to 14 kPa	0 inH ₂ O to 50 inH ₂ O	gauge	0.01 + 0.01	-	0.005 + 0.005
PM500-G20K	0 kPa to 20 kPa	0 inH ₂ O to 80 inH ₂ O	gauge	0.01 + 0.01	-	0.005 + 0.005
PM500-G35K	0 kPa to 35 kPa	0 psi to 5 psi	gauge	0.01 + 0.01	-	0.005 + 0.005
PM500-G70K	0 kPa to 70 kPa	0 psi to 10 psi	gauge	0.01 + 0.01	-	0.005 + 0.005
PM500-NG100K	-100 kPa to 0 kPa	-15 psi to 0 psi	negative gauge	0.01 + 0.01	-	0.005 + 0.005
PM500-BG1.4K	-1.4 kPa to 1.4 kPa	-5 inH ₂ O to 5 inH ₂ O	bi-directional gauge	0.03 + 0.02	-	0.015 + 0.01
PM500-BG2.5K	-2.5 kPa to 2.5 kPa	-10 inH ₂ O to 10 inH ₂ O	bi-directional gauge	0.03 + 0.02	-	0.015 + 0.01
PM500-BG3.5K	-3.5 kPa to 3.5 kPa	-15 inH ₂ O to 15 inH ₂ O	bi-directional gauge	0.01 + 0.01	-	0.005 + 0.005
PM500-BG7K	-7 kPa to 7 kPa	-30 inH ₂ O to 30 inH ₂ O	bi-directional gauge	0.01 + 0.01	-	0.005 + 0.005
PM500-BG14K	-14 kPa to 14 kPa	-50 inH ₂ O to 50 inH ₂ O	bi-directional gauge	0.01 + 0.01	-	0.005 + 0.005
PM500-BG25K	-25 kPa to 25 kPa	-100 inH ₂ O to 100 inH ₂ O	bi-directional gauge	0.01 + 0.01	-	0.005 + 0.005
PM500-BG40K	-40 kPa to 40 kPa	-6 psi to 6 psi	bi-directional gauge	0.01 + 0.01	-	0.005 + 0.005
PM500-BG60K	-60 kPa to 60 kPa	-9 psi to 9 psi	bi-directional gauge	0.01 + 0.01	-	0.005 + 0.005
				% FS		% FS
PM500-BG100K	-100 kPa to 100 kPa	-15 psi to 15 psi	bi-directional gauge	0.01	-	0.005
PM500-BG200K	-100 kPa to 200 kPa	-15 psi to 30 psi	bi-directional gauge	0.01	-	0.005
PM500-BG250K	-100 kPa to 250 kPa	-15 psi to 36 psi	bi-directional gauge	0.01	-	0.005
PM500-BG350K	-100 kPa to 350 kPa	-15 psi to 50 psi	bi-directional gauge	0.01	-	0.005
PM500-BG400K	-100 kPa to 400 kPa	-15 psi to 60 psi	bi-directional gauge	0.01	-	0.005
PM500-BG700K	-100 kPa to 700 kPa	-15 psi to 100 psi	bi-directional gauge	0.01	-	0.005

Notes

- The 1 Year Instrumental Uncertainty is specified with a zeroing technique in the Operators Manual. If not adhered to the 1 Year Instrumental Uncertainty is:

$$\sqrt{\left(\frac{1 \text{ year instrumental uncertainty}}{2}\right)^2 + \left(\frac{1 \text{ year zero drift}}{1.73}\right)^2} \times 2$$

- PM500 gauge or bi-directional mode modules support absolute mode measurement when used with a Barometric Reference Module. Instrumental uncertainty for gauge mode modules used in absolute mode by addition of a barometric reference module is calculated as the uncertainty of the gauge mode module root sum squared with the uncertainty of the barometric reference module. Uncertainty for gauge mode assumes routine zeroing which is default operation mode when used in a chassis.

EM300 Modules

Specifications are valid from 18 °C to 28 °C. For temperatures from 15 °C to 18 °C and 28 °C to 35 °C, add 0.002 % FS/°C.

Table 3. EM300 Module Measurement Specifications

All outputs are positive only.

DC Voltage		
Range	Resolution	1 Year Instrumental Uncertainty
30 V	1 mV	0.01 % of reading + 2 mV
DC Current		
Range	Resolution	1 Year Instrumental Uncertainty
24 mA	1 µA	0.01 % of reading + 2 µA

Operating Characteristics

Control Precision (Dynamic Mode)

PM200-BG2.5K..... 0.005 % Range Span
 PM500 <20 kPa Full Scale 0.002 % Range Span
 All other Ranges 0.001 % Range Span
 Control Turndown 10:1 (typical)

To meet the control specifications, supply pressure should not be greater than 10 times the range of the measurement module. Control turndown is defined as the relationship between the provided supply pressure and the appropriate supply pressure for the range. For example, a unit with a 7 MPa (1000 psi) and 700 kPa range (100 psi) with a supply pressure of 7.7 MPa (1100 psi) provides control precision of 0.001 % range because 7 MPa is 10 times greater than 700 kPa. A system with ranges of 20 MPa (3000 psi) and 700 kPa (100 psi) with supply pressure of 22 MPa (3300 psi) will have 0.001 % range control precision on the 20 MPa range but only 0.003 % control precision on the 700 kPa range. Control precision of 0.001 % on the low range can be achieved by reducing the supply pressure.

Low Control Point 1 kPa (0.15 psi) absolute

Settling Time (typical)

PM200-BG2.5K..... 40 seconds
 All other PM200 ranges 20 seconds
 PM500 ≤20 kPa Full Scale 45 seconds
 PM500 >20 kPa Full Scale 30 seconds

Typical settling time is the time required to be within 0.005 % of the setpoint for 10 % steps into volumes of 0 to 50 cm³ and pressures above 50 kPa (7.25 psi) absolute. Lower absolute pressures require longer settling times depending upon quality of the vacuum pump, diameter and material of tubing used, and test volume.

Maximum Overshoot..... 0.02 % Range Span

Pressure Limits

Working Pressure Range..... -97.90 kPa (-14.2 psi) gauge to 20 MPa (3000 psi) gauge
 Supply Port 23 MPa (3300 psi) gauge
 Test Port 20 MPa (3000 psi) absolute
 Reference Port 115 kPa (17 psi) absolute
 Vent Port 150 kPa (22 psi) absolute

Relief Valves

- Chassis Supply port relief valve is set to 24.1 MPa (-0/+700 kPa), 3500 psi (-0/+100 psi)
- Exhaust port relief valve is set to ~830 kPa (120 psi).
- Each Pressure Measurement Module (PMM) includes a module-specific pressure protection device.

Supply Gas Type

- Clean Dry Air or Nitrogen (Industrial Grade, 99.5 %)
- Maximum Particulate Contamination.....≤1.25 micrometer (50 microinches)
- Maximum Moisture Content.....-50 °C dew point
- Maximum Hydrocarbon Content30 ppm

Vacuum Supply

- >50 liters per minute capacity with Auto Vent feature
- Exhaust gas will pass through the vacuum supply. Appropriate protections should be taken when operating at higher pressures.

Source

- Loop Compliance Voltage.....≥24 V dc @ 20 mA (without 250 Ω built in resistor)
- ≥19 V dc @ 20 mA (with 250 Ω built in resistor)

Switch Testing

- Current Limits≤4 mA
- Conditions Closed >1.5 mA, Open <0.5 mA

HART Communication and Functions

- HART Modes HART mA measurement with 24 V (Loop)
- Automatic HART Detection..... HART connected with automatic polling
- HART Selectable Resistor Built-in 250 Ω loop resistor. Selectable ON/OFF
- HART Commands..... HART universal and common practice commands (no device specific commands)
- Write Protection HART Write enable/disable.