

RPM3TM

MULTI-RANGE REFERENCE PRESSURE MONITOR



High performance pressure measurement
and great features in a compact, rugged
and easy to use package...

INTRODUCTION

RPM3 is much more than a traditional pressure indicator.

Advanced pressure transducer technology, microprocessor control and innovative engineering are combined to offer new levels of versatility and valuable features while keeping operation simple and straightforward.

Push-button selection between measuring modes and up to six ranges in one compact package allow a single RPM3 to fill-in where multiple instruments were needed in the past... and two levels of internal transducer performance are offered to best fit your application and budget. Full remote communications are supported but all functions can also be controlled locally, without a computer, from the user friendly front panel.

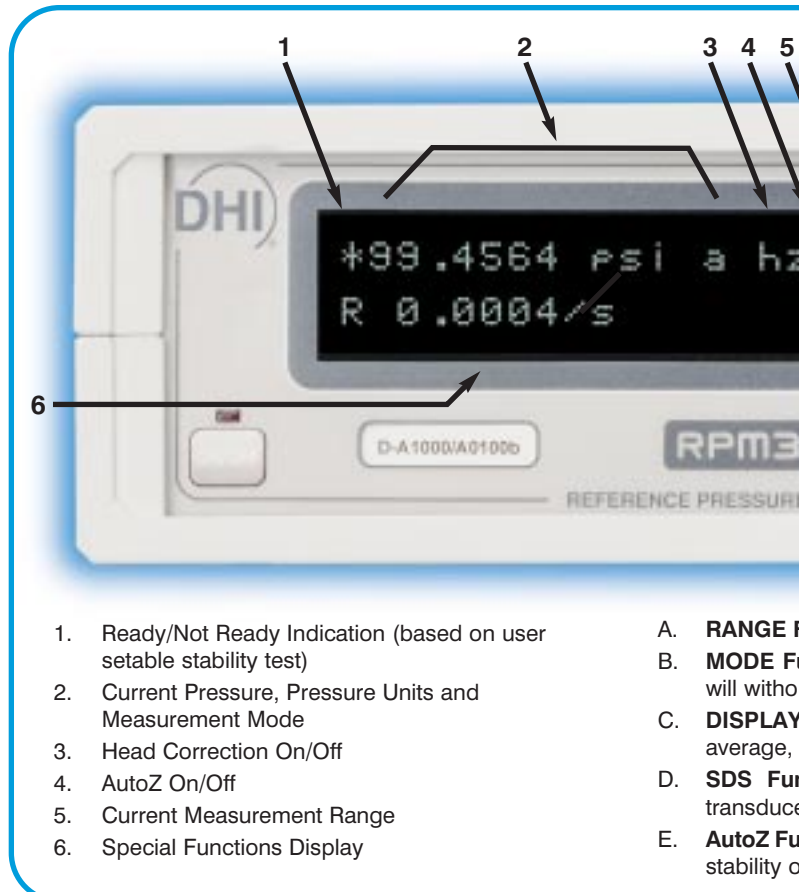
State of the art features... compact and rugged... specifications you can count on... and configured specifically to your needs... **RPM3, the perfect solution in a wide variety of high accuracy pressure calibration, testing and measurement applications.**

ADVANCED PRESSURE MEASUREMENT TECHNOLOGY

RPM3 uses transfer standard quality reference pressure transducers (RPTs) to provide extraordinary pressure measurement capability. Their quartz crystal oscillator based technology is more costly than the "super compensated" commodity sensors used by many manufacturers, but the benefits in precision and stability over time are well worth it. RPM3's RPTs also offer the advantages of low warm up time, gas species independence, complete isolation of the measuring element from the test medium and minimal sensitivity to attitude.

For applications not requiring the highest specifications, a **"b" Type RPT** is offered. RPM3's practical features and operations are maintained, while cost is reduced.

A unique **dynamic atmospheric pressure compensation system** uses an independent on-board barometer to provide seamless push



1. Ready/Not Ready Indication (based on user settable stability test)
2. Current Pressure, Pressure Units and Measurement Mode
3. Head Correction On/Off
4. AutoZ On/Off
5. Current Measurement Range
6. Special Functions Display

- A. RANGE F
- B. MODE F
- C. DISPLAY
- D. SDS Fu
- E. AutoZ Fu

button switching between gauge and absolute measurement modes without extra vacuum pumps or gauges (AXXXX RPTs only).

AutoZ™, an **automated autozeroing** function supports simple, one-step rezeroing whenever vented in gauge mode or by comparison to any barometric reference in absolute mode.

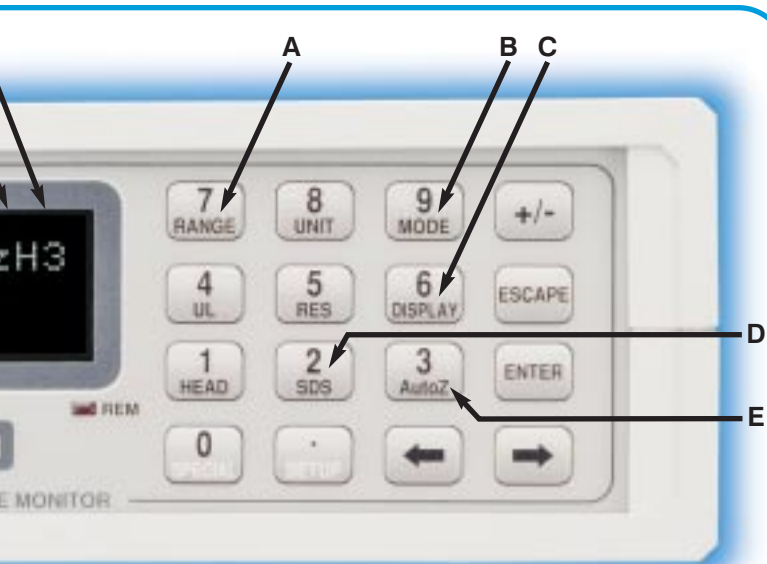
MULTI-RANGING

Thanks to the quality of its RPTs and advanced pressure measurement technology, each RPM3 RPT supports three ranges with a 3:1 turndown ratio without deterioration in

REFERENCE PRESSURE MONITOR

accuracy. A single RPM3 can include one or two RPTs giving a **total of three or six ranges in a single unit.**

Complete freedom in combining RPT ranges and types allows an RPM3 to be configured to your exact requirements. See the table on the facing page for the full selection of RPTs available.



Function - Select between up to six ranges at the push of a button.

Function - Change between gauge and absolute measurement modes at the push of a button (XXXXX RPTs only).

Function - Select special display functions including rate, deviation, hi/lo, freeze and clean.

Function - Self Defense System (SDS) to isolate and protect internal components from test system.

Function - One step, intelligent rezeroing relative to a reference for improved accuracy over time.

SDS™ SELF DEFENSE SYSTEM

Every RPT of 1 500 psi (10 000 kPa) or under is protected by **DHI's** unique Self Defense System (SDS). **SDS automatically protects RPM3 RPTs from overpressure damage and possible loss of valuable calibration history...** SDS uses two miniature valves and on-board RPM3 intelligence to isolate and vent RPTs when they are not in use or overpressure is about to occur. SDS allows any range of RPT to be left

connected to a pressure system up to 2 000 psi (13 MPa) without separate measures to isolate or disconnect it. Whether an RPM3 is in use or idle, SDS is always active to isolate and vent RPTs in anticipation of a potential overpressure situation.

ON-BOARD DISPLAY FUNCTIONS

By simple front panel selection, the second line of the RPM3 display can be customized to display a variety of useful information. Display options include:

- | | |
|------------------|---|
| Average | The average pressure over a user set time period with countdown to next update and standard deviation about the mean. |
| Rate | The current rate of change of pressure (stability) in pressure units/second. |
| Deviation | The deviation of the current pressure from a user set target pressure. |
| Hi/Lo | The maximum and minimum pressure observed since start time. |
| Freeze | Hold a displayed reading on operator trigger. |

FEATURES, FEATURES, FEATURES

RPM3 includes all the features you expect in today's modern instruments and more... stability dependent pressure ready/not ready indication to simplify use... automatic liquid and gas head corrections for maximum accuracy... 15 pressure units including custom units... pressure rate dependent reading integration for display updates at the speed you need them... no-nonsense, easy to read display... standard IEEE-488 interface using SCPI protocol... pass through RS-232 interfaces for chaining... flash memory for simple software upgrades from a PC... PC based recalibration utility software included... LabVIEW® drivers included.

REFERENCE PRESSURE TRANSDUCERS (RPTs) AND RANGES

SELECTING PRESSURE RANGES

An RPM3's pressure ranges and specifications are determined by the selection of the reference pressure transducer(s) (RPTs) that it uses to measure pressure. One or two (RPTs) may be included in a single RPM3. **See the notes below the tables for specific configuration guidelines.**

The tables below provide a list of the RPTs available. In a US version, the ranges are defined in and the default unit is psi. Ranges in other units are the equivalent of the psi ranges. In the SI version, ranges are defined in and the default unit is kPa. Ranges in other units are the equivalent of the kPa ranges. See the Specifications page of this brochure for the difference between Standard and b Type RPTs.

STANDARD RPTs

	US UNITS VERSION (psi)						SI UNITS VERSION (> A1500, MPa; ≤ A1500, kPa)							
RPT Designation	Range1 (Lo) Absolute Gauge		Range2 (Mid) Absolute Gauge		Range3 (Hi) Absolute Gauge		Range1 (Lo) Absolute Gauge		Range2 (Mid) Absolute Gauge		Range3 (Hi) Absolute Gauge		Test Connection	SDS System
A0015	5	-10	10	-5	15	0	30	-70	60	-40	100	0	1/8 in NPT F	Yes
A0023	7	-8	15	0	23	8	50	-50	100	0	160	60	1/8 in NPT F	Yes
A0030	10	-5	20	5	30	15	60	-40	120	20	200	100	1/8 in NPT F	Yes
A0050	15	0	30	15	50	35	100	0	200	100	350	250	1/8 in NPT F	Yes
A0100	30	15	60	50	100	100	200	100	400	300	700	700	1/8 in NPT F	Yes
A0200	50	50	100	100	200	200	400	400	800	800	1 400	1 400	1/8 in NPT F	Yes
A0300	100	100	200	200	300	300	600	600	1 200	1 200	2 000	2 000	1/8 in NPT F	Yes
A0500	150	150	300	300	500	500	1 000	1 000	2 000	2 000	3 500	3 500	1/8 in NPT F	Yes
A1000	300	300	600	600	1 000	1 000	2 000	2 000	4 000	4 000	7 000	7 000	1/8 in NPT F	Yes
A1500	500	500	1 000	1 000	1 500	1 500	3 000	3 000	6 000	6 000	10 000	10 000	1/8 in NPT F	Yes
A2000	600	600	1 200	1 200	2 000	2 000	5	5	9	9	14	14	1/8 in NPT F	No
A3000	1 000	1 000	2 000	2 000	3 000	3 000	6	6	12	12	20	20	1/8 in NPT F	No
A6000	2 000	2 000	4 000	4 000	6 000	6 000	13	13	25	25	40	40	1/8 in NPT F	No
A10000	3 000	3 000	6 000	6 000	10 000	10 000	20	20	40	40	70	70	1/8 in NPT F	No
A15000	5 000	5 000	10 000	10 000	15 000	15 000	30	30	60	60	100	100	DH500 F	No
A20000	6 000	6 000	12 000	12 000	20 000	20 000	40	40	80	80	140	140	DH500 F	No
A30000	10 000	10 000	20 000	20 000	30 000	30 000	60	60	120	120	200	200	DH500 F	No
A40000	12 000	12 000	25 000	25 000	40 000	40 000	100	100	150	150	275	275	DH500 F	No
G0015	N/A	5	N/A	10	N/A	15	N/A	30	N/A	60	N/A	100	1/8 in NPT F	Yes
G0030	N/A	10	N/A	20	N/A	30	N/A	60	N/A	120	N/A	200	1/8 in NPT F	Yes

b TYPE RPTs

	US UNITS VERSION (psi)						SI UNITS VERSION (≤ A1500, kPa)							
RPT Designation	Range1 (Lo)		Range2 (Mid)		Range3 (Hi)		Range1 (Lo)		Range2 (Mid)		Range3 (Hi)		Test Connection	SDS System
	Absolute	Gauge	Absolute	Gauge	Absolute	Gauge	Absolute	Gauge	Absolute	Gauge	Absolute	Gauge		
A0020b	6	-9	15	0	20	5	40	-60	100	0	140	35	1/8 in NPT F	Yes
A0100b	30	15	60	50	100	100	200	100	400	300	700	700	1/8 in NPT F	Yes
A0500b	150	150	300	300	500	500	1 000	1 000	2 000	2 000	3 500	3 500	1/8 in NPT F	Yes
G0002b	N/A	0.6	N/A	1.2	N/A	2	N/A	5	N/A	10	N/A	15	1/8 in NPT F	Yes
G0007b	N/A	2.5	N/A	4	N/A	7	N/A	15	N/A	30	N/A	50	1/8 in NPT F	Yes
G0020b	N/A	7	N/A	12	N/A	20	N/A	50	N/A	80	N/A	140	1/8 in NPT F	Yes

Configuration Notes:

- Any two RPTs can be combined in one RPM3 except designations > A10000 must be single.
- All RPTs designated A1500 or lower include SDS (Self Defense System) except if liquid filled.
- In two RPT systems, if both RPTs are designated ≤ A1500, there is only one test port (1/8 in. NPT F). If one or both of the RPTs is of a designation > A1500, there is one test port for each RPT with test connection fittings as specified in the tables above. Liquid filled RPTs always have independent test ports and no SDS.
- GXXXX RPTs have a 1/8 in. NPT F TEST (-) port (connected to the low side of the GXXXX RPT) in addition to the regular TEST port.

RPM3™

ORDERING INFORMATION

RPM3 may be configured with single or dual reference pressure transducers (RPTs). Single RPT models have three ranges, dual RPT models have six ranges. RPTs available and their corresponding ranges are listed in the table on the preceding page. Standard and **b** Type RPTs may be mixed in one RPM3.

SINGLE RPT MODELS

Specify the model number as:

RPM3 MXXXXb

Where: MXXXX indicates the RPT designation (see RPT and Ranges tables), include **b** only for **b** Type RPT.

For example: RPM3 A1000 is a pressure monitor with a single standard RPT whose designation is A1000. It has three ranges (those of an A1000 RPT as listed in the RPTs and Ranges tables).

The test port fitting on a single RPT is either 1/8 in. NPT F or DH500 as specified in the RPTs and Ranges tables. RPM3s with a gauge RPT (GXXXX) also have an 1/8 in. NPT F gauge reference port.

To configure an RPM3, define the model number following instructions for single or dual RPTs below and add options and accessories as separate line items as desired.

DUAL RPT MODELS

Specify the model number as:

RPM3 D-MXXXXb1/MXXXXb2

Where: MXXXXb1 indicates the RPT designation of the Hi RPT. Include **b** only for **b** Type RPT.

MXXXX2 indicates the RPT designation of the Lo RPT.

For example: RPM3 D-A1000/A0100b is a pressure monitor with two RPTs whose designations are A1000 and A0100b. It has six ranges (those of an A1000 RPT and an A0100b RPT as listed in the RPTs and Ranges tables).

In dual RPT systems, if both RPTs are a designation of A1500 or lower, there is only one test port (1/8 in. NPT F). If one or both of the RPTs is of a designation greater than A1500, then there is one test port for each RPT whose fittings are specified in the RPTs and Ranges tables. Liquid filled RPTs always have independent test ports and no SDS.

STANDARD DELIVERY

Each RPM3 is delivered complete with:

- Power cord
- Tilt-up front feet
- Operation and maintenance manual
- Calibration report documenting direct traceability to the United States National Institute of Standards and Technology (NIST)
- CalTool™ for RPM3™ recalibration assistance software with manual

OPTIONS

SPECIAL TEST FLUID FOR HI RPT:

(P/N 07) Specify test fluid to be used

SPECIAL TEST FLUID FOR LO RPT:

(P/N 08) Specify test fluid to be used

UNITS, SI: SI units version

(P/N 04)

ACCESSORIES

MPC1-1000: Manual gas pressure controller (P/N 401067) for vacuum to 1 000 psi (7 000 kPa)

MPC1-3000: Manual gas pressure controller (P/N 401210) for vacuum to 3 000 psi (20 MPa)

VA-MPC-REF, 110V: Vacuum pump (110V) and connections for MPC1 (P/N 400992)

VA-MPC-REF, 220V: Vacuum pump (220V) and connections for MPC1 (P/N 401160)

PK-7000-PPC/MPC: Interconnections kit for RPM3 and MPC1 with quick connector test connections (3 000 psi max) (P/N 400985)

OPG1: Power assisted oil pressure generator/controller for pressure up to 200 MPa (30 000 psi) (P/N 401497)

RACK MOUNT KIT: Rack mount kit for one RPM3 (2V, 3.5 in. panel) (P/N 401465)

COMPASS® for PPC/RPM™:

(P/N 401502) Calibration assistance software to automate pressure calibration using RPM3 as the reference

RPM3™ SPECIFICATIONS

GENERAL

Power Requirements:	85 to 264 VAC, 47 to 440 Hz, 18 VA max consumption
Operating Temperature Range:	15 to 35 °C
Vibration:	Meets MIL-T-28800D
Weight:	3.5 kg (7.7 lb) max
Dimensions:	8 cm H x 22.5 cm W x 20 cm D (3.1 in. x 8.9 in. x 7.9 in.)
Microprocessor:	Motorola 68000, 16 MHz
Communications Ports:	RS-232 (COM1, COM2), IEEE-488.2
Pressure Ranges:	Vacuum to 40 000 psi (275 MPa) Up to six ranges per RPM3
Operating Medium:	Any non-corrosive gas or liquid RPTs < 10 000 psi (70 MPa) set up for gas operation, RPTs > 10 000 psi delivered oil filled b Type RPTs dry (non-condensing) gas only
Pressure Connections:	TEST Port RPT ≤ 10 000 psi: 1/8 in. NPT F RPT > 10 000 psi: DH500 (gland and collar type for coned and left hand threaded tube equivalent to AE F250C, HIP HF4, etc.) Note: RPM3s with two RPTs have only one TEST port if designation of both RPTs is ≤ A1500. If either of the RPTs is > A1500 or if an RPT is liquid filled, there are two TEST ports, one for each RPT.
Gauge Reference Port	1/8 in. NPT F (GXXXX RPTs only)
SDS (Self Defense System):	SDS is included on any ≤ A1500 RPT that is NOT liquid filled. Note: SDS is designed to protect RPTs from accidental overpressure. However, when SDS is present, normal precautions to avoid RPT overpressure should be observed. Even when SDS is present, damage to RPTs due to overpressure is not covered under the product warranty.
CE Conformance:	Available, must be specified

PRESSURE MEASUREMENT

STANDARD RPTs (± FS of Active Range)

Transducer Type:	Bellows or boudon tube loaded isolated oscillating quartz crystal
Warm Up Time: (for temperature stabilization)	≤ 1 500 psi 15 minutes > 1 500 psi 30 minutes
Overpressure Limits:	
Without Effect on Calibration	115 % of range 3
Without Permanent Damage	125 % of range 3
Resolution:	To 1 ppm, user setable by individual range
Temperature Effect:	Fully compensated with active independent temperature measurement from - 20 to 100 °C 0.005 % in normal operating temperature range of 15 to 35 °C

Attitude Effect: 0.008 % /g maximum

Precision¹:	
≤ 1 500 psi	0.005 %
> 1 500 and ≤ 20 000 psi	0.010 %
> 20 000 psi	0.015 %

Predicted Stability²:	All Ranges 90 day / 1 yr
	[%]
Gauge Mode (w/Autozero)	0.003 / 0.009
Absolute Mode (w/Autozero)	0.003 / 0.009
Absolute Mode (w/out Autozero)	0.006 / 0.015

Measurement Accuracy³:	≤ 1 500 psi	> 1 500, ≤ 20 000 psi	> 20 000 psi
	90 day / 1 yr [%]	90 day / 1 yr [%]	90 day / 1 yr [%]
Gauge Mode (w/Autozero)	0.008 / 0.012	0.012 / 0.015	0.020 / 0.022
Absolute Mode (w/Autozero)	0.008 / 0.012	0.012 / 0.015	0.020 / 0.022
Absolute Mode (w/out Autozero)	0.010 / 0.017	0.015 / 0.020	0.022 / 0.025

b TYPE RPTs (± FS of Active Range)

Transducer Type:	Micro-machined piezoresistive silicon
Warm Up Time: (for temperature stabilization)	15 minutes
Overpressure Limits:	
Without Effect on Calibration	120 % of range 3
Without Permanent Damage	150 % of range 3
Resolution:	10 ppm, user setable by individual range
Temperature Effect:	Fully compensated with active independent temperature measurement from - 40 to 85 °C 0.015 % maximum temperature effect in normal ambient 15 to 35 °C operating range

Attitude Effect: Negligible on all axes

Precision¹: 0.015 %

Predicted Stability²:	All Ranges 90 day / 1 yr [%]
Gauge Mode (w/Autozero)	0.01 / 0.03
Absolute Mode (w/Autozero)	0.01 / 0.03
Absolute Mode (w/out Autozero)	0.03 / 0.05

Measurement Accuracy³:	All Ranges 90 day / 1 yr [%]
Gauge Mode (w/Autozero)	0.025 / 0.040
Absolute Mode (w/Autozero)	0.025 / 0.040
Absolute Mode (w/out Autozero)	0.035 / 0.060

¹ Precision: Combined linearity, hysteresis, repeatability.

² Stability: Maximum change in zero and span over specified time period for typical RPT used under typical conditions. As stability can only be predicted and varies from RPT to RPT, stability for a specific RPT should be established from experience.

³ Measurement Accuracy: Maximum deviation of the RPT indication from the true value of the applied pressure including precision, stability, temperature effect and calibration standard accuracy of ± 0.0035 % of reading.

Note: When using an absolute RPT for gauge mode measurements, add ± 2.5 Pa (0.00035 psi) to the precision specification to take into account the resolution and short term stability of the on-board barometer.

Due to a policy of continuous improvement, all specifications contained in this document are subject to change without notice.

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