Sensors Today, Sensing Tomorrow
专注传感，感知未来

# 技术规格书 Datasheet

## RS PM060-DI

## 小型化、低功耗温压一体数字输出传感器

## RS PM060-DI Compact Low Power Digital Pressure and Temp. Dual Output Sensor





**RS PM060-DI** 系列是一款超小尺寸、超低功耗的数字(I²C)型压力和温度双输出高稳定性智能传感器，产品采用模块化、小型化结构设计制造。

测量压力范围 0-50…800Psi，有相对表压、密封表压和绝压可选。

产品最大安装尺寸φ15.7x22mm，特别适用于对安装空间有特别要求及要求省电的应用，比如仪表内置设计的场景。

**RS PM060-DI**

It's an extreme small size and Low Power digital (I²C) pressure and temperature Dual output Sensor, use silicon piezoresistive technology with compact designed.

Pressure Range, 0 -50 … 800 Psi, Gauge (relative), Gauge (sealed) and Absolute available.

## 功能和应用 Features & Applications

PM060-DI 系列产品采用数字运算补偿标定，I²C 数字压力和温度双输出：

在-10°C~70°C 温度区间内产品总精度 TEB≤ ±0.5%(典型值)。

专为物联网时代超低待机功耗、小尺寸、需要长期可靠工作的数据采集应用需求设计，产品具有长期可靠的稳定性。

产品压力介质接触部分采用 SUS316L 不锈钢密封焊接设计,保证压力传感器的可靠性和耐用性，该系列产品设计有 EMI 防护能力，能满足大多数应用环境。

PM060-DI pressure transmitter are digital compensated and with I²C digital output for pressure and temperature;

TEB ≤±0.5%(Typical) between -10°C ~70 °C.

Products are designed for lower power consumption applications, supper small sizes and with long-term stabilities.

Material contacts with Media are SUS316L S. steel, and welded together to enhance the product reliability and durability, also designed with EMI protection.

## 产品特点：
## Product Highlights:

- ✓ 超小尺寸，最大外径φ15.7mm
- ✓ 压力和温度双信号数字输出(I2C)
- ✓ 高精度±0.25%FS ,TEB≤±0.5%FS
- ✓ uA 级待机功耗
- ✓ 支持 I²C 地址改写
- ✓ 高过载，全系列≥3x 过载设计
- ✓ 支持低电压，最低电压至 2.7Vdc

- ✓ Smaller, overall size < Dia 15.7mm
- ✓ Digital Interface (I²C), dual output for pressure and temperature;
- ✓ ±0.25%FS Accuracy, TEB≤±0.5%FS
- ✓ Super Low power consumption
- ✓ Name I²C Address function
- ✓ ≥3x FS Pressure Overload
- ✓ Voltage supplies lower to 2.7Vdc

## 技术参数
## Technical Data

### 参数指标 Parameters

除非另有说明，电压 3.3VDC,环境温度 25°C;
Unless otherwise stated: Supply Voltage: 3.3VDC, Ambient Temperature 25°C.

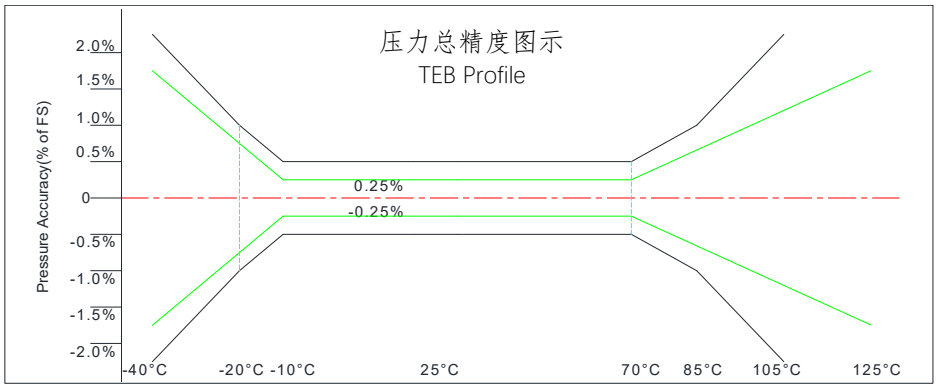
| 参数表 Parameter | 最小 Min | 典型值 TYP. | 最大 Max | 单位 Units | 备注 Notes |
|---|---|---|---|---|---|
| 压力输出 0 点值(10% ~ 90%) Zero Pressure Output | | 666 | | HEX counts | 1 |
| 压力输出 0 点值(5% ~ 95%) Zero Pressure Output | | 333 | | HEX counts | 1 |
| 满量程压力输出值(10% ~ 90%) Full Scale Pressure Output | | 399A | | HEX counts | 1 |
| 满量程压力输出值(5% ~ 95%) Full Scale Pressure Output | | 3CCB | | HEX counts | 1 |
| 25°C 时精度 Accuracy @25°C | -0.25 | ±0.1 | +0.25 | % FS | |
| 总误差 Total Error Band(-10°C ~ 70°C) | -0.5 | ±0.25 | 0.5 | % FS | 2 |
| 压力分辨率 Pressure Resolution | 0.008 | | | % FS | |
| 温度测量范围 Temperature Measurement Range | -10 | | 70 | °C | 3 |
| 温度测量精度 Temperature Accuracy | -1.5 | | 1.5 | °C | 4 |
| 温度分辨率 Temperature Resolution | | 0.1 | | °C | |
| 工作电压范围 Input Voltage Range | 2.7 | 3.3 | 5.5 | $V_{DC}$ | 5 |
| 供电电流 – 连续工作模式 Supply Current – Continuous Mode | | 2.8 | | mA | |
| 供电电流 – 睡眠工作模式 Supply Current – Sleep Mode | | 2 | | uA | |
| 负载电阻 Load Resistance (RL) | 10 | | | KΩ | |
| 绝缘电阻 Insulation Resistance (250Vdc) | 100 | | | MΩ | 6 |
| 长期稳定性（零点和满量程） Long Term Stability (Offset & Span) | | ±0.2 | | %FS/Year | |
| 补偿温度范围 Compensated Temperature | -10 | | 70 | °C | |
| 工作温度范围 Operating Temperature | -40 | | 125 | °C | |
| 存储运输温度 Storage Temperature | -40 | | 125 | °C | |
| 输出压力分辨率 Output Pressure Resolution | | | 14 | Bits | |
| 输出温度分辨率 Output Temperature Resolution | 8 | | 11 | Bits | |

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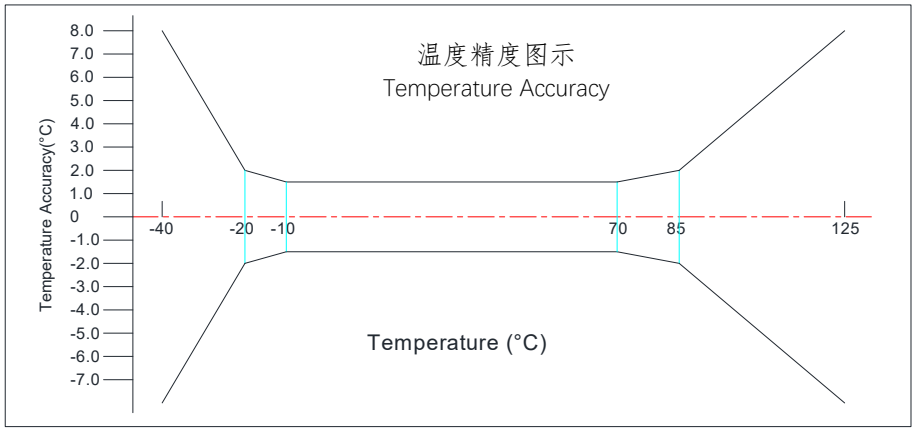
**Continuous**

| | | | | | |
|---|---|---|---|---|---|
| 响应时间 Response Time | | 1.6 | | ms | |
| 加电后数据准备时间<br>Start Time to Data Ready | | 10 | | mS | 7 |
| 耐用性 Durability,<br>压力 P：10~90% FS | >10 x $10^6$ 次循环 cycles | | | | |
| 输出类型<br>Output Type | 10%-90% or 5%-95% | | | | |
| 连接方式<br>Interface Type | I²C (ADDR, 0x28H)<br>I²C (ADDR, 0X36H) – 需定制(Customized)<br>I²C (ADDR, 0x46H) - 需定制(Customized)<br>SPI | | | | |
| 压力适用媒介<br>Media – Pressure Contact | 适合对 316/316L 无腐蚀的液体或者气体<br>Liquids and gases compatible with 316/316L Stainless Steel | | | | |

1. 绝压类型抽真空测量，表压和密封表压对大气测量，输出比例跟实际供电电压没有比例关系。
   Measured at vacuum for absolute(A), ambient for gauge(G) and sealed gauge(S). Output is not radiometric to supply voltage.
2. TEB 总误差包括补偿范围内的校准误差和温度影响，细节见“压力总精度图示”。
   Total Error Band: includes calibration errors and temperature effects over the compensated range. See “TEB Profile”.
3. 超出该温度范围，温度精度误差会很大。
   Temperature data will not be accurate if it’s out of range -10°C to 70°C.
4. 在补偿范围内，温度偏差依据最优线性直线比计算出来，补偿范围外温度精度，见“温度精度图示”。如有更高温度精度需求，请联系罗迪传感销售。
   Within the compensated temperature range, the deviation is measured from a best fit straight line (BFSL) fitted to the output. For errors beyond the compensated temperature range, See “Temperature Accuracy” Profile.
   More Temperature Accuracy version is available upon request.
5. 为了保证产品精度，建议使用 3.3±5%VDC 的供电。
   For product accuracy purpose, recommend to supply 3.3±5% VDC.
6. 芯体引线和外壳之间的电阻值。
   Resistance measured between case and sensing element.
7. 加电后数据准备时间为断电再加电后第 1 次运行的时间，后续持续工作的数据准备时间见传感器响应时间。
   Start time to data ready is the time to get valid data after POR (Power on Reset). The time to get subsequent valid data is then specified by the response time specification.
8. 避免硬接触压力膜片，防止膜片在操作或者运输过程中碰伤或损坏，影响产品工作性能。
   Don’t direct mechanical contact with Diaphragm, Diaphragm surface must remain free of defects (scratches, punctures, dents, fingerprints, etc.) for device to operate properly. Caution is advised Always protect diaphragm not be damaged during handing or transportation.




1). TEB (Total Error Band), 包括准确性、线性度、迟滞性、重复性和热影响误差；
TEB includes accuracy, Linearity, Hysteresis. Repeat and Thermal affects;




## 过载与爆裂压力(静态) Overload and Burst Pressure (Static)

| 标定压力<br>Pressure Range | 50 Psi<br>3 Bar | 100 Psi<br>7 Bar | 150 Psi<br>10 Bar | 200 Psi<br>16 Bar | 300 Psi<br>25 Bar | 500 Psi<br>40 Bar | 800 Psi<br>60 Bar |
|---|---|---|---|---|---|---|---|
| 过载倍数<br>Overload (times of FS) | 3x | 3x | 4x | 3x | 4x | 4x | 3x |
| 爆裂压力<br>Burst Pressure(bar) | 100 | 100 | 100 | 100 | 300 | 300 | 300 |
| 压力连接器选择<br>Fitting Selection | M8x1.0, M10x1.0, G1/8A, 1/8-27NPT | | | | | | |

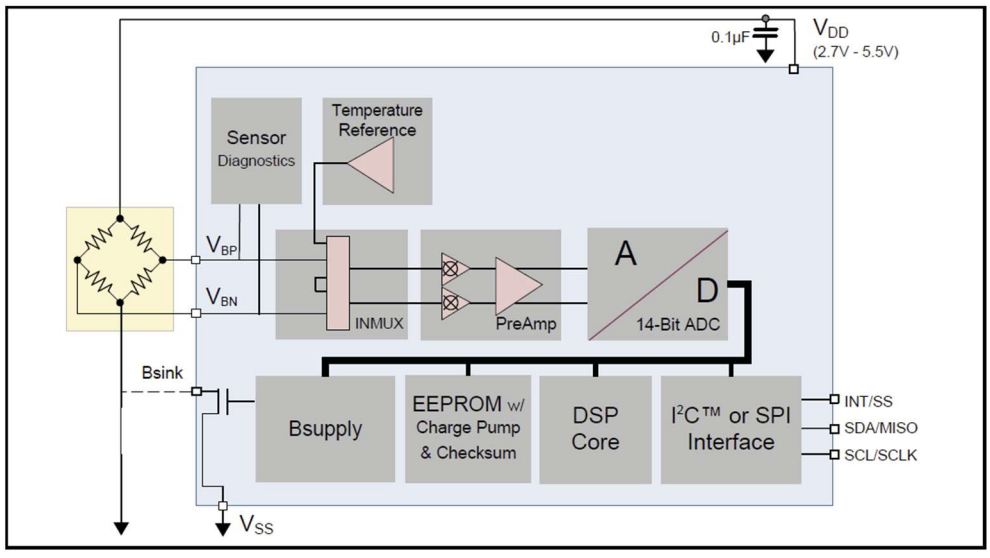
*可以定制其他压力类型或更大过载需求，请联系罗迪传感销售。
Other pressure range or more pressure overload requirement are available upon request.

## 环境条件 Environment

| | |
|---|---|
| 错接线保护 Miswiring | 电源+/-接错有保护 Protected(V+ and V-) |
| 机械冲击 Shock IEC 60068-2-27 | 峰值 Peak: 100G |
| 机械震动 Vibration IEC 60068-2-6 (正弦, Sinus)<br>IEC 60068-2-64 (随机,Random) | 正弦 Sinus: 20G, 10-2000Hz<br>随机 Random: 7.5G rms, 5-1000Hz |

## 传输功能 Transfer Functions

## 功能框架图 Block Diagram

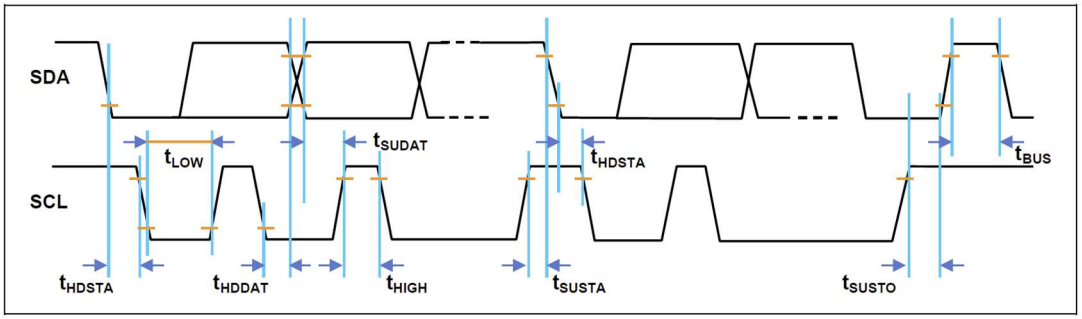


## I²C 通讯接口规范 I²C Interface Parameters

| 参数 Parameters | 标示 Symbol | 最小值 Min | 典型值 Typ. | 最大值 Max | 单位 Units |
|---|---|---|---|---|---|
| 时钟频率 SCL Clock Frequency | FSCL | 100 | | 400 | kHz |
| 时钟低脉冲维持时间 Minimum SCL Clock Low Width | tLOW | 0.6 | | | us |
| 时钟高脉冲维持时间 Minimum SCL Clock High Width | tHIGH | 0.6 | | | us |
| SDA建立时间 Data setup time on SDA relative to SCL edge | tSUDAT | 0.1 | | | us |
| SDA保持时间 Data hold time on SDA relative to SCL edge | tHDDAT | 0.0 | | | us |
| 每次开始时的建立时间 Start condition setup time relative to SCL edge | tSUSTA | 0.1 | | | us |
| 开始条件保持时间 Start condition hold time relative to SCL edge | tHDSTA | 0.1 | | | us |
| 停止时间建立时间 Stop condition setup time on SCL | tSUSTO | 0.1 | | | us |
| 两次通讯之间间隔时间 BUS free time between stop and start condition | tBUF | 2 | | | us |

Note:Combined low and high widths must equal or exceed minimum SCLK period

## I²C 时序图 I²C Timing Diagram

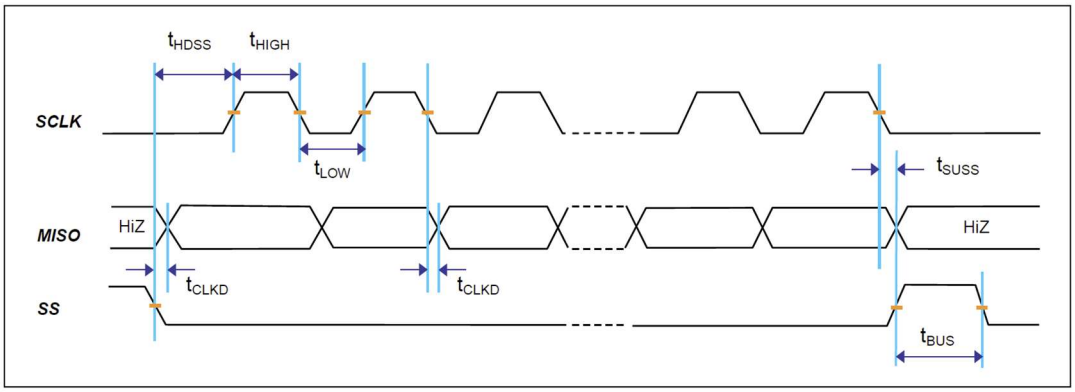



## SPI 通讯接口规范 SPI Interface Parameters

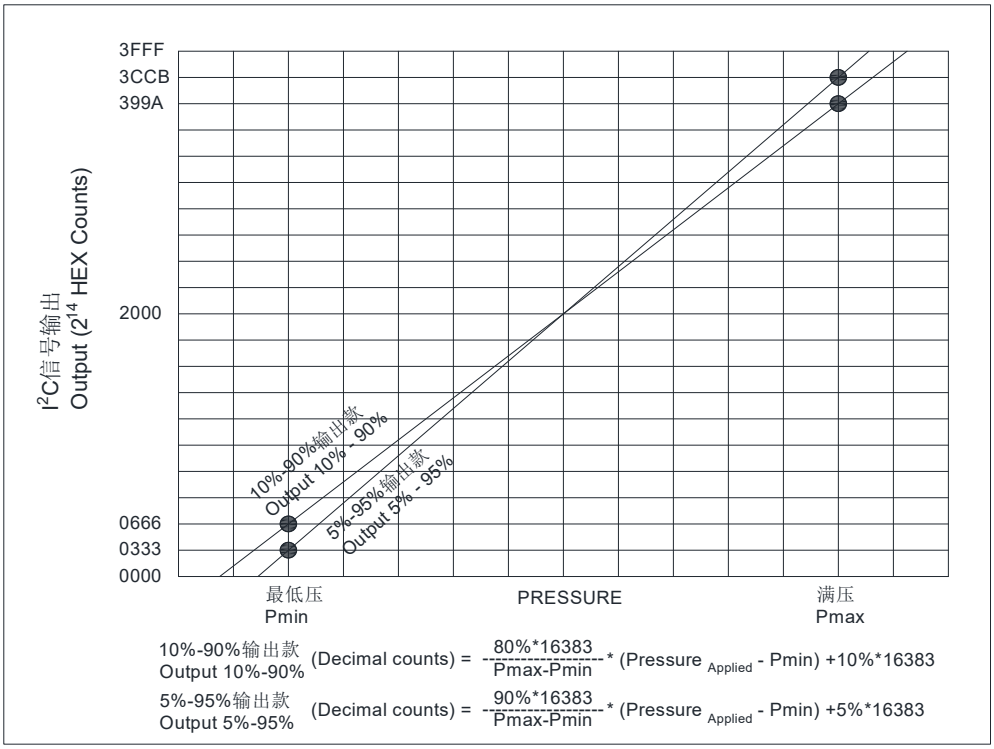
| 参数 Parameters | 标示 Symbol | 最小值 Min | 最大值 Max | 单位 Units |
|---|---|---|---|---|
| SCLK Clock Frequency | fSCL | 50 | 800 | KHz |
| Min. SCLK clock low width | Tlow | 0.6 | | us |
| Min. SCLK clock high width | tHIGH | 0.6 | | us |
| SS drop to first clock edge | tHDSS | 2.5 | | us |
| Clock edge to data transition | tCLKD | 0 | 0.1 | us |
| Rise of SS relative to last clock edge | tSUSS | 0.1 | | us |
| Bus free time between rise and fall of SS | tBUS | 2 | | us |

Note: Combined low and high widths must equal or exceed minimum SCLK period.

## SPI 时序图 SPI Timing Diagram



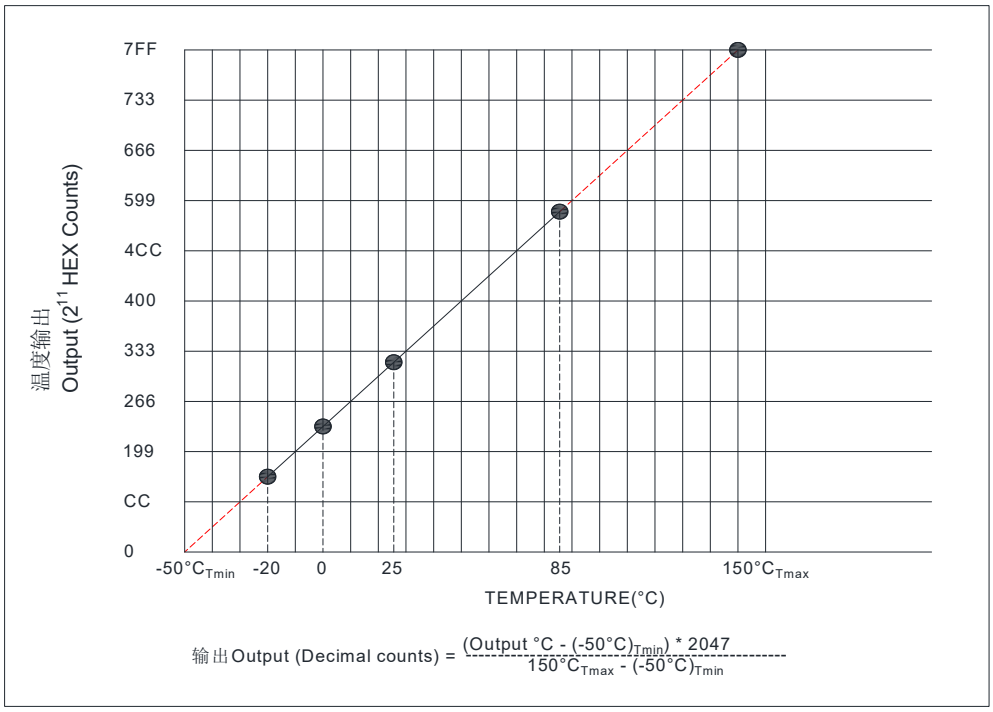

## 压力传输功能 Pressure Transfer Functions




## 压力输出重要百分比位 Senor Outputs at Key Percentages

| 输出%<br>% of Output | 数字计数（十进制）<br>Digital Counts(decimal) | 数字计数（十六进制）<br>Digital Counts(hex) |
|---|---|---|
| 0 | 0 | 0 x 0000 |
| 5 | 819 | 0 x 0333 |
| 10 | 1638 | 0 x 0666 |
| 50 | 8192 | 0 x 2000 |
| 90 | 14746 | 0 x 399A |
| 95 | 15563 | 0 x 3CCB |
| 100 | 16383 | 0 x 3FFF |

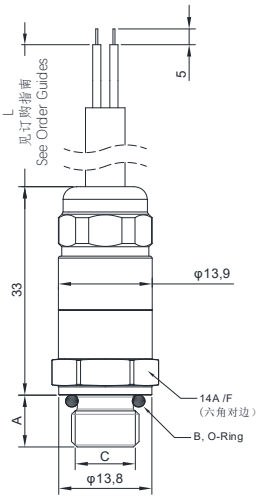
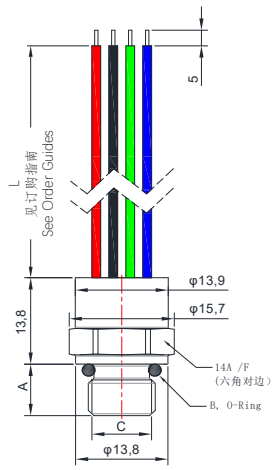
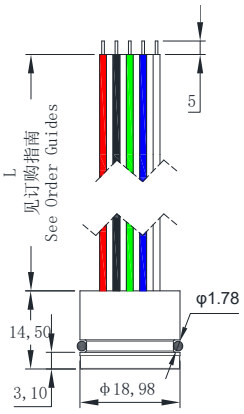
## 温度传输功能 Temperature Transfer Functions




## 温度输出 vs 计数器 Temperature Output vs Counts

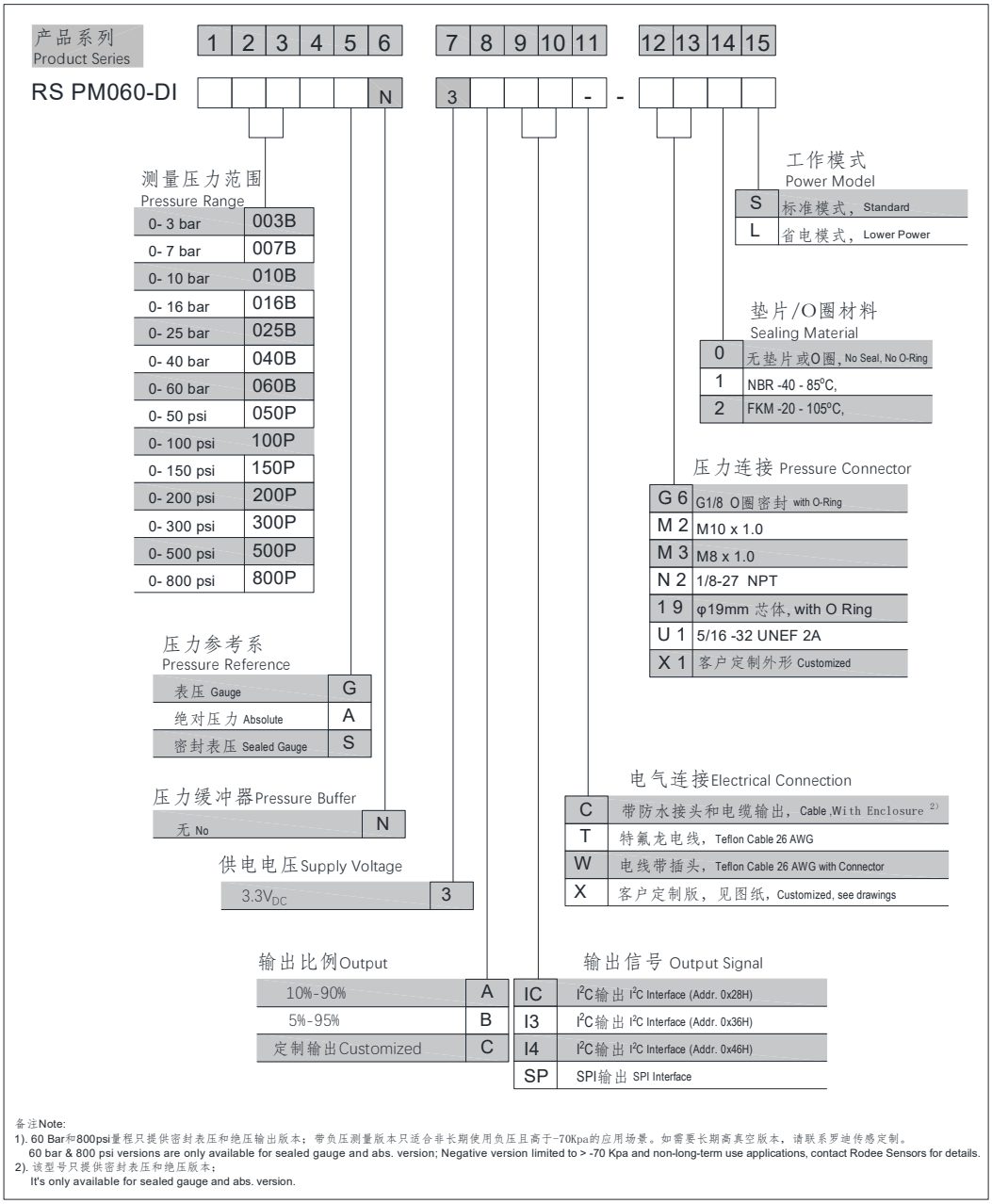
| 输出°C<br>Output °C | 数字计数（十进制）<br>Digital Counts(decimal) | 数字计数（十六进制）<br>Digital Counts(hex) |
|---|---|---|
| -50 | 0 | 0 x 0000 |
| -20 | 307 | 0 x 0133 |
| 0 | 512 | 0 x 0200 |
| 25 | 767 | 0 x 02FF |
| 50 | 1024 | 0 x 0400 |
| 85 | 1381 | 0 x 0565 |
| 150 | 2047 | 0 x 07FF |

## 电气连接 Electrical Connection

| 型号 Connections | 带密封外壳电缆输出 PVC Cable with enclosure | 特氟龙 26 AWG Teflon Cable | φ19mm 标准芯体，带 26AWG Teflon 线 |
|---|---|---|---|
| 接线图示及外形 Connection Figure & Profile |  |  |  |
| 尺寸 Dimensions | C 螺纹类型 Fitting / A / B O Ring | | O Ring: φ16.0 x 1.78 |
| | G1/8 / 7.6 / φ8.0 x 1.9 | | |
| | M10x1.0 / 8.2 / φ8.0 x 1.9 | | |
| | M8x1.0 / 8.2 / φ6.07 x 1.78 | | |
| | 1/8-27 NPT / 8.7 / N/A | | |
| | 5/16 -32 UNEF 2A / 5.7 / φ6.0 x 1.0 | | |
| 适用压力类型 Pressure Type | 密封表压、绝压 Sealed Gauge, Absolute | 表压、密封表压、绝压 Relative Gauge, Sealed Gauge, Absolute | 表压、密封表压、绝压 Relative Gauge, Sealed Gauge, Absolute |
| $I^2C$ 输出 $I^2C$ Interface | 红色 Red: 电源 V+<br>黑色 Black: 电源 V-<br>绿色 Green: SDA<br>白色 White: SCL | 红色 Red: 电源 V+<br>黑色 Black: 电源 V-<br>绿色 Green: SDA<br>蓝色 Blue: SCL | 红色 Red: 电源 V+<br>黑色 Black: 电源 V-<br>绿色 Green: SDA<br>蓝色 Blue: SCL |
| SPI 输出 SPI Interface | 不适用 N/A | 红色 Red: 电源 V+<br>黑色 Black: 电源 V-<br>绿色 Green: MISO<br>蓝色 Blue: SCLK<br>白色 White: SS | 红色 Red: 电源 V+<br>黑色 Black: 电源 V-<br>绿色 Green: MISO<br>蓝色 Blue: SCLK<br>白色 White: SS |
| 材料 Material | 316L 不锈钢 S. Steel<br>304L 不锈钢 S. Steel<br>PVC Cable<br>线头镀锡 Tin Plated Ends | 316L 不锈钢 S. Steel<br>304L 不锈钢 S. Steel<br>Teflon Cable<br>线头镀锡 Tin Plated Ends | 316L 不锈钢 S. Steel<br>304L 不锈钢 S. Steel<br>Teflon Cable<br>线头镀锡 Tin Plated Ends |
| 防护等级 Enclosure | IP68 | IP67<br>密封表压、绝压<br>(Sealed gauge and Absolute) | IP67<br>密封表压、绝压<br>(Sealed gauge and Absolute) |
| 工作温度 1) Operating Temperature | -40°C ~ 85°C | -40°C ~ 125°C | -40°C ~ 125°C |

1) 除了工作温度限制外，温度测量范围为-10°C-70°C。Temperature measurement range is -10°C to 70°C.
2) 其他螺纹规格压力连接头，请联系罗迪传感销售。Other pressure connectors, please contact Rodee Sensors.

# 产品订购指南
# Ordering Guides




备注Note:
1). 60 Bar和800psi量程只提供密封表压和绝压输出版本；带负压测量版本只适合非长期使用负压且高于-70Kpa的应用场景。如需要长期高真空版本，请联系罗迪传感定制。
60 bar & 800 psi versions are only available for sealed gauge and abs. version; Negative version limited to > -70 Kpa and non-long-term use applications, contact Rodee Sensors for details.
2). 该型号只提供密封表压和绝压版本；
It's only available for sealed gauge and abs. version.

**例如：**
PM060-DI 016BGN-3BICT-M21L
**代表：**
测量压力范围 0-16 bar,
表压,
无压力缓冲器,
3.3V 供电版本,
5%-95%输出
I2C 数字输出,
特氟龙电线,
M10x1.0 螺纹,
NBR 密封圈,
省电模式输出。

**Order Example:**
PM060-DI 016BGN-3BICT-M21L
**Represented;**
Pressure range 0-16 bar,
Gauge (Relative),
No pressure buffer,
3.3V Supply Voltage,
5%-95% output
I²C Interface
Teflon wires,
M10x1.0 Fitting,
NBR O Ring;
Lower Power model

* 其它测量压力量程、压力连接器和信号连接型号；
* 以及其它电压输出范围；
请联系罗迪传感销售

* Other pressure ranges, pressure connectors and electrical connections;
* Other voltage modes requested, please contact **Rodee Sensors.**


## 销售联系方式

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