## Technical Datasheet

## Performance Series <br> Bellows Operated Pressure Switch

Models: 201, 202, 203 \& 281

## Key Features

- Precision stainless steel mechanism for arduous atmospheres and high humidity.
- Set point adjustable over whole range against calibrated scale with tamperproof adjuster.
- Weatherproof and Flameproof models ATEX and IECEx.
- Safety vented or blow out device as standard.
- NACE MR-01-75 compatibility.
- Hermetically sealed microswitch option.
- Models for fixed switching differential, adjustable differential and HI-LO operation.
- Precise and accurate operation guaranteed by use of hydraulic formed bellows, or capsule stack.
- Ranges available up to 75 bar (1,000 psi). Static pressure up to 100 bar (1,400 psi).


## Series Overview

- Designed in the mid-1970s and developed over subsequent years, the Performance Series switch range offers users the broadest range of options, the highest levels of set-point repeatability and the confidence of long term performance that a mature product such as this can prove.
- The models 201/202/203/281 Performance Series pressure switches utilise bellows type sensor that offer a very linear response to pressure change. This sensor, coupled with a precision stainless steel mechanism designed to minimise friction in the moving parts, helps deliver the market leading performance customers have come to expect from the series.



## Product applications

The 201 Performance Series is suitable for a wide range of applications in:

- Oil \& Gas
- Chemical
- Petrochemical
- Refining
- Power
- Food Industry

The choice of models available ensures that the 201/2/3/281 Performance Series is suitable for use in:

- Corrosive atmospheres
- Resistant to chemical attack



## How to order

Switches can be configured by selecting codes representing the desired features from the tables that follow. The chart below, describes how the model code is built up. For assistance in configuring a switch that best suits your needs,


NOTE: Options shaded in the following tables are the most common options and are available on the quickest lead-times and at the lowest cost.

NOTE: Only the most common options are shown in this data sheet. Should you require a feature that is not shown, please contact your local sales office for further details.

## Technical Specification

| Accuracy: | Set point repeatability $\pm 0.5 \%$ of span at $20^{\circ} \mathrm{C} / 68^{\circ} \mathrm{F}$ ambient. Scale accuracy $\pm 2 \%$ of full scale. |
| :---: | :---: |
| Storage Temperature: | -25 to $+60^{\circ} \mathrm{C} /-13$ to $+140^{\circ} \mathrm{F}$ |
| Ambient Temperature: | $-25 \text { to }+60^{\circ} \mathrm{C} /-13 \text { to }+140^{\circ} \mathrm{F}$ <br> Special build is also available for temperatures down to $-60^{\circ} \mathrm{C}\left(-76^{\circ} \mathrm{F}\right)$ |
| Maximum Process Temperature: | Subject to appropriate installation practice, the component parts will withstand up to $+60^{\circ} \mathrm{C}\left(+140^{\circ} \mathrm{F}\right)$. For process temperatures up to $+120^{\circ} \mathrm{C}\left(+248^{\circ} \mathrm{F}\right)$, order WETTED PARTS Code R (Table 4). For higher temperatures, refer to special engineering. |
| Maximum Enclosure Temperature: | Instrument has not been tested regarding maximum temperature with respect to dust layer above 50 mm . Therefore product is not suitable for operating under excess layer of dust. |
| Enclosure classification: | IP66 / NEMA 4X / Flameproof Ex d |
| Switch output: | SPDT or DPDT snap action microswitch (standard) Hermetically sealed (optional) |
| Electrical rating: | See Table 6 |
| Process Connection: | Rc 1/4 (BSP), $1 / 4$ NPT Internal, $1 / 2$ NPT Internal \& 1/2 NPT External |
| Approximate Weight: | Enclosures: "W \& N" $3.1 \mathrm{~kg} / 6.8 \mathrm{lb}$; "A \& O" $3.9 \mathrm{~kg} / 8.6 \mathrm{lb}$; "H" $4.6 \mathrm{~kg} / 10.2 \mathrm{lb}$; "K" 9.4kg/20.7lb; "M" 9.9kg/21.8lb. |

## Enclosure

## FINISH

All enclosures except Type A are finished in light grey epoxy resin paint. Special finishes to order.

## INTRINSIC SAFETY

Because of the low voltages and currency of I.S. circuits, we recommend using gold and/or sealed contacts.

NOTE: Enclosure Codes W \& A with range $\mathrm{BC}, \mathrm{C} 6, \mathrm{E} 1$ and $\mathrm{E} 8(\mathrm{BU}, \mathrm{CP}, \mathrm{E} 4$, E7) have weather protection reduced to IP54. In the interests of reliability not all enclosures are available with all wetted parts materials. See Table 4.

Temperatures in Table 1 refer to limitations for certified enclosures.

See TECHNICAL SPECIFICATION

## Models

## NOTE:

Models 202, 203 are not supplied with all materials of wetted parts. See table 4.

TABLE 1


| ENCLOSURE TYPES | Code |
| :---: | :---: |
| Weatherproof Enclosures |  |
| General Purpose <br> The basic enclosure is pressure die-cast in zinc alloy, offering weather protection not less than NEMA $4+13 / I P 66$. | W |
| For Aggressive Atmospheres Investment cast enclosure in austenitic stainless steel with weather protection not less than NEMA 4X + 13/IP66. | A |
| Flameproof Enclosures Category 2 (Zone 1) | H |
| ATEX Ex db IIC T6 ( -60 to $+40^{\circ} \mathrm{C}$ ), $\mathbf{T 4}\left(-60\right.$ to $\left.+80^{\circ} \mathrm{C}\right)$ II 2 G D <br> Gravity die-cast enclosure in aluminium-silicon alloy. <br> Suitable for outdoor use, IP66 / NEMA 4. |  |
| IECEx Ex db IIC |  |
| ATEX Ex db IIC T6 ( -60 to $+40^{\circ} \mathrm{C}$ ), $\mathrm{T} 4\left(-60\right.$ to $\left.+80^{\circ} \mathrm{C}\right)$ II 2 G D As Code H , but sand cast in high quality grey iron. <br> Ex II 2 GD | K |
| IECEx Ex db IIC |  |
| Exn Enclosures Category 3 (Zone 2). | $N$ |
| Type of Protection Exn II T6 (-25 to $\left.+60^{\circ} \mathrm{C}\right)$, T4 $\left(-25 \mathrm{TO}+80^{\circ} \mathrm{C}\right)$ II 3 G D <br> As code 'W' but Exn. <br> Weatherproof to NEMA 4/IP66. <br> Limited switching facility (see Table 6). <br> II 3 GD |  |
| As ' $N$ ' but with investment cast enclosure in austenitic stainless steel as 'A'. | 0 |

## TABLE 2



|  | Code |
| :--- | :---: |
| Fixed Switching Differential <br> See Tables 10A \& 10C. |  |
| Basic model giving close, fixed switching differential using |  |
| proprietary microswitch operated by high integrity stainless steel |  |
| mechanism. Set point field adjustable over full range against |  |
| calibrated scale. SPDT \& DPDT options available. |  |$\quad 201$

## Electrical Entry

Adaptors are available for other popular thread sizes.

## Enclosures 'W' and ' N '

Standard option code $1(22 \mathrm{~mm}$ dia) is provided with a nylon 22/20 reducer and fibre washer suitable for a standard M20 cable gland and back nut. Option code 0 elbow adaptor is factory fitted. Adaptor kits may also be provided retrospectively to fit at site if required. Ask for details. See diagrams for dimensions.

## 'W' and 'N' SAFETY NOTE

If a metal cable gland is site fitted it must either be earthed locally or an earth/gland plate must be used to connect the body of the gland at the enclosure earthing point. Earth/gland plates can be provided either factory fitted or in kit form for site assembly. Ask for details.

Material of Wetted Parts

Not all ranges are available with all materials. Refer to Table 5 for availability.

## Setting Ranges

$P_{\max }=$ maximum working pressure
Ranges $\mathrm{BC}, \mathrm{C} 6$ \& E 1 ( $\mathrm{BU}, \mathrm{CP}, \mathrm{E} 4$ ) not available on Model 202. Range G1 (GF) is only available as Models 201/281. available on HI-LO model (281).
$\dagger$ Available as Special Engineering.

TABLE 3


|  | Code |
| :--- | :---: |
| Enclosures W \& N: Clearance for 20mm (3/4 in) outside dia conduit. | 1 |
| Enclosures H, K, A \& O: M20 x 1.5 ISO thread (direct) | 0 |
| Enclosures H \& K: M20 x 1.5 ISO thread, dual entry. | 5 |
| Enclosures H \& K: 3/4-NPT INT. | 3 |
| Enclosures H \& K: 1/2-NPT INT. | 2 |
| Enclosures H \& K: 3/4-NPT INT dual entry. | 6 |
| Enclosure W: M20 x 1.5 elbow adaptor. | 0 |
| Enclosure N: M20 x 1.5 straight adaptor (Approved). | 0 |

TABLE 4


|  | Code |
| :--- | :---: |
| Stainless steel bellows/capsule stack and process connection all <br> welded fabrication. | 2 |
| Nickel Alloy (Monel) bellows/capsule stack and process connection. <br> Suitable for NACE MR-01-75. All welded fabrication. | M |



| $\mathrm{P}_{\text {max }}$ |  | Range |  |  |  |  |  | Code |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| bar | psi | bar | mbar | Code | psi | In. Hg | In. $\mathrm{H}_{2} \mathrm{O}$ |  |
| 1.4 | 20 |  | -1000 to 0 | A0 |  | -30 to 0 |  | AB |
| 1 | 15 |  | -12.5 to +12.5 | BC§* |  |  | -5 to 5 | BU§* |
| 4 | 60 | -1 to 1.5 |  | G3 | -14.5 to +20 |  |  | GK |
| 1 | 15 |  | 3 to 25 | C6§* |  |  | 1 to 10 | CP§* |
| 1 | 15 |  | 5 to 120 | E1* |  |  | 2 to 50 | E4* |
| 1 | 15 |  | 50 to 350 | E8 | 1 to 5 |  |  | E7 |
| 1.4 | 20 | 0.2 to 1 |  | G1* | 3 to 15 |  |  | GF* |
| 2 | 30 | 0.1 to 1.5 |  | G5 | 1 to 20 |  |  | GP |
| 8 | 100 | 0.2 to 4 |  | J0 | 2 to 60 |  |  | J3 |
| 9 | 125 | 0.2 to 7 |  | M1 | 3 to 100 |  |  | M4 |
| 20 | 300 | 0.3 to 15 |  | P6 | 4 to 200 |  |  | PB |
| 40 | 600 | 6 to 25 |  | Q2 | 85 to 400 |  |  | QB |
| 100 | 1400 | 10 to 40 |  | R3 | 140 to 600 |  |  | RB |
| 100 | 1400 | 15 to 75 |  | S7 | 200 to 1000 |  |  | SB |


| Availability material code (table 4) |  |  | Range code |
| :---: | :---: | :---: | :---: |
| 1 | 2 | M |  |
|  | $\sqrt{ }$ | $\dagger$ | A0/AB |
|  | $\sqrt{ }$ | $\sqrt{ }$ | BC/BU |
| $\sqrt{ }$ | $\sqrt{ }$ | $\dagger$ | G3/GK |
|  | $\sqrt{ }$ | $\sqrt{ }$ | C6/CP |
| $\sqrt{ }$ | $\sqrt{ }$ | $\sqrt{ }$ | E1/E4 |
|  | $\sqrt{ }$ | $\sqrt{ }$ | E8/E7 |
| $\sqrt{ }$ | $\sqrt{ }$ | $\checkmark$ | G1/GF |
|  | $\sqrt{ }$ | $\sqrt{ }$ | G5/GP |
|  | $\sqrt{ }$ | $\sqrt{ }$ | J0/J3 |
| $\sqrt{ }$ | $\sqrt{ }$ | $\sqrt{ }$ | M1/M4 |
| $\sqrt{ }$ | $\sqrt{ }$ | $\sqrt{ }$ | P6/PB |
|  | $\sqrt{ }$ | $\sqrt{ }$ | Q2/QB |
|  | $\sqrt{ }$ | $\sqrt{ }$ | R3/RB |
|  | $\sqrt{ }$ | $\sqrt{ }$ | S7/SB |

## Switch Options

## TABLE 6



A much wider variety of switching options can be engineered to customer's requirements for Model 201 switches including heavy DC, manual latching, pneumatic output etc. On Models 202, 203 \& 281 only the switching options specified can be supplied. Please consult our engineers for further information.


## Process Connection

Other thread specifications and sizes are available without using adaptors.

Adaptors are available for applications where their use is permitted.

## Options \& Treatments

Combinations available, apply for details.

## Special Engineering

Last 4 digits of model code only used when special engineering is required.

TABLE 7


|  | Code |
| :--- | :---: |
| Rc $1 / 4$ (1/4 BSP tr INT) to ISO $7 / 1$ | A |
| $1 / 4-18$ NPT INTERNAL | F |
| $1 / 2-14$ NPT INTERNAL | H |
| $1 / 2-14$ NPT EXTERNAL | J |



|  | Code |
| :--- | :---: |
| Tropicalisation High humidity atmospheres | 01 |
| Marine and Offshore Saline atmosphere or salt spray | 02 |
| Ammonia Process (wetted) parts and construction suitable for <br> atmospheric ammonia | 03 |
| Oxygen Service 2: Process (wetted) parts are cleaned for oxygen | 04 |
| Oxygen Service 3: Process and non-process parts are cleaned for use <br> with oxygen | 05 |
| Stainless Steel Pipe Mounting Bracket Permits local 2" pipe work to be <br> utilized for mounting the instrument | 10 |
| Tagging - Variety of tagging methods are available | APPLY <br> FOR <br> DETAILS |
| Applies when - no option is required and selection is made from <br> special engineering | 00 |



## Performance Data

## Bar Units

Due to manufacturing tolerances the figures quoted in these tables are for guidance only and are typical for weatherproof models.

Flameproof models maybe up to 2 times higher depending on the range. Should the differential be critical for specific applications our engineers should be consulted prior to ordering.

Model 281: The switching differential on each point may be up to 1.5 times that of Table 10A \& C. Care must be exercised, therefore, in specifying high differential switches on sensitive ranges, or set point separation less than 3 times switching differential.

TABLE 10

MODELS 201 (281)

| Range Code | Range mbar/bar | Wetted parts code | SPDT OPTIONS (mbar) |  |  |  |  | DPDT OPTIONS (201 only) (mbar) |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | $\begin{gathered} 00 \\ (20) \end{gathered}$ | $\begin{gathered} 02 \\ (22) \end{gathered}$ | $\begin{gathered} 04 \\ (24) \end{gathered}$ | $\begin{aligned} & 08 / 0 \mathrm{G} \\ & (28 / 2 \mathrm{G}) \end{aligned}$ | $\begin{gathered} \mathrm{H} 2 \\ (\mathrm{H} 4) \end{gathered}$ | 01 | 03 | 05 | 09/0H | H3/H6 |
| A0 | -1000 to 0 | 2 | 14 | 43 | 15 | 64 | 150 | 20 | 56 | 22 | 75 | 225 |
| BC | -12.5 to +12.5 | 2M | 2 | 6 | 2 | 13 | 5 | 3 | 10 | 4 | 15 | 8 |
| G3 | -1 to +1.5 | 2 | 15 | 46 | 16 | 71 | 180 | 20 | 59 | 23 | 82 | 270 |
| C6 | 3 to 25 | 2M | 2 | 6 | 2 | 13 | 5 | 3 | 10 | 4 | 15 | 8 |
| E1 | 5 to 120 | 2M | 2 | 7 | 2 | 14 | 5 | 4 | 11 | 4 | 16 | 8 |
| E8 | 50 to 350 | 2M | 2 | 7 | 2 | 14 | 6 | 3 | 10 | 4 | 16 | 9 |
| G1 | 0.2 to 1 | 2M | 6 | 18 | 6 | 30 | 28 | 8 | 22 | 8 | 35 | 42 |
| G5 | 0.1 to 1.5 | 2M | 5 | 17 | 6 | 25 | 80 | 10 | 25 | 10 | 29 | 120 |
| J0 | 0.2 to 4 | 2M | 34 | 106 | 36 | 160 | 420 | 50 | 234 | 52 | 190 | 630 |
| M1 | 0.2 to 7 | 2M | 50 | 112 | 38 | 180 | 500 | 50 | 139 | 54 | 200 | 750 |
| P6 | 0.3 to 15 | 2M | 76 | 240 | 80 | 390 | 1200 | 100 | 285 | 110 | 440 | 1800 |
| Q2 | 6 to 25 | 2M | 160 | 492 | 165 | 800 | 2300 | 210 | 587 | 230 | 900 | 3450 |
| R3 | 10 to 40 | 2M | 310 | 991 | 340 | 1500 | 3000 | 440 | 1300 | 490 | 1700 | 4500 |
| S7 | 15 to 75 | 2M | 330 | 1000 | 350 | 1600 | 3060 | 460 | 1300 | 510 | 1900 | 4590 |

MODELS 202, 203
TABLE 10B

| Range Code | Range mbar/bar | Wetted parts code | 202 (mbar/bar value) |  |  |  | 203 (mbar/bar value) |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | SPDT ONLY |  |  |  | SPDT |  | DPDT |  |
|  |  |  | 0C |  | 0D |  | 02 or 04 |  | 03 or 05 |  |
|  |  |  | Min | Max | Min | Max | Min | Max | Min | Max |
| A0 | -1000 to 0 | 2 | 27 | 77 | 80 | 185 | 170 | 500 | 250 | 500 |
| BC | -12.5 to +12.5 | 2M | N/A | N/A | N/A | N/A | 8 | 25 | 10 | 25 |
| G3 | -1 to +1.5 | 2 | 29 | 80 | 86 | 200 | 700 | 1500 | 1100 | 1500 |
| C6 | 3 to 25 | 2M | N/A | N/A | N/A | N/A | 8 | 25 | 10 | 25 |
| E1 | 5 to 120 | 2M | N/A | N/A | N/A | N/A | 25 | 60 | 37 | 60 |
| E8 | 50 to 350 | 2M | 4 | 14 | 11 | 23 | 100 | 200 | 150 | 200 |
| G5 | 0.1 to 1.5 | 2M | 11 | 35 | 31 | 67 | 150 | 700 | 225 | 700 |
| J0 | 0.2 to 4 | 2M | 65 | 183 | 197 | 459 | 400 | 2000 | 600 | 2000 |
| M1 | 0.2 to 7 | 2M | 68 | 189 | 207 | 488 | 600 | 3500 | 900 | 3500 |
| P6 | 0.3 to 15 | 2M | 143 | 338 | 443 | 1000 | 1000 | 7000 | 1500 | 7000 |
| Q2 | 6 to 25 | 2M | 294 | 796 | 908 | 2100 | 2 | 12.5 | 3 | 12.5 |
| R3 | 10 to 40 | 2M | 611 | 1700 | 1800 | 4200 | 5 | 20 | 7.5 | 20 |
| S7 | 15 to 75 | 2M | 639 | 1700 | 1900 | 4500 | 5 | 37.5 | 7.5 | 37.5 |

MODELS 201 (281)
TABLE 10C

| Range Code | Range psi / in. Hg / in. $\mathrm{H}_{2} \mathrm{O}$ | Wetted parts code | SPDT OPTIONS |  |  |  |  | DPDT OPTIONS (201 only) |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | $\begin{gathered} 00 \\ (20) \end{gathered}$ | $\begin{gathered} 02 \\ (22) \end{gathered}$ | $\begin{gathered} 04 \\ (24) \end{gathered}$ | $\begin{aligned} & 08 / 0 \mathrm{G} \\ & (28 / 2 \mathrm{G}) \end{aligned}$ | $\begin{gathered} \mathrm{H} 2 \\ (\mathrm{H} 4) \end{gathered}$ | 01 | 03 | 05 | 09/0H | H3/H6 |
| AB | -30 to 0 | 2 | 0.45 | 1.30 | 0.5 | 2.0 | 4.4 | 0.65 | 1.7 | 0.65 | 2.25 | 6.64 |
| BU | -5 to +5 | $2 M$ | 0.8 | 2.4 | 0.8 | 5.2 | 2 | 1.2 | 4.0 | 1.6 | 6.0 | 3.2 |
| GK | -14.5 to +20 | 2 | 0.2 | 0.67 | 0.23 | 1.0 | 2.6 | 0.3 | 0.85 | 0.33 | 1.2 | 3.9 |
| CP | 1 to 10 | $2 M$ | 0.8 | 2.4 | 0.8 | 5.2 | 2 | 1.2 | 4.0 | 1.6 | 6.0 | 3.2 |
| E4 | 2 to 50 | $2 M$ | 0.8 | 2.8 | 0.8 | 5.5 | 2 | 1.6 | 4.5 | 1.6 | 6.5 | 3.2 |
| E7 | 1 to 5 | 2M | 0.03 | 0.1 | 0.03 | 0.2 | 0.09 | 0.04 | 0.15 | 0.06 | 0.23 | 0.13 |
| GF | 3 to 15 | 2M | 0.09 | 0.26 | 0.1 | 0.43 | 0.41 | 0.1 | 0.32 | 0.12 | 0.50 | 0.61 |
| GP | 1 to 20 | 2M | 0.07 | 0.25 | 0.1 | 0.35 | 1.2 | 0.15 | 0.38 | 0.15 | 0.42 | 1.74 |
| J3 | 2 to 60 | 2M | 0.5 | 1.5 | 0.5 | 2.5 | 6.1 | 0.7 | 3.5 | 0.8 | 2.8 | 9.14 |
| M4 | 3 to 100 | 2M | 0.5 | 1.6 | 0.6 | 2.6 | 7.3 | 0.7 | 2.0 | 0.8 | 2.9 | 10.88 |
| PB | 4 to 200 | 2M | 1.1 | 3.5 | 1.2 | 5.7 | 17.4 | 1.5 | 4.2 | 1.6 | 6.4 | 26.1 |
| QB | 85 to 400 | 2M | 2.3 | 7 | 2.5 | 11.6 | 33.4 | 3.0 | 8.5 | 3.3 | 13 | 50.03 |
| RB | 140 to 600 | 2M | 4.5 | 14.3 | 5 | 22 | 43.5 | 6.4 | 19 | 7 | 25 | 65.25 |
| SB | 200 to 1000 | 2M | 4.8 | 14.5 | 5 | 23 | 44.4 | 6.7 | 19 | 7.5 | 28 | 65.26 |

MODELS 202, 203
TABLE 10D


Page 7 of 9

## Electrical Connections

## Terminal Block

Cable entry is to a non-pinching terminal block made of a non-hygroscopic thermosetting plastic, suitable for cables up to $2.5 \mathrm{~mm}^{2} / 14 \mathrm{AWG}$.

## Earthing/Grounding

An earthing stud is provided inside all weatherproof enclosures, adjacent to the entry.External earthing is standard on flameproof versions. Safety note see Table 3.

## Dielectric Strength

The electrical assembly is capable of withstanding *2kV between live parts and earth/ground and 500 V between open contacts.

* 1.2 kV for micro switch Codes $\mathrm{H} 2, \mathrm{H} 3, \mathrm{H} 4$ and H6. Refer to Table 6.


## Electrical Entry

Standard options are listed in Table 3. Other threads can be accommodated by adaptors. Dual entry available, see Table 3.

## Optional Extras

## Chemical Seals

Chemical seals of our own or proprietary manufacture can be fitted when required.

## Mounting Position/Location/Installation

Vertical as shown, IN DIMENSIONS, taking care to avoid siting in locations that transmit excessive shock or vibration. For further advice contact our engineers.

## Pollution degree (EN60947-5-1)

All products are suitable for use in pollution degree 3. For extreme conditions where condensation may readily form, then sealed contacts should be used. See Table 6 Codes 08/09, 0G/0H, 2G, 28, H2/H3/H4/H6.

## Electrical Isolation

These products are not suitable for electrical isolation. Always isolate circuit separately to carry out any electrical work.


## Dimensions



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