

# Technical Datasheet



## Industrial Series Diaphragm Operated Pressure Difference Switch

Models: S31, S34

### Key Features

- Weatherproof and Flameproof models ATEX and NEC 500.
- NACE MR-01-75 compatibility.
- Ranges available up to 10 bar (160 psi),  
Static pressure up to 250 bar (3500 psi)
- Field set adjustment against a reference scale.
- Hermetically sealed microswitch options.
- Optional gold alloy contacts.
- Terminal block for easy field wiring.
- Safety vented design as standard.



### Series Overview

- The Industrial Series switches were developed in the mid-1990's to offer customers a robust range of switches suitable for applications where requirements were more standard than those for which the highly configurable Performance Series switches were designed.
- Using diaphragm based sensors and a more traditional in-line force balance mechanism to transfer movement from the sensor to the microswitch, these switches are suitable for a wide range of industrial applications. Various international approvals make the Industrial Series suitable for use in both safe and Hazardous Areas in Europe, North America and throughout the world.

Other products in the series include:

- Pressure Switches: Model S20
- Temperature Switches: Model S70



### Product applications

The S31/4 is suitable for a wide range of applications in:

- Oil & Gas
- Chemical
- Petrochemical
- Refining
- Power
- OEM

The choice of models available ensures that the S31/4 is suitable for use in:

- Corrosive atmospheres
- Resistant to chemical attack

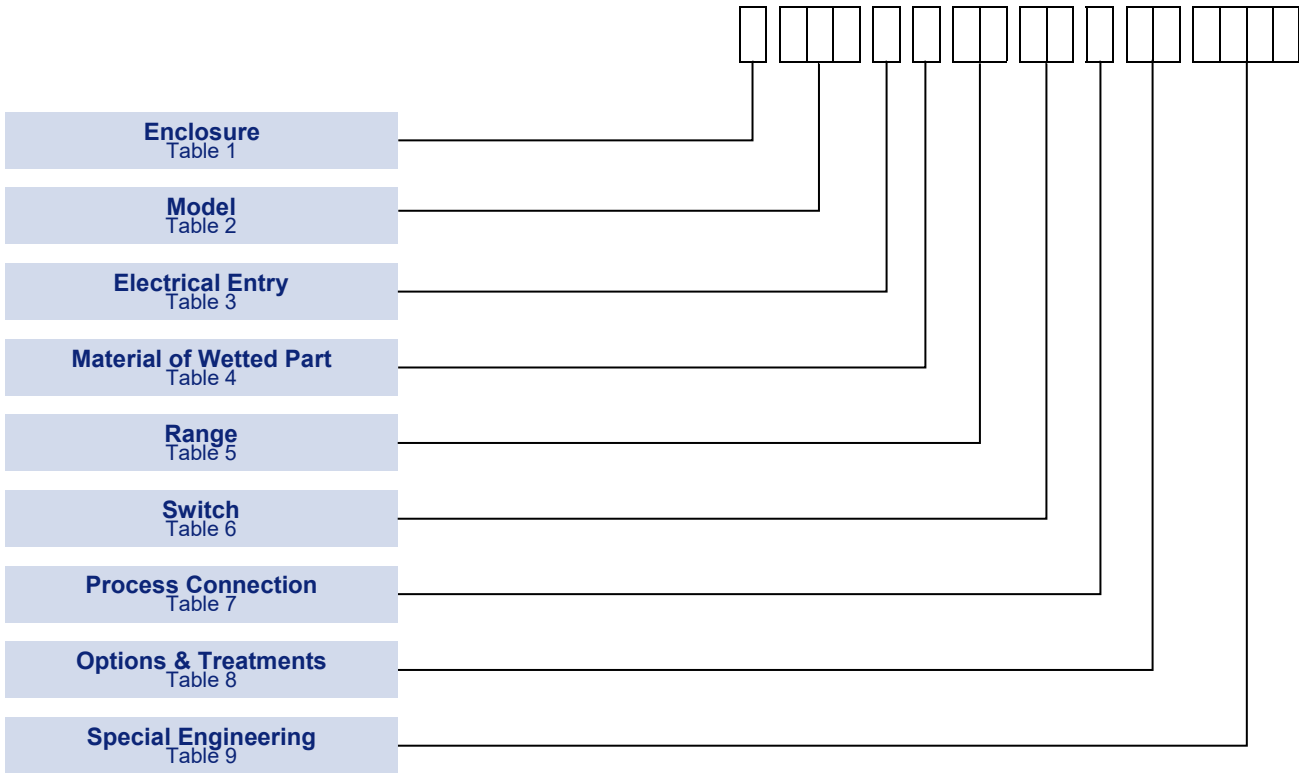
### How can we help you?

Delta Controls' offers fast, efficient and knowledgeable support when and where you need it. Please visit our web site at [www.delta-controls.com](http://www.delta-controls.com) to find your local support centre or call us on:

**+44 (0)1252 729140**

## 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, please contact your local sales office.



**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

<b>Industrial Series</b> Models: S31 & S34	<b>Accuracy:</b>	Set point repeatability $\pm 1\%$ of span at 20°C / 68°F ambient.
	<b>Storage Temperature:</b>	-25 to +60°C / -13 to +140°F
	<b>Ambient Temperature:</b>	-25 to +60°C / -13 to +140°F For continuous use below -25°C (-13°F) we recommend using only enclosures H, R, T, U and A with only special gaskets and limited switching.
	<b>Maximum Process Temperature:</b>	Subject to appropriate installation practice, the component parts withstand up to +60°C (+140°F).
	<b>Enclosure classification:</b>	IP66 / NEMA 4X / Flameproof Ex d
	<b>Switch output:</b>	SPDT or DPDT snap action microswitch (standard) Hermetically sealed (optional)
	<b>Electrical rating:</b>	See Table 6
	<b>Process Connection:</b>	Rc 1/4 (BSP), 1/4 NPT Internal, 1/2 NPT Internal, 1/2 NPT External
	<b>Approximate Weight:</b>	Enclosures: <b>"H &amp; T"</b> 4.0kg/8.8lb to 8.6kg/19.0lb, <b>"R &amp; U"</b> 8.7kg/19.2lb to 13.1kg/29.9lb, <b>"W"</b> 4.0kg/8.8lb to 8.6kg/19.0lb, <b>"A"</b> 5.5kg/12.1lb to 9.9kg/21.8lb depending on model

## Enclosure

### FINISH

All enclosures except Type R, A and U 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:** In the interests of safety and reliability not all enclosures are available with all wetted parts. See Table 4.

### NOTE: Codes H, T for 4X

Aluminium Enclosure protected by quality epoxy paint system.

Performance of enclosure requires careful installation and sealing of cable gland connection in site.

Assembly requires to be built for Marine use, See Table 8, Code 02.

### NOTE: Codes 4 and 5.

To be used only on switch codes 04/05, 0G/0H, H2/H3/H6 - See Table 6. PED Cat IV not available at present.

Temperatures in Table 1 refer to limitations for certified enclosures.

See **TECHNICAL DATA**.

TABLE 1	
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ENCLOSURE TYPES	Code
<b>FLAMEPROOF ENCLOSURES (ZONE 1)</b>	
<b>ATEX Ex d IIC T6 Gb (-60 to +65°C) T5 Gb (-60 to +80°C) II 2 GD</b> Gravity die-cast enclosure in aluminium-silicon alloy, epoxy painted. Suitable for outdoor use, IP66 / NEMA 4X.  II 2 GD	<b>H</b>
<b>ATEX Ex d IIC T6 Gb (-60 to +65°C) T5 Gb (-60 to +80°C) II 2 GD For Aggressive Atmospheres</b> Investment cast enclosure in austenitic stainless steel. Suitable for outdoor use, IP66 / NEMA 4X.  II 2 GD	<b>R</b>
<b>NEC 500, NEMA 7, 9</b> Gravity die-cast enclosure in aluminium-silicon alloy, epoxy painted. Class 1, Groups C and D, Class II, Groups E, F and G. Suitable for outdoor use, IP66 / NEMA 4X.	<b>T</b>
<b>NEC 500, NEMA 7, 9 For Aggressive Atmospheres</b> Investment cast enclosure in austenitic stainless steel. Class 1, Groups C and D, Class II, Groups E, F and G. Suitable for outdoor use, IP66 / NEMA 4X.	<b>U</b>
<b>WEATHERPROOF ENCLOSURES</b>	
<b>General purpose</b> The basic enclosure is pressure die-cast in zinc alloy, epoxy painted, with weather protection not less than NEMA 4, IP66.	<b>W</b>
<b>For Aggressive Atmospheres</b> Investment cast enclosure in austenitic stainless steel with weather protection not less than NEMA 4X, IP66	<b>A</b>
<b>INTRINSIC SAFE ENCLOSURES</b>	
<b>ATEX Ex ia IIC T6 Ga (-25 to +60°C) or T5 Ga (-60 to +80°C) II 1G</b> As code "W" but Ex ia. Weatherproof to IP66 / NEMA 4.  II 1G	<b>5</b>
<b>ATEX Ex ia IIC T6 Ga (-25 to +60°C) or T5 Ga (-60 to +80°C) II 1G</b> As code "A" but Ex ia. Weatherproof to IP66 / NEMA 4X.  II 1G	<b>4</b>

## Models

TABLE 2	
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### S31

Maximum working pressure 1.0 bar (14.5 psi)/110 bar (1600 psi) see Table 5.

### S34

Maximum working pressure 250 bar (3,500 psi).

	Code
<b>Fixed Switching Differential</b> SPDT & DPDT options available. See Table 6.	<b>S31</b>
<b>Fixed Switching Differential</b> SPDT & DPDT options available. See Table 6.	<b>S34</b>



Applies to all models.

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## Electrical Entry

Adaptors are available for other popular thread sizes.



\* For codes 3 & 6 see approvals and Table 1 Codes T & U

TABLE 3

	Code
Enclosure W: Clearance for 20mm (3/4 in) outside dia conduit.	1
Enclosure W: M20 x 1.5 ISO thread	0
Enclosure W: 3/4-NPT INT. elbow adaptor to suit.	3
Enclosures H, R & A: M20 x 1.5 ISO thread.	0
Enclosures H, R & A: M20 x 1.5 ISO thread, dual entry.	5
Enclosures H & R: 1/2" NPT INT	2
Enclosures H, R, T & U: 3/4-NPT INT (direct).	3*
Enclosures H, R, T & U: 3/4-NPT INT dual entry	6*

## Material of Wetted Parts

For aluminium flanges (Code D) select only from enclosures codes H, T and W. For Cast Iron flanges (Code E) select only from enclosure codes R, U or A. See Table 1.



Applies to all materials.

TABLE 4

Ranges		Code
BD-EA	316 Stainless steel diaphragm. All other wetted parts fully austenitic 300 Series stainless steel, PTFE and Nitrile seals.	I
	For wetted parts required to conform with Sour Gas or Sour Crude, applications as laid down in NACE standard MR-01-75.	L
BC	Nitrile diaphragm and seal with aluminium flanges.	D
	Nitrile diaphragm and seal with cast iron flanges.	E

## Setting Ranges

$P_{max}$  = maximum working pressure

When ordering, please state units required. Range and set point will be in units preference. Unless otherwise stated, units will be in bar/mbar.

The instrument will sustain, without loss of performance, a continuous forward over pressure equal to the maximum static pressure and/or full vacuum.

**NOTE:** For pressure difference switches maximum working pressure ( $P_{max}$ ) and maximum static/line pressure mean the same.

TABLE 5

Model	$P_{max}$		Range			Code
	bar	psi	mbar/bar	Code	in H <sub>2</sub> O/psi	
S31	1.0	14.5	-12.5 to +12.5	BC*	-5.0 to +5.0	BU*
S31 (S34)	110 (250)	1600 (3500)	6 to 40	BD (0D)	2.5 to 16	BY (0Y)
S31 (S34)	110 (250)	1600 (3500)	25 to 160	CB (0B)	10 to 64	CS (IS)
S31 (S34)	110 (250)	1600 (3500)	100 to 600	CE (0E)	1.5 to 8.5	CK (0K)
S31 S34	110 250	1600 3500	0.4 to 2.5	DC	6 to 40	DP
S31 S34	110 250	1600 3500	0.6 to 4	DD	10 to 60	DT
S31 S34	110 250	1600 3500	1.6 to 10	EA	25 to 160	EH

\*Forward overpressure is limited to 500 mbar



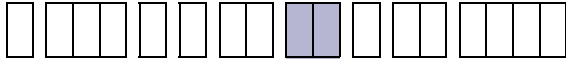
Applies to all ranges above


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Maximum static/line pressure applied in the reverse direction (i.e., to low pressure connection with high pressure connection open to atmosphere) will be contained without failure. The diaphragm on ranges BD to EA (BY to EH) will however have been distorted, leading to a degradation of performance and a shortening of the service life.


For applications where regular reversals of pressure are inevitable, a special engineering facility is available, see Table 9.

## Switch Options

TABLE 6 

Model S31/4								
CSA RATING (RESISTIVE) see note	IEC947-5-1 / EN 60947-5-1 RATING						Contact	Code
	Designation & Utilisation Category	Rated operational current $I_e$ (A) At rated operational voltage $U_e$	$U_i$	$U_{imp}$	VA Rating			
					Make	Break		
5 Amps @ 110/250V AC Light Duty for AC only	AC14 D300 DC13 R300	0.6/0.3A @ 120/240 V AC 0.22/0.1A @ 125/250V DC	250V	0.8kV	432 28	72 28	SPDT DPDT	<b>00</b> <b>01</b>
5 Amps @ 110/250V AC and 2 Amps @ 30V DC General purpose precision	AC14 D300 DC13 R300	0.6/0.3A @ 120/240 V AC 0.22/0.1A @ 125/250V DC	250V	0.8kV	432 28	72 28	SPDT DPDT	<b>02</b> <b>03</b>
1 Amp @ 125V AC and <b>§ 100mA @ 30V DC</b> Gold Alloy contacts for low voltage switching	1A @ 125 VAC RESISTIVE (IEC 1058-1/EN 61058-1)						SPDT DPDT	<b>04</b> <b>05</b>
<b>§ 5 Amps @ 110/250V AC &amp; 5 Amps @ 30V DC</b> Environmentally sealed	AC14 D300 DC13 R300	0.6/0.3A @ 120/240 V AC 0.22/0.1A @ 125/250V DC	250V	0.5kV	432 28	72 28	SPDT* DPDT*	<b>08</b> <b>09</b>
<b>§ 1 Amp @ 30V AC and 30V DC</b> Environmentally sealed with gold contacts	AC14 E150	0.3A @ 120 V AC	125V	0.5kV	216	36	SPDT* DPDT*	<b>0G</b> <b>0H</b>
5 Amps @ 250V AC & 2 Amps @ 30V DC Hermetically sealed. Gold plated silver contacts	AC14 D300 DC13 R300	0.6/0.3A @ 120/240 V AC 0.22/0.1A @ 125/250V DC	250V	0.5kV	432 28	72 28	SPDT DPDT	<b>H2</b> <b>H3†, H6‡</b>
† 2 Single pole, double throw, simultaneous falling under pressure ‡ 2 Single pole, double throw, simultaneous rising under pressure								
<p><b>NOTE:</b> Enclosure Codes T and U. Microswitch Codes 02 and 03. CSA rating as follows:- 110/250V AC 5A 250V/125V DC 0.25/0.5A</p> <p style="text-align: right;">Enclosure Codes H and R. Microswitch Codes 02 and 03. CSA rating as follows:- 110/250V AC 5A 250V/125/30V DC 0.25/0.5/2A</p> <p> 00, 01, 02, 03, 04, 05, H2, H3†, H6‡ microswitches CSA accepted component for use in hazardous areas Class 1, Div 2, Groups A, B, C and D. When used in enclosures T and U.</p> <p>The electrical rating is dependent on the microswitch fitted to the instrument. The electrical ratings defined by each approval that the microswitch complies with and is shown on the product nameplate, ie CSA, or IEC. It should be noted that the instrument must be used within the electrical rating specified from the approval you require. This table lists the actual IEC ratings against the Designation &amp; Utilization Category marked on the nameplates. In the absence of any verification by CSA the microswitch § manufacturer's rating is stated in <i>italics and bold</i>. <b>If in doubt seek guidance from the factory.</b></p> <p><b>NOTE:</b> For low energy circuits e.g. 30V and up to 100mA, we recommend using gold alloy contact switches. <math>U_i</math> = rated insulation voltage                      <math>U_{imp}</math> = rated impulse to withstand voltage across contacts.</p>								


## Process Connection

TABLE 7 

**NOTE:** Range code BC (BU) can only be supplied with integral Rc1/4 or 1/4 NPT process connections. For other thread sizes specify adaptors.

**NOTE:** Range code BC/BU for CSA can only be supplied with process connections Code A

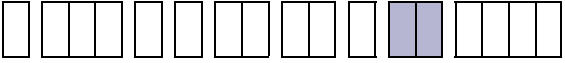
	Code
Rc 1/4 (1/4 BSP tr INT) to (ISO 7/1)	<b>A</b>
1/4—18 NPT INT	<b>F</b>
1/2—14 NPT INT	<b>H</b>
1/2—14 NPT EXT	<b>J</b>

 Applies to all connections in this table.

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## Options & Treatments

Combinations available, apply for details.

TABLE 8 

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

\* Not available on range BC/BU

## Special Engineering

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



 Refer to engineering

TABLE 9 

	Code
Please consult Delta sales engineering for special requirements	<b>TBA</b>

## Performance Data

TABLE 10

## Bar Units

### FIXED SWITCHING DIFFERENTIAL

Due to manufacturing tolerances, the figures quoted in these tables are for guidance only.

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.

Code	Range mbar/bar	P <sub>max</sub> Bar	Model	Microswitch - Option Switching Differential mbar									
				00	01	02	03	04	05	08/0G	09/0H	H2	H3/H6
<b>BC</b>	12.5 to 12.5	1	S31	0.6	1	2	2.5	1	1.5	1.8	2.4	2.4	2.4
<b>BD</b>	6 to 40	110	S31	1.3	2	4	6	2	3	8	11	10	10
<b>CB</b>	25 to 160	110	S31	2.6	4	9	12	4	6	16	21	18	21
<b>CE</b>	100 to 600	110	S31	3.3	5	12	15	6	9	20	27	30	32
<b>DC</b>	<b>0.4 to 2.5</b>	110	S31	50	75	120	160	70	100	300	400	200	270
<b>DD</b>	<b>0.6 to 4</b>	110	S31	60	90	210	270	90	140	360	480	350	480
<b>EA</b>	<b>1.6 to 10</b>	110 250	S31 S34	120	180	420	540	180	250	720	960	800	1200

## PSI Units

Code	Range Ins H <sub>2</sub> O	P <sub>max</sub> Psi	Model	Microswitch - Option Switching Differential Ins H <sub>2</sub> O / Psi									
				00	01	02	03	04	05	08/0G	09/0H	H2	H3/H6
BU	-5.0 to +5.0	14.5	S31	0.2	0.4	0.8	1.0	0.4	0.6	0.7	0.9	0.9	0.9
BY	2.5 to 16	1600 3500	S31 S34	0.5	0.9	1.6	2.3	0.8	1.2	3.1	4.3	3.9	3.9
CS	10 to 64	1600 3500	S31 S34	1.0	1.6	3.5	4.7	1.6	2.3	6.2	8.2	7.2	8.2
CK	1.5 to 8.5	1600 3500	S31 S34	0.05	0.07	0.17	0.21	0.08	0.13	0.29	0.39	0.43	0.46
DP	6 to 40	1600 3500	S31 S34	0.72	1.1	1.7	2.3	1.0	1.4	4.3	5.8	2.9	3.9
DT	10 to 60	1600 3500	S31 S34	0.87	1.3	3.0	3.9	1.3	2.0	5.2	7.0	5.1	7.0
EH	25 to 160	1600 3500	S31 S34	1.7	2.6	6.1	7.8	2.6	3.6	10.4	13.9	11.6	17.4

## 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 2.5mm<sup>2</sup>/14AWG.

### 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 500V between open contacts.

\* 1.2kV for micro switch Codes H2, H3, H4 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.

## Approvals

### EUROPEAN DIRECTIVES



**Low voltage Directive (LVD) 2014/35/EU.**  
Compliant to LVD

**Pressure Equipment Directive (PED) 2014/68/EU:**

This product has a process connection size  $\leq$ DN25 and is therefore categorised as sound engineering practice under Cat 3.3

**ATEX Directive 2014/35/EU**



INTRINSIC SAFETY:

Certificate No. Baseefa05ATEX0111  
EN 60079-0, EN 60079-11

For Zone 0 models (**Enclosure code 4/5, see table 1**)

Because of the low voltages and currents of intrinsically safe circuits, we recommend using gold contacts.  
Refer to Table 6.

II 1 G Ex ia IIC T6 Ga (Tamb  $-25^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$ ) or T5 Ga (Tamb  $-60^{\circ}\text{C}$  to  $+80^{\circ}\text{C}$ )

FLAMEPROOF:

Certificate No. BAS01ATEX2113X  
EN 60079-0, EN 60079-1, EN 60079-31, EN 60079-26

For Zone 1 models (**Enclosure code H/R, see table 1**)

**Fluorosilicone O-ring**

II 2 GD Ex d IIC T6 Gb (Tamb  $-60^{\circ}\text{C}$  to  $+65^{\circ}\text{C}$ )  
Ex tb IIIC T85 $^{\circ}\text{C}$  Db

II 2 GD Ex d IIC T5 Gb (Tamb  $-60^{\circ}\text{C}$  to  $+80^{\circ}\text{C}$ )  
Ex tb IIIC T100 $^{\circ}\text{C}$  Db

**Nitrile O-ring**

II 2 GD Ex d IIC T6 Gb (Tamb  $-30^{\circ}\text{C}$  to  $+65^{\circ}\text{C}$ )  
Ex tb IIIC T85 $^{\circ}\text{C}$  Db

II 2 GD Ex d IIC T5 Gb (Tamb  $-30^{\circ}\text{C}$  to  $+80^{\circ}\text{C}$ )  
Ex tb IIIC T100 $^{\circ}\text{C}$  Db

### GLOBAL CERTIFICATION

**CANADIAN STANDARDS ASSOCIATION**

Switches - Automatic - Pressure Type - for hazardous locations  
Enclosure codes T & U.  
Class 1, Groups C & D Class II, Groups E, F, G.  
LR94185-2

**SAFETY INTEGRITY LEVEL (SIL)**

IEC 61508 Part 1 and 2  
Systematic integrity and random integrity SIL2 Capable  
Certificate number DC060816C001





# Dimensions

All dimensions mm (inches)

### W ENCLOSURE

MODEL S31/S34		
RANGE	DIM. A	DIM. B
BD, CB, CE	108 (4.25)	54 (2.12)
DC, DD, EA	85 (3.74)	41 (1.61)

### A ENCLOSURE

MODEL S31/S34		
RANGE	DIM. A	DIM. B
BD, CB, CE	115 (4.52)	57 (2.24)
DC, DD, EA	103 (4.05)	45 (1.77)

### H, R, T & U ENCLOSURES

MODEL S31/S34		
RANGE	DIM. A	DIM. B
BD, CB, CE	149 (5.86)	80 (3.14)
DC, DD, EA	138 (5.35)	87 (2.63)

### MODEL S31 PROCESS CONNECTIONS RANGE BC/BU

DIMENSIONS FOR GUIDANCE ONLY. mm (inches)

### MODEL S31 PROCESS CONNECTIONS

MODEL S31				
RANGE	DIA. A	DIM. B	DIM. C	DIM. D
BD, CB, CE	179 (7.04) CODE A & F	65 (2.55)	121 (4.76)	192 (7.55) CODE A & F
	205 (8.07) CODE H			218 (8.58) CODE H
	195 (7.67) CODE J			208 (8.18) CODE J
DC, DD, EA	154 (6.06) CODE A & F	52 (2.04)	96 (3.77)	166 (6.53) CODE A & F
	180 (7.08) CODE H			192 (7.55) CODE H
	170 (6.69) CODE J			182 (7.16) CODE J

DIMENSIONS FOR GUIDANCE ONLY. mm (inches)

### MODEL S34 PROCESS CONNECTIONS

MODEL S34				
RANGE	DIA. A	DIM. B	DIM. C	DIM. D
BD, CB, CE	126 (4.96)	63 (2.48)	126 (4.96)	192 (7.55) CODE A & F
	218 (8.58) CODE H			218 (8.58) CODE H
	208 (8.18) CODE J			208 (8.18) CODE J
DC, DD, EA	100 (3.93)	52 (2.04)	102 (4.01)	166 (6.53) CODE A & F
	192 (7.55) CODE H			192 (7.55) CODE H
	182 (7.16) CODE J			182 (7.16) CODE J

DIMENSIONS FOR GUIDANCE ONLY. mm (inches)

### CABLE GLAND ASSEMBLY

In the interest of development and improvement Delta Controls Ltd, reserves the right to amend, without notice, details contained in this publication. No legal liability will be accepted by Delta Controls Ltd for any errors, omissions or amendments.

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