



# Model 31CS

## Standard Duty

### Intrinsically Safe CSA Rated

### Pressure Transducer

The Model 31CS is designed for hazardous locations requiring intrinsic safety, top of the line performance, reliability, and stability at an affordable price. The Model 31CS offers exceptional  $\pm 0.25\%$  FS accuracy in pressure ranges from 75 PSI to 32,000 PSI and features an all welded stainless steel construction for a robust design and IP67 seal for moisture and humidity protection. The Model 31CS offers a variety of different outputs, pressure connectors, and electrical connectors to satisfy the most challenging application requirements. In addition, voltage units are available with a dual pressure/temperature output. For ATEX/IECEx intrinsically safe pressure transducers, refer to Setra's 31IS and 32IS.

#### Best in Class Price-to-Performance

Strain Gauge technology provides a very linear and predictable output signal over a wide temperature range, which enables Setra to provide an inherently stable and accurate sensor element in high volumes and at low cost. The Model 31CS sensor is constructed using a highly sophisticated automation process, where the sensors are manufactured in a Class 100 clean room. To ensure best in class accuracy and long term stability, each sensing element is thermally compensated to an accuracy of less than  $0.005\%^{\circ}\text{C}$  prior to leaving the clean room for final assembly. Thermally compensating the unit ensures improved accuracy and simplified conditioning of electronics, while eliminating the need for calibration over elevated temperatures as a transducer.

#### Unrivaled Quality

Setra understands the importance of quality in OEM applications, which is why we are always looking for ways to improve the quality rating of our products. Over the last two years, the Model 31CS failure rate is less than 0.1%, a quality rating unmatched by the competition. The worst thing that could happen to an engineer is to shut down their work because of quality issues. Setra takes this seriously, which is why we have worked hard to ensure that product quality issues will never be a concern for our customers.

#### Rugged Design

The Model 31CS's compact welded stainless steel design is constructed to protect the sensor in demanding industrial environments. The electrical connectors are tested to an environmental protection specification of IP67, and a robust internal design ensures that the transducers can survive high levels of vibration. A high level of EMC protection allows the transmitters to perform to the most stringent of industrial standards, and all devices are RoHS compliant.



- Premium Price-to-Performance
- High Quality:  $<0.1\%$  Failure Rate
- Long Term Stability ( $<0.1\%$ FS/YR)

#### Model 31CS Features:

- Class I, Division 1, Groups C & D
- Class I, Zone 0 Ex ia IIB T4 Ga
- Class I, Zone 0 AEx ia IIB T4 Ga
- No Oil Fill - Prevents Thermal Instability & Leakage
- Wide Choice of Pressure Ranges: 75 PSI-32,000 PSI
- $\pm 0.25\%$  FS Accuracy
- Dual Temperature and Pressure Output
- Small Footprint - Less than 1" Diameter
- Reverse Wiring Protection
- All Welded Stainless Steel Construction
- CE & UL Approved, RoHS Compliant
- IP67 Rated
- 40x FS Burst Pressure\*

\*Range Dependent

#### Applications:

- Industrial Processes
- Chemical
- HVAC/R Equipment
- Water Management

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## GENERAL SPECIFICATIONS

Performance		Electrical Data	
Accuracy <sup>1</sup> RSS	±0.25% FS	Voltage <sup>3</sup>	
Long Term Drift	0.2% FS/YR (non-cumulative)	Output (3-Wire)	0V min to 10V max.
Thermal Error		Supply Voltage	1 Volt above full scale with min supply of 8V; max 30V at 4.5mA
31CS	±1.5% max, ±1% typical/212°F (100°C)	Source & Sinks	2 mA
Compensated Range	-40 to +176°F (-40 to +80°C)	Current <sup>3</sup>	
Operating Temp	-40 to +176°F (-40 to +80°C)	Output (2-Wire)	4-20 mA
Zero Tolerance Max.	0.5% of Span	Supply Voltage	8-24 Volts measured at the input to the transducer terminals
Span Tolerance Max.	0.5% of Span	Max Loop Resistance	(Supply Voltage - 8) x 50 ohms. See Graph Below
Fatigue Life	Designed for more than 100M cycles	Ratiometric Output	
<b>Physical Description</b>		Output	0.5 to 4.5V (Source & Sink 2 mA)
Pressure Port	See Ordering Information	Supply Voltage	5 VDC ±10% at 4.5 mA
Wetted Parts <sup>2</sup>	17-4 PH Stainless Steel (Diaphragm)	<b>EMC Specifications</b>	
Electrical Connection	See Ordering Information	Emission Tests:	EN61326-1:2006 and EN61326-2-3:2006
Enclosure	IP67 (IP65 for Electrical Code A)	EN55011:2007	Radiated Emissions 30-230MHz 30dB µV/M @10M 230-1000MHz 37dB µV/M @10M
Vibration	BSEN 60068-2-6 (FC) Sine (20G) BSEN 60068-2-64 (FH) Random (14.1 Grms)	Immunity Tests:	EN61326-1:2006 and EN61326-2-3:2006
Shock	BSEN 60068-2-27 (Ea) (50G, 11ms)	EN61000-4-2:2009	Electrostatic Discharge: ±4Kv contact ±8Kv air
Weight (Configuration dependant.)	1.8 to 5.3 oz (50-150 grams).	EN61000-4-3:2006	Radiated Immunity: 10V/M 80-1000MHz 3V/M 1400-2000MHz 1V/M 2000-2700MHz
<b>Zener Barrier &amp; Entity Parameters</b>		EN61000-4-4:2004	Fast Transients: ±0.25, 0.5, 1Kv
Zener Barrier Parameters		EN61000-4-6:2007	Conducted Immunity: 3V 0.15 to 80MHz 80% 1KHz modulation
Voltage	Ui = 30VDC		
Current	Li = 100mA		
Power	Pi = 0.7W		
Entity Parameters			
Signal Current	In = 4 to 20mA		
Effective Internal Capacitance	Ci = 323n		
Effective Internal Inductance	Li = 9µh		
Values to be added when supplied with integrated cable:			
Cable Capacitance	Ci = 300pF / m (max) Wire-to-Wire or Wire-to-Shield		
Cable Capacitance	Li = 2µH / m (max) Wire-to-Wire		

## OVER-PRESSURE CAPABILITY

Pressure Range PSI (BAR)	Proof Pressure (x Full Scale)	Burst Pressure (x Full Scale)
75-300 (4-20)	3.00 x FS	40 x FS
500-1,500 (40-100)	2.00 x FS	20 x FS
2,000-6,000 (140-400)		10 x FS
10,000 (700)		>60,000 PSI (4,000 Bar)
15,000 (1,000)		
25,000 (1,800)	1.40 x FS	
30,000 (2,200)		

The data in this table is "times rated ranges" (xRR)

Application pressure should be restricted to the rated-range of the transducer. The maximum overpressure is the pressure limit at which the transducer will not show significant offset shift. The minimum burst pressure is the test-rating for fluid containment.

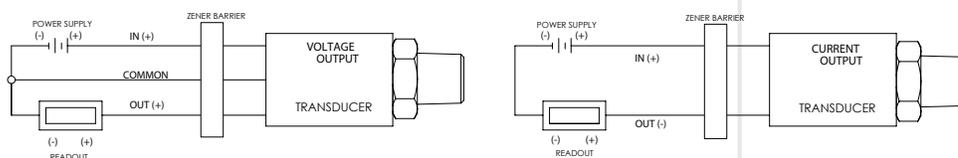
<sup>1</sup> RSS of Non-Linearity, Hysteresis, and Non-Repeatability.

<sup>2</sup> Note: Hydrogen not recommended for use with 17-4 PH Stainless Steel.

<sup>3</sup> Reverse Wiring Protected

Specifications subject to change without notice.

## WIRING



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## ELECTRICAL FITTINGS

M12			Deutsch DT01-4P		Industry Standard Form C		EN175301-803 (DIN 43650 A)		AMP Superseal 1,5 Series			METRIPACK T (150 SERIES)		
Code E			Code 8		Code R		Code G		Code 6			Code 9		
Pin #	Voltage	Current	Voltage	Current	Voltage	Current	Voltage	Current	Pin #	Voltage	Current	Pin #	Voltage	Current
1	+IN	+IN	0V	0V	+IN	+IN	+IN	+IN	1	+OP	DNC	A	0V	0V
2	+OP	DNC	+IN	+IN	0V	0V	0V	0V	2	0V	0V	B	+IN	+IN
3	0V	0V	NC	NC	+OP	DNC	+OP	DNC	3	+IN	+IN	C	+OP	DNC
4	NC	NC	+OP	DNC	NC	NC	NC	NC	Recommended Mating Connector: 282087-1 as housing, 183025-1 as contact (x3), 281934-3 as wire seal (x3), 880811-2 as protective boot (strain relief)			Recommended Mating Connector: 12065286 as connector body, 12052893 as con- nector seal. Consult Delphi Packard for appropriate contacts and wire seals.		
Recommended Mating Connector: To IEC 61076-2-101 Hirschmann, Brad Harrison, Lumberg			Recommended Mating Connector: DT0645-P012 as connector plug, W45-P012 as wedge, 0462-201-1631 as gold socket (x4)		Recommended Mating Connector: Hirschmann GDS 307 Part Number 933 024-100 or equivalent		Recommended Mating Connector: Molex/Brad/mPm Series 121201 (C28300N05) or equivalent							
Integrated Cable			<p><b>NOTES:</b> DNC: Do Not Connect (Leave Floating). NC: Not Connected at Transducer End Alternative pin-outs are not available.</p> <p>The integrated cable is shielded. For compliance with EN 61000-4-5, shielded cable should be used on all transducers.</p> <p>WARNING: Substitution of Components May Impair Suitability For Intrinsic Safety</p>											
Code F														
Color	Voltage	Current												
Red	+IN	+IN												
Black	0V	0V												
White	+OP													

## PRESSURE FITTINGS

SAE	1/8" - 27 NPT*	1/8" - 27 NPTF Dryseal	1/4" - 18 NPT	1/4" - 18 NPT Internal	1/4" - 18 NPTF Dryseal
Dimensions in Inches					
Fitting Code	08	4D	02	0E	4C
Torque	2-3 TFFT*	2-3 TFFT*	2-3 TFFT*	2-3 TFFT*	2-3 TFFT*
	SAE J1926/2:3/8-24 w/o O-Ring*	7/16" - 20 UNF w/ O-Ring*	7/16"-20 UNF w/37° Flare	SAE 4 Female 7/16" Schraeder	9/16"-18 "Heavy Duty" w/ O-Ring
Dimensions in Inches					
Fitting Code	4N	1J	04	1G	1P
Torque	18-20 NM	18-20 NM	15-16 NM	18-20 NM	18-20 NM
BSP & Metric	G1/4" - 19 External w/ O-Ring*	G1/4" - 19 A Integral Face Seal*	M12 x 1.5 w/ O-Ring*	M12 x 1.5 HP Metal Washer Seal*	G1/4" A Integral Face Seal
Dimensions in Inches					
Fitting Code	01	05	0L	2T	05
Torque	30-35 NM	30-35 NM	28-30 NM	30-35 NM	

\*O-Rings are not supplied with pressure fittings.

NOTE: Not all available pressure connectors are shown. Please consult the factory for additional configurations.

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## ORDERING INFORMATION

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Model	Output	Pressure Range	Pressure Port	Connector	Pressure Restrictor	Cable Length
31CS=Standard Duty	See Table 1	See Table 2	See Table 3	6 Amp Superseal 1/5 Series	R Restrictor	00 Not Fitted
				8 Deutsch DT04-4P	0 No Restrictor	01 1 meter
				9 Metripack T (150 Series)		02 2 meter
				E M12 x P, 4-Pin		03 3 meter
				G <sup>5</sup> EN175301 (DIN43650 A)		05 5 meter
				R Industry Standard Form C		10 10 meter
				F Integrated Cable		

**Table 1. Output**

CODE	Output
B <sup>1</sup>	4-20 mA
C	1-6V
F	0.1-5.1V
G <sup>1</sup>	0.2-10.2V
H	1-5V
N	0.5-4.5 V Non Ratio-metric
P <sup>1</sup>	1-10V
R	0-5V
S <sup>1</sup>	0-10V
T	0.5-4.5 V Ratio-metric
V	0.5-4V

**Table 2. Pressure Range**

CODE	BAR	CODE	PSI	CODE	BAR	CODE	PSI
				GAUGE		SEALED	
0004G	4	075PG	75	0100S	100	15CPS	1,500
0006G	6	100PG	100	0160S	160	20CPS	2,000
0010G	10	150PG	150	0250S	250	35CPS	3,500
0016G	16	200PG	200	0400S	400	50CPS	5,000
0025G	25	300PG	300	0600S <sup>3</sup>	600	10KPS	10,000
0040G	40	500PG	500	1000S <sup>3</sup>	1,000	15KPS <sup>3</sup>	15,000
0060G	60	10CPG	1,000	1600S <sup>3</sup>	1,600	20KPS <sup>3</sup>	20,000
				2200S <sup>2,3</sup>	2,200	25KPS <sup>3</sup>	25,000
						30KPS <sup>2,3</sup>	30,000
						32KPS <sup>2,3</sup>	32,000

**Table 3. Pressure Port**

CODE	DESCRIPTION	CODE	DESCRIPTION
OH	1/2" NPT	1J	7/16" - 20 UNF 2A SA1926/2 O'RING
O2	1/4" - 18 NPT	1P	9/16" - 18UNF 22 A/F
OE <sup>4</sup>	1/4" - 18 NPT Female	4P	G1/2" A 27A/F
4C	1/4" - 18 NPTF Dryseal	05	G1/4" A Integral Face Seal
0A	1/4" - 19 PT (JIS) or 1/4" - 19 BSPT	01	G1/4" A Stud (BS 5380 Port)
4B	1/4" Female (7/16UN with Shraeder Deflator)	0S	G1/8" A Stud (BS 5380 Port)
08	1/8" - 27 NPT	2T	M12x1.5 (6g) High Pressure (Washer Seal)
4D	1/8" - 27 NPTF Dryseal	0L	M12x1.5P (6g) O'Ring to ISO 6149-2
4N	3/8" - 24 UNF Union	1G <sup>4</sup>	Schraeder 7-16" - 20 UN 2B Female
04	7/16" 20 (37FLARE SAE J514 SIZE 4)		

<sup>1</sup>Output codes B, G, P, S not available below 100 PSI (7 BAR)

<sup>2</sup>Ranges above 25 KPS and 1600 BAR only available with 31CS

<sup>3</sup>Ranges 1000 Bar (15,000 PSI) and above in 31CS and 700 BAR (10,000 PSI) and above in 32CS available with 2T pressure port only

<sup>4</sup>Pressure ports OE and 1G not available with restrictor option

<sup>5</sup>Vented only (no connector)